AN IDENTIFICATION AND DESCRIPTION OF SECONDARY AVIATION MAGNET SCHOOLS IN THE UNITED STATES

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

BACKGROUND OF THE STUDY

"On the diffusion of education among the people rests the preservation and perpetuation of our free institutions."

Daniel Webster, 1837

The research presented in this study was primarily conducted to determine the identity, location, and description of the undetermined number of secondary aviation magnet schools now existing in the United States. The research was necessary in order to provide opportunity to describe the program characteristics, organization, curricula, evaluation, resources, and community awareness. The conclusions reached in the study are the product of statistical research yielded from surveys as well as the study of current societal trends as reflected in research involving such sources as the United States Department of Education, the Library of Congress and the Federal Aviation Administration. The context for the study begins with the first attempts to desegregate schools in America.

In 1954, the United States Supreme Court heard the historic *Brown vs. Board of Education* case and handed down the decision that "separate schools are inherently unequal."

Whereas the historic decision effectively laid the groundwork for the desegregation of the schools in the nation, it also inspired thousands of legal maneuvers designed to ensure the status quo in public education. In response

to these actions, the federal courts began to order mandatory school assignment plans to eliminate segregation "root and branch" and to compensate for the damage done by prior discrimination.

The orders from the federal court to dismantle racially unbalanced schools and to eliminate patterns of discrimination prompted a number of approaches, including mandatory assignment and busing across neighborhood boundaries. One consequence of such desegregation plans was the flight of white middle class families away from their neighborhood schools, leaving many school districts blacker and poorer.

In the face of the exodus to the suburbs and to private schools, many districts created high quality special programs in selected neighborhood schools in order to slow down the flight and possibly to lure students back into the district.

These efforts to establish "magnets" served the fundamental purpose of attracting a racially heterogeneous student population based on common educational interests. By focusing on a curricular specialty such as art, music, science or mathematics, magnets were (and are) able to effectively draw students from all parts of a school district.

In addition to a shared interest in a specialized subject, magnets are characterized as a voluntary choice by students and parents; they offer open or controlled access to enrollment outside the neighborhood attendance zone; and they play a unique role in the voluntary desegregation within a school district.

The pursuit of educational excellence did not spark the initial spread of magnet schools but the goal of school desegregation did. The federal government helped fuel the magnet movement by establishing a funding program in 1976 for school systems using magnets to desegregate. Today, that

Department of Education program remains a major source of magnet funding supplying $110 million each year to school systems from Boston to San Diego. State funding plus business and industry have also become major sources of financial assistance to many magnet schools at all levels of education.

Thus, in many cities, magnets have been successful in improving the racial mix of schools. But increasingly, the national demands for educational excellence have propelled the spread of the movement (Toch, 1991).

Over 20 years ago, the U.S. Government released the A Nation at Risk report that warned that schools were jeopardized by a "rising tide of mediocrity." A correlation to this situation was a growing school dropout problem. In 1991, for example, four million persons in the 16 through 24 year old age group had dropped out of school (Kaufman, McMillen, and Bradby, 1991). The report said unless major steps were taken to reconstruct American education, the nation would not be able to compete in the international economy.

Since that report was issued, the magnet school movement has continued to grow and develop. In cities from Syracuse to Sacramento, where neighborhood schools clearly weren't working for either blacks or whites, school officials have embraced magnets as a means of providing top students with more challenging academic work. The result has been a rapidly expanding network with a wide array of schools. In Los Angeles today, 31,000 of the 625,000 students in the city are attending 98 magnet programs. They range from the Sherman Oaks Center for Enriched Studies, an elementary program where the tradition of grouping students by age and grade has been abandoned, to the Animal and Biological Sciences Center, where officials have opened their research facilities to the school students. In Buffalo, N.Y.,

14,000 magnet students specialize in everything from the visual and performing arts to finance and computer science (Toch, 1991).

The magnets come in many forms but they seem to share a number of qualities: They are rigorously academic and teach a specialized curriculum in math and science, or foreign languages, or the arts. Many use non-traditional teaching techniques and they deliberately draw their students from beyond traditional neighborhood boundaries. One quarter to one-third of all magnet schools select students on the basis of grades and test scores; others enroll on a first-come first-served basis or through lotteries. Even those that do not use academic admission standards to screen applicants have demanding programs that in effect exclude many students (Toch, 1991).

In 1994, the first published directory of public schools in the United States organized around themes identified 2,452 individual building programs, many with multiple theme offerings. Of that number, 584 were support programs for high school students (Magnet Schools of America, 1994). Today, over 4,000 magnet schools nationwide offer unique programs (Waldrip, 1996).

The U.S. Department of Education has listed 71 magnet thematic programs that they have funded under the Magnet School Assistance Program since 1985. Aviation education programs are outstanding examples of one such thematic form utilized in magnet schools today (Strickler, 1994).

AVIATION EDUCATION PROGRAMS

Aviation education had its beginning in the United States in 1908 (only five years after the Wright brothers flew in 1903) when H. Lavonne Twining of the Los Angeles Polytechnic High School used the subject of aviation in his physics classes. Following World War I, an increased interest occurred in

pioneering aviation events in education. Later during the 1920s, documented examples of aviation education school programs could be found in every region of the country. One of the early examples of a school program was the designing, building and flying of model airplanes in school contests. From the earliest days of aviation education, it has gained high levels of acceptance and approval by students, teachers, administrators, and parents.

In 1925, the Galt, California schools provided the first public school flight training program at the high school level. The flight training was also related to all of the other relevant school subjects. Therefore, the Galt program was probably the first application of aviation education to the magnet school concept in the United States. (Strickler, 1991)

Later efforts in the 1920s and 1930s to develop significant aviation education programs at all school levels were stimulated by the Daniel Guggenheim Fund for the promotion of Aeronautics. A national committee was established, primarily at the request of educators, to develop answers to aviation education questions students in public schools were asking in every part of the nation. Consequently, early significant publications and books were developed to be used as sources of contemporary aviation education materials. (Strickler, 1991)

In the 1930s, the U.S. Office of Education began publishing aviation bulletins and the newly emerging airlines employed educators to work with schools and colleges and develop materials of instruction. With the passage of the 1926 Air Commerce Act, federal efforts to provide aviation educational programs and support began which continues to this day.

Events in the late 1930s that led to World War II greatly increased interest and pioneering contributions to aviation education. Through the efforts of the U.S. Office of Education, the largest peacetime pilot training

program ever created, the Civilian Pilot Training Program, was established in 1939 using private aviation contractors and also schools and colleges to train pilots. In 1942, the U.S. Office of Education initiated a new program designed to established pre-flight aeronautical courses in secondary schools. The program provided detailed course outlines and led to the development of a textbook and teaching materials series for schools. An estimated 12,000 high schools offered the aeronautics courses to a quarter of a million students (Strickler, 1994).

Education programs in secondary aviation decreased after World War II. But with the advent of the space age in the late 1950s and the creation of the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA), huge resources for aviation and aerospace education began to again become available.

In the 1960s and 1970s, the growth of the general aviation and airline industries spurred a renewed interest in secondary aviation courses and in 1973 as many as 1,500 high schools were offering aerospace or aviation ground school courses as a part of their curriculum (Mitchell, 1990). During this period, aviation education, given its long history and specific success in motivating students to stay in school and to do their best on subjects of real world value, set the stage for the transition into secondary aviation magnet schools.

NATURE OF THE PROBLEM

A report by the Organization for Economic Cooperation and Development makes it clear that no country is plagued by greater educational disparities between rich and poor than the United States (Sanchez, 1993).

A fundamental change has occurred in the American mosaic. Forty percent of the class of 2000, fifth graders of 1993, are something other than white, native-born Americans and 24 percent of them live in poverty (Wear, 1993). A recent study by Gregory Spencer of the United States Census Bureau predicted that the country is undergoing a profound demographic shift and by the middle of the next century only about half of the population will be non-Hispanic white compared to 74 percent today (New York Times News Service, 1996).

Unfortunately, educational reform has made painfully little progress to improve K-12 education. The Education Commission of the States says fundamental change in the curriculum, teaching techniques, management, and administration is needed to reform schools. But only one percent to four percent of the 110,000 schools in the nation are in the process of restructuring (Perry, 1993).

David Kearns, former Deputy Secretary of Education, said, "We put a man on the moon in ten years. But in terms of what our children know, have we progressed since the early 1980s? The answer is no. Since the early 1970s? The answer is no." A report from the Department of Education strengthens this option when it reviewed reading tests of 140,000 students which showed that more than two-thirds of fourth, eighth, and twelfth graders are not proficient readers. A second report indicated that only 9 percent of high school seniors can solve math problems that require more than an educated guess (Perry, 1993).

According to the 1994 National Assessment of Educational Progress, a full 25 percent of high school seniors are deemed functionally illiterate. Only 36 percent are considered "proficient" readers and a mere four percent have "advanced" reading skills (Dole, 1996).

In another study, the results showed some 40 million adults had only the most rudimentary reading and writing skills. An additional 50 million adults fared a little better but were still considered to have inadequate reading and writing skills. They could not, for instance, use a calculator for basic addition. For years, business executives have said the low level of literacy among tens of millions of Americans was a direct threat to the U.S. economy (L.A. Times/Washington Post Service, 1993).

The average math scores on the Scholastic Aptitude Test have fallen 24 points in 25 years. The scores further indicate that only a tiny fraction of high school seniors are prepared for college-level math and science and the outlook is even bleaker for young women and minorities who continue to lag in scoring (Childs, 1992). Approximately half the twelfth graders graduating today appear to have an understanding of mathematics that does not extend significantly beyond simple problem solving with whole numbers (Yancy, 1993). For three of every four Americans, school ends without a four-year college degree. And when it comes to equipping these people for the world of work, the U.S. education systems are often judged to be failing. The lack of impact of school science programs on students is further illustrated in a National Outreach Survey conducted by Purdue University and published in *USA Today* on what most influences interest in science. The results are presented in Table I.

TABLE I

INFLUENCE ON STUDENT INTEREST IN SCIENCE

GRADES 3-12

Star Trek TV programs	28%
Science Fiction Movies	18%
Science TV Shows	15%
NASA	11%

(USA TODAY, 1994)

High school curricula no longer provide students with skills that will lead to well paying jobs. Many of those who go on to trade schools also cannot find work in the occupations that they have chosen because no linkage exists between the training and the labor market. The unemployment rate for U.S. adults who did not finish high school averaged 11.2 percent last year, whereas it was just three percent for college graduates according to the Bureau of Labor Statistics (Arndt, 1994).

Worst of all, fewer than 40 percent of school leaders say most high school graduates who are not bound for college know enough math to hold entry level jobs, according to a National Alliance Business survey. Only 42 percent say graduates read well enough and just 27 percent say they write adequately. Fewer than 40 percent of high school principals rated their students qualified in communication and listening skills. Employers generally rated these same students even lower; just 19 percent judged the students able to write adequately, whereas only 27 percent considered their

reading and 29 percent their math abilities up to par (Washington Wire, 1992).

ROLE OF TRANSPORTATION

Transportation accounts for 20 percent of the total U.S. economy. Within transportation, aviation and aerospace represent a very large part of this total. Huge numbers of trained people are required to keep airplanes flying and customers well served. Hundreds of careers exist in aviation other than piloting, air traffic controlling, and maintaining aircraft and equipment. People are needed to manage airports, to manage and operate ground services, to schedule pilots and dispatch flights, to service aircraft, and maintain airports (Strickler 1993).

Opportunities exist for pilots and will expand among air carriers, business and a variety of other specialties. In 1990, 134,856 professional pilots were employed in the industry. By 2005, analysts project a need for 40,000 additional pilots, based on industry trends and retirements. As for maintenance technicians, a predicted need for 100,000 to 120,000 technicians by the year 2000 reflects the need to maintain older aircraft and accommodate new aircraft. A shortage of technicians to meet industry needs will occur unless the educational system can develop 65,000 to 85,000 new aviation technicians in the immediate future (Strickler, 1993). Because the demographics of the nation are shifting to an increase in minority population (Hispanics, Asians and Blacks), the educational system is making painfully little progress in educational quality reforms to prepare students for the kind of jobs that exist and are increasing in the aviation and aerospace segments of the transportation part of the economy.

The magnet school approach to education does seem to offer an aid to desegregation as well as an answer to motivating students and improving their educational performance regardless of their ethnic and economic background. This is particularly significant because of the rapid shift in the balance of minorities to the non-white majority. In the future, this change in racial balance will create a larger pool of ethnic minorities to train for jobs in the aviation industry or in other sectors of the economy.

These schools, located in all geographic regions of the nation, represent large and small districts in urban and suburban settings. Whereas the earlier magnet schools offered highly specialized programs essentially serving gifted students, the magnet school today embraces a much greater variety of curricular interests and serves students of diverse educational and socio-economic backgrounds. The secondary Aviation Magnet School is a product of this expansion.

PURPOSE OF THE STUDY

The purpose of this study was to to identify and describe secondary aviation magnet school programs by program characteristics, organization, curricula, evaluation, resources, and community awareness. Prior to this study, the number, location and description of secondary aviation magnet schools was not reported in the literature. Moreover, the precise description of their programs, organizational structure, curricula, evaluation methods, resources utilized, and community awareness techniques remained unknown. While this study is primarily aimed at gathering basic data, it does reflect on ways in which secondary aviation magnet schools may serve as a remedy for racial isolation, excessive dropouts, and inadequate coursework by students, particularly among minorities. Each secondary aviation magnet

school program has a program administrator who is responsible for implementation of the program at each respective high school. These administrators offered the necessary information about the programs and objectives. They also were able to describe the current status of program implementation and future needs.

Data were gathered to gain insight into the needed support and promotion of these aviation magnet schools. The information gathered through this study will allow government and industry aviation organizations at large to better understand the needs of program providers and users.

The principal purpose of the study remains to identify, describe, and determine the current status of secondary aviation magnet programs in order that insight toward their success can be identified. In a collateral sense, the collection of this data will allow recommendations to be made on how these programs can be improved to prepare students to meet industry work force needs.

RESEARCH OBJECTIVES WERE:

(1) to identify the various secondary aviation magnet programs,
(2) to compile the necessary data to describe program characteristics,
(3) to describe program organization,
(4) to describe curricula,
(5) to describe evaluation methods,
(6) to describe resources utilized,
(7) to describe community awareness techniques.

LIMITATIONS OF THE STUDY

This study has assembled data on the number and identity of active secondary aviation magnet schools in the United States. This effort will

reflect their common program characteristics, organization, curricula, evaluation, resources, and community awareness efforts. The collection of the data from these schools allows a first opportunity to study these programs as a collective group. The conclusions of this study were drawn from data collected from the program administrators. The results of other research conducted on magnet schools in general as well as earlier research on selected aviation magnet schools was used to compare information.

This study was not made to determine the implementation status and future prospects for developing aviation magnet programs by secondary schools who do not have them. Any report of survey data will be reflective of the perceptions of the program administrator. Other general and demographic data are presented and described in a manner which will hopefully allow for the understanding of the information that was shared by administrators.

ASSUMPTIONS

The following assumptions were accepted:

(1) The assumption that program administrators were honest and complete in their responses

(2) The assumption that the questionnaire covered needed areas

(3) The assumption that the questionnaire was understood by program administrators

DEFINITIONS

In order to understand the terms used in this study, the following definitions are provided:

FAA - Federal Aviation Administration

Magnet School - An elementary or secondary school that has a specialized curriculum with a central theme and enrolls students on a voluntary or selected basis from throughout the school district.

Aviation Education - That branch of general education concerned with communicating knowledge, skills and attitudes about aviation and its impact upon society (Strickler, 1951).

Program Administrators - Teachers or administrators responsible for implementing and supervising the curriculum and teaching of a magnet school program.

MSAP - The Magnet Schools Assistance Program is a federally funded program to directly support school desegregation.

Aerospace Education - A coined term created after the Soviet Union launched Sputnik to embrace broad education in the realms of both air and space. It has curricular relevance in varying degrees to every traditional subject or discipline (Strickler, 1995).

CHAPTER II

REVIEW OF THE LITERATURE

INTRODUCTION

Whereas the concept of the Magnet school is not new, the application of that concept has been expanded and modified over the years as the needs of students and society have changed. The first magnet school, Boston Latin, was actually founded in 1635. Magnet schools were originally designated to meet the needs of a small intellectual elite but they now serve a twin focus: the improvement of educational quality while increasing racial integration (Estes, Levine, Waldrip, 1990).

Professor Mary Anne Raywid stated succinctly in her monograph entitled "The Case for Public Schools of Choice" that these fundamental premises underlie the idea of choice : "1) There is no best school for everyone. 2) It is necessary to provide diversity in school structure and programs in order to accommodate all students and to enable them to succeed. and 3) Students will perform better and accomplish more in learning environments they have freely chosen than those they are simply assigned" (Raywid, 1989).

At the beginning of this decade, more than 2,000 elementary and secondary magnet schools of choice existed in the United States. Most of these schools are district-wide, open enrollment institutions that are thematically organized around subject areas such as science and mathematics, performing arts or career areas such as engineering and aviation. They are largely non-selective—that is, students who apply are evaluated primarily on the basis of interest and motivation rather than academic records and test scores.

In the early 1900s, the magnet high school often took the form of a technical trade school. Students from throughout a district could request a transfer to these programs. The programs tended to be geared to the student who would end his education with high school graduation and skill acquisition, mainly in the trades. These schools continue to function in many districts throughout the nation.

During the 1960s, the magnet school came into being in the form of the alternative school, designed for students who did not function well in a regular setting. These students were frequently dropouts who had dropped back in, potential dropouts, students with financial and family problems, or those students who simply had a problem adjusting to the regular school structure. Over the last three decades, these alternative schools have continued to grow in number.

A third type of magnet school is the concept of the "Super High School." The main difference in approach between this version and the technical high school is that the development approach provides learning opportunities for both the student who plans to continue his education and the student who wishes to enter the job market immediately after graduation. A typical secondary magnet school curriculum illustrating this approach is described in Appendix D.

Magnet schools today are playing a vital role in the effort to reform public education in the United States. Studies of contemporary magnet schools show them to be fairly successful (Estes, Levine, Waldrip, 1990). Dr. Nolan Estes in his book, *Magnet Schools Recent Developments and Perspectives* (1990), said: " The magnet school concept, then, can be considered critical to the future of public education in the United States. In order for public schools to remain viable institutions, educators must offer many

different options. The magnet school approach presents a workable method for developing schools of choice to match exactly the needs and goals of each student." Estes further stated: "Magnet schools also play an increasingly successful role in the desegregation of educational institutions. They bring together students of different races and backgrounds who share common interests and goals, but for educational reasons rather than for the simple exercise of mixing bodies. "The exciting thing is that the magnet school is a sound approach to education. Parents will choose to send their children to schools where they can find the best and most positive educational opportunity. Magnet schools can and will continue to compete successfully with the finest private schools anywhere" (Estes, 1990).

BACKGROUND LITERATURE

A Gallup Poll conducted in 1973 reported that 62 percent of parents and 80 percent of professional educators believed that providing options for students was a constructive idea. This was before the notion of the alternative or magnet schools was well-known. Prior to 1970, no body of literature specifically addressed itself to magnet public schools (Estes and Waldrip, 1978). Some creative school administrators, supported by their school boards, realized that what they were doing was not working. In September 1968, junior high students who had been attending McCarver Junior High School in Tacoma, Wa., were reassigned to other schools and the first "magnet school" opened its doors to district-wide attendance. McCarver offered the latest in continuous progress strategies and individualizing techniques and was oversubscribed the first year. The school went from 87 percent African American to 53 percent African American the first year.

In 1969, a similar school was established in Roxbury, Mass., and that same year the Minneapolis public schools received a research grant from the federal government to study alternative forms of education. The result, in 1970, consisting of four elementary schools and one high school, was the first system of magnet schools organized to bring about racial integration voluntarily (Waldrip, 1994).

By 1976, the Research Report from the National School Boards Association indicated that: "One quarter of the school board members have alternative schools functioning in their school districts currently" (Estes and Waldrip, 1978). Since alternative schools were offering variety in the curricula, it was logical to use the learning environments and distinctive features to attract different learners and help promote desegregation. So alternative magnet schools started in science rich schools, arts-oriented schools, and the like, and then slowly expanded into such community resources as schools-without-walls. This move from the magnet as schoolhouse to the magnet as a community-based center was very important (Estes and Waldrip, 1978).

Dr. Mario Fantini describes this move as follows: "The idea of using community resources to improve learning is not new, of course. Most schools engage in community visits through field trips. However, until recently we have not taken the bigger step of moving education into these real world environments as a logical extension of the classroom. The focus on the four walls of the school as the major legitimate boundary in which learning takes place has conditioned most of our thinking about education. Similarly, building modern schools has been viewed as important because they were places in which such improved learning takes place. In any event, the focus has been on the schoolhouse. But this model has led to serious drawbacks

because the schoolhouse was and is unable to deal effectively with human diversity" (Estes and Waldrip, 1978). Magnet schools became an extension of earlier efforts of providing alternatives to the growing aspirations of countercultures or different lifestyle groups, the changing economic needs in our society to meet different educational goals, and to adjust to societal demands.

Dr. Fantini continued his analysis as follows: "We have known for some time that education is basic to human and societal development. But now this basic need is being expressed in terms of a universal demand for quality education. However, the public school system, as it is presently structured, no longer has the capacity to respond to this demand. The present system of public schooling was designed for an earlier time. Yet, societal demands continue to pressure it and those connected with it" (Estes and Waldrip, 1978).

Magnet schools provide "spin-off" values today in cooperative efforts between school and community. For example, such joint efforts build a greater base of understanding and support for the public school system by making more effective use of available resources and minimizing duplication. Dr. Fantini concluded by saying" "Finally, there is something legitimate about the creation of a full or partial school that emphasizes the humanities, performing arts, ecology, languages, aerospace, etc., and a school that is located in community settings noted for such orientations" (Estes and Waldrip, 1978).

Under such a concept of magnet schools, the rich resources of the community could be considered in reforming the public education system. And it can be accomplished without seriously affecting the economic, political or educational underpinnings of that system.

Demographic data about schools of choice are relatively scant. Up to 1994, only two national surveys of such schools have been completed in the past two decades, one focusing on public alternative high schools (Raywid, 1982) and the other looking at magnet schools at all grade levels (Blank, et al, 1983). At that time, the magnet school survey located 1,019 such programs. The alternative school survey located 2,500 but estimated that the actual total might be three or four times that number.

A third national survey, completed in 1994, reported that the number of individual magnet schools has more than doubled over the past decade with a total of 2,400 (Steel and Levine, 1994). The following table shows the distribution of magnet schools and desegregation plans by region and district as described in the study.

TABLE II

MAGNET SCHOOLS AND DESEGREGATION PLANS BY U.S. DEPARTMENT OF EDUCATION REGION AND DISTRICT CHARACTERISTICS

Region	**Magnet Schools**	**Desegregation Plans**	**All Multischool Districts**
Northeast	27.8 %	12.4%	21.8%
Central	19.5%	15.6%	34.6%
Southeast	22.2%	46.2%	14.7%
West	30.3%	25.7%	28.8%
TOTAL	230	672	6,389

(Steel and Levine, 1994)

According to the study, most magnet school programs were whole magnets, where all students in the school participate in the magnet program. The following table displays the type of magnet program by grade level.

TABLE III

GRADE LEVELS SERVED BY PROGRAM DELIVERY SYSTEMS

Type of Magnet Program	Grade Level Elementary	Middle	Secondary	Combined	Overall
Whole School-Attendance Zone	35.9%	28.3%	2.8%	14.4%	25.6%
Whole School Dedicated	30.9%	29.7%	27.1%	49.3%	32.1%
Program within School	26.7%	41.5%	69.2%	29.4%	37.9%
Unknown	6.5%	0.5%	0.8%	6.9%	4.5%
TOTAL	1,661	472	631	350	3,118

(Steel and Levine, 1994)

Magnet schools offer a wide range of distinctive programs with the largest category being programs emphasizing academic subject matter such as math, science, aerospace technology, language immersion, or humanities. Table IV from the study shows the primary themes used by the various types of magnet programs

TABLE IV

PROGRAM THEMES BY PROGRAM DELIVERY SYSTEMS

Type of Magnet Program	Magnet Program Theme					
	Instructional Approach	Arts	Gifted & Talented	Subject Matter	Vocational Training	Overall
Whole School-Attendance Zone	21.9%	33.7%	20.0%	30.0%	18.9%	25.6%
Whole School Dedicated	36.9%	31.0%	24.9%	32.6%	28.2%	32.1%
Program within School	27.4%	32.2%	55.1%	36.6%	51.7%	37.9%
TOTAL	826	349	359	1,149	435	3,118

(Steel and Levine, 1994)

From an attendance viewpoint, magnet programs attract an increasing number of students and a considerable unmet demand exists for them. In the 1983 national study (Blank, et al), a survey was conducted with 350 largest urban districts. The results showed that 138 districts or more than one-third had magnet schools, a total of over 1,100 magnet schools. About half of the districts had received no federal magnet school funding. The mean number of students in magnet schools per district was 3,100.

In a follow-up study in 1989, data was collected from 15 urban districts that were part of the 1983 national study (Blank, et al). The 15 districts were originally selected to provide representation of the 138 urban districts with magnet schools in 1983 and the data is displayed in Table V.

TABLE V

ENROLLMENT TRENDS IN MAGNET SCHOOLS: 1982-83 to 1988-89

District	1982-83 District Enrollment	Total Magnet Enrollment	District Enrollment	1988-89 Total Magnet Enrollment	Percent Sr. High
Augusta, Ga.	31,375	1,121	32,000	1,442	12%
Birmingham, Ala.	44,717	7,548	43,169	8,776	39%
Buffalo, N.Y.	46,757	17,542	46,284	15,679	26%
Cincinnati, Ohio	71,722	15,000	52,000	17,706	21%
Kankakee, Ill.	5,932	1,031	5,600	2,395	43%
Louisville, Ky.	31,375	1,121	98,276	8,400	15%
Lubbock, Texas	29,141	3,075	29,174	5,336	17%
Memphis, Tenn	107,221	6,000	104,743	11,500	NA
New Haven, Conn.	17,154	537	17,016	1,947	NA
Pasadena, Calif	22,531	3,038	21,535	2,336	25%
Pittsburg, Pa.	41,855	4,500	39,549	6,717	7%
St. Paul, Minn.	31,276	2,586	33,472	11,961	22%
San Diego, Calif	109,808	15,200	116,371	31,359	25%
Seattle, Wash.	44,795	8,000	43,023	21,933	40%
Shreveport, La.	46,310	4,502	52,435	8,726	16%

(Blank, 1989)

In the 1994 national study (Steel and Levine, 1994), the data analysis showed that the number of districts offering magnet school programs had increased by 67 percent in the past decade. The study estimated that 230 multischool districts offered magnet school programs during the 1991-92

school year. These 230 districts were four percent of all multischool districts nationwide, and included 24 percent of all students in multischool districts or 7.8 million students. Thus, nearly one in four students in multischool districts were enrolled in a district that offered magnet schools in 1991-92. Within the 230 districts, the study also estimated that there was a total of 2,433 individual magnet schools in operation.

On average, 15 percent of students in magnet districts were enrolled in magnet programs totaling 1.2 million students nationwide—a threefold increase in magnet program enrollment since 1982 and approximately half of the magnet programs maintain waiting lists. (Steel and Levine, 1994)

LITERATURE IDENTIFYING THE PROBLEM

Aside from demographics, the magnet school concept is spreading for specific common purposes. In 1984-85 and in 1989, the New York State Education Department and a consortium of 14 school districts funded the most extensive statewide study of magnet schools completed to date. The study covered over 100 state funded magnet school programs and 65,000 students (Musumeci and Szczypkowski, 1991). The evaluation study identified several factors that seemed to contribute to magnet school growth and success in school desegregation, student achievement and lowering the dropout rate. Factors listed by the study are graphically depicted in Figure 1.

Magnet School Components that Influence School Outcomes

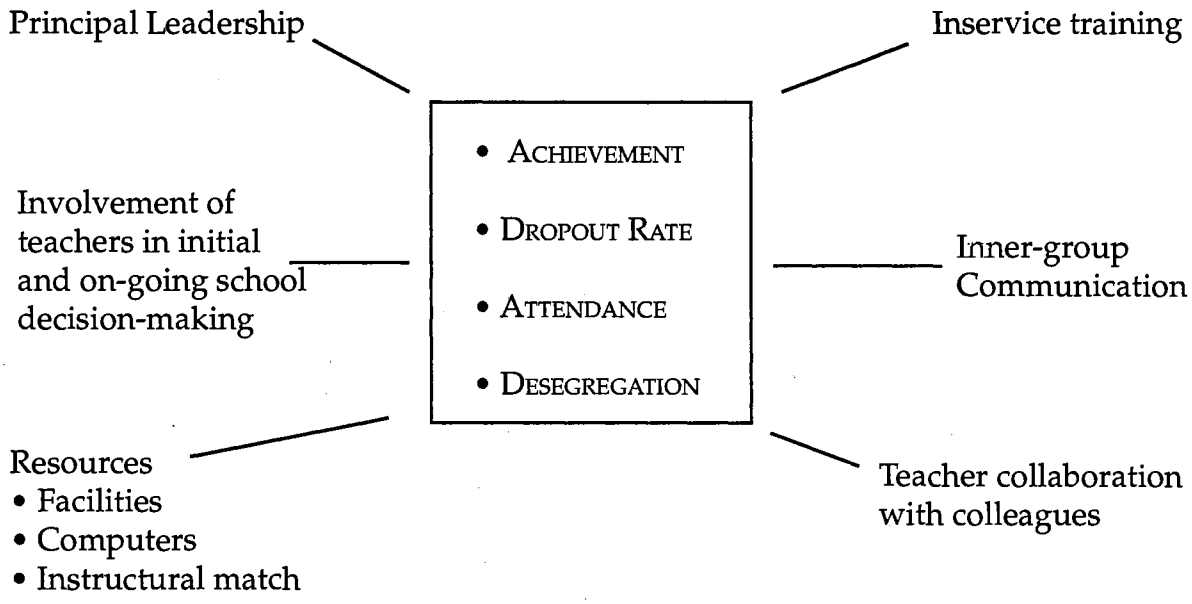

Figure 1 (Waldrip, Marks and Estes, 1993)

Dr. Don Waldrip, Executive Director of Magnet Schools of America stated, " All in all, over 3,000 magnet schools now operate in the United States in 45 states and they all have the following characteristics in common:

1. They all are voluntarily selected by parents and/or students.
2. They all seek to improve the quality of general education; the theme or the organizational pattern provides the means to improve the overall quality.
3. In districts serving a radically diverse student body, all magnet schools reduce racial isolation. No magnet school segregates on the basis of race" (Waldrip, 1993).

Court orders on desegregation or the threat of such orders have been a factor in establishing magnet schools in many areas. About 500 school districts remain under desegregation orders and others are seeking to avert such

orders by offering choice plans. Many districts are adopting the magnet concept as a general reform strategy or as a mechanism for school revitalization. Another impetus has been renewed interest in dropout prevention with the argument that the opportunity to select a different learning environment might entice marginal students to remain in school and to improve their chances for success (Raywid, 1989).

In all three key areas, magnet schools have been successful. Christine H. Rossell's book, *The Carrot or the Stick for School Desegregation Policy,* analyzed the magnet school plans of 20 school districts and 13 separate studies on issues of desegregation and came to this conclusion: " The analysis presented here suggests that the public choice model is relevant for school desegregation. When asked to choose between their neighborhood school and a superior magnet school, sufficient numbers will choose the latter, so that plans based primarily on choice will produce more interracial exposure than those based primarily on mandatory reassignment" (Rossell, 1990). Rossell argues that voluntary plans with magnet schools produce more desegregation than the mandatory plans in part because the superior resources in magnet schools and the innovative curricula "earn" the participation of whites (Rossell, 1990).

In extensive New York state studies which reviewed racial/ethnic data over a 15-year period for all magnet and non-magnet schools in magnet districts, the study of magnet school effects on racial desegregation produced very positive results. Schools that once were segregated became significantly less so as a result of magnet implementation. The results were consistent in all districts studied (Musumeci and Szczypkowski, 1991).

Magnet schools and the need for diversity to accommodate the full range of students' requirements impact the national dropout and failure

rates. Dropout figures as high as 75 percent have been reported in some urban areas. Yet, documentation of real reversals by previously disaffected learners attending magnet schools shows that many failures simply need not happen (Raywid, 1989).

A number of studies have shown remarkable improvement by low achievers who had been placed in new and different learning environments. An analysis of dropout patterns in Portland, Ore., showed that the school attended has more to do with whether a student drops out than does the student's economic circumstances or racial identity. The data also revealed that students who attend a magnet school have much lower dropout rates than do students assigned to a non-magnet school. Another study of at-risk students in Chicago reached the same conclusion (Raywid, 1989).

Moore and Davenport, in their study of student placement in large school systems, showed that 72 percent of the original entering class in 18 non-selective low income high schools in Chicago either dropped out or graduated so poorly that they were unlikely to find an entry-level job with any future in 1984 (Moore and Davenport, 1984).

Data presented in Table VI shows a dropout comparison of all high schools with a selective magnet high school in Chicago. The study indicates similar results in three other cities favoring the magnet schools.

TABLE VI

STUDENT OUTCOMES IN CHICAGO HIGH SCHOOLS

Types of High Schools	% of dropouts in Class of 1984	% Class of 1984 graduating and reading above national level
Selective Magnet	13%	57%
All High Schools	35%	19%

(Moore and Davenport, 1989)

To the extent that magnet schools improve the quality of general education, extensive findings on magnet systems and individual magnet schools over the past two decades have been developed. But the problem has been that documentation of the successes remains so little known. Several national studies have commanded attention, but the bulk of the evidence is in local studies that never achieve national visibility. An estimated 70 such studies were reported as of 1985 and the total is now above one hundred. One rarely hears of them or their findings (Nathan, 1988).

Professor Mary Anne Raywid in "The Mounting Case for Schools of Choice" presents findings on four studies identifying the accomplishments of 139 schools of choice located in 11 cities and suburban areas across the country. All the schools involved, except for 14, are at the secondary level. " Based on the prevalent success measure of test scores, schools of choice are highly successful. In Spanish Harlem of Manhattan, N.Y., where test scores used to place District No. 4 at the very bottom of the list of 32 community school districts, 62 percent of the youngsters now read at or above grade level. Meanwhile, studies of 41 magnet schools in New York state, of 84 in Los Angeles, Calif., and 14 in Montgomery County, Md., all found students'

reading and math scores above district and/or national averages" (Nathan, 1988).

In the four large school systems studied by Moore and Davenport, they found dozens of high school magnets of outstanding quality providing students with an excellent educational experience. For example, they report "Whitney Young High School in Chicago, Ill., is an Academically Selective Magnet School whose racial composition mirrored the school system. It has consistently competed on an equal footing in academic contests with suburban Chicago high schools that are, by reputation, among the best in the nation" (Moore and Davenport, 1989).

Dr. Mary Metz in her book, *Different by Design: The Context and Character of Three Magnet Schools*, reported at length on how two magnet schools enabled low achieving students to make more sense of their education, and to experience greater academic success than had similar students in other desegregated schools studied earlier. Douglas Archbald in his report for the American Institutes for Research stated that test scores in magnet schools are typically higher than those of non-magnet schools. One example cited was the Montclair, N.J., school district which turned all its schools into magnet schools in the early 1980s, and subsequently experienced significant improvements in test scores (Archbald, 1991).

The first national survey of magnet schools by the U.S. Department of Education in 1983 reported that 80 percent of the 32 magnets reporting scores listed above average achievement scores and 20 percent had school means more than 30 points above the district average (Blank, et al, 1983). In his follow-up study of 15 school districts covered in the 1983 national study, Rolf K. Blank said that studies which used more complex research models show magnet schools have positive effects on outcomes. Virtually all the studies

reviewed showed the average test scores of students in magnet schools are higher than scores for non-magnet schools (Blank, 1989).

Finally, Beatriz Clewell and Myra Joy, completing research for the Educational Testing Service, referenced nine studies that show magnet students achieve at higher levels. In their evaluation of the Montclair, N.J., magnet school system, they concluded that desegregation goals can be achieved through a magnet school plan while maintaining a quality education for all students (Estes, Levine and Waldrip, 1990).

Together, these three areas—desegregation, dropout prevention and quality revitalization are predictably responsible for a large percentage of magnet schools launched in the 1980s. Because these problems are likely to appear more urgent in urban than in suburban or rural areas, a higher percentage of magnet schools now are concentrated in cities than was earlier the case (Raywid, 1989).

Large scale and more rigorous studies have analyzed the effectiveness of magnet schools. A U.S. Department of Education study undertaken by Patricia Fleming and others in 1982 examined more than 1,000 magnet schools and found them to have fewer student behavior problems and higher teacher satisfaction than conventional public schools. Researchers also found greater teacher and student commitment in magnets than in conventional schools. The success of magnet schools has led observers to see them, particularly in urban areas, as powerful tools for educational change (Young and Clinchy, 1992).

SECONDARY AVIATION MAGNET SCHOOL RESEARCH

Although no overall study has been made of aviation education magnet school programs, many of the studies cited earlier included schools with aviation or aerospace theme-based programs. Don Waldrip, Executive Director of Magnet Schools of America, says that aviation or aerospace magnet programs are one of the fastest growing themes (Waldrip, 1996).

Investigations of all popular sources of literature have not resulted in finding any comprehensive national study nor identifying how many of these secondary education aviation schools exist and where they are located. The aviation literature does indicate, however, that a number of individual local studies have taken place over recent years which have involved magnet type programs as an outgrowth of the space age and the growth of the aviation industry. The majority of the studies were designed to explore to what extent aviation education motivated students, attracted minorities and improved education. In all cases, the results have been positive and similar to results described earlier for magnet schools.

The basic attraction of aviation or aerospace education as a theme in magnet schools is that it creates high interest on the part of the students and teachers alike because it can relate to all areas of the curricula. In the volume entitled, An Introduction to Aerospace Education, from the Aviation and Space Sciences Encyclopedia series, Raymond Johnson and Jean Blashield established 10 functional categories to describe the field and its relationship to the many disciplines ranging from A to Z, Art to Zoology, Alpha to Omega (Strickler, 1994). The outline of these categories is shown in Figure 2.

The Ten Definitive Categories of Aerospace

I. The Environment
II. The Basic Sciences in Aerospace
III. Man in Flight
IV. People and Events in Aerospace Development
V. Aerospace Vehicles
VI. Aviation and Space Operations
VII. The Art and Techniques of Flight
VIII. Communications and Control
IX. Manufacturing and Facilities
X. Aerospace and Society

Figure 2 (Strickler, 1994)

In addition, Dr. Mervin K. Strickler, Jr., in his publication, *Federal Aviation Administration Curriculum Guide for Aviation Magnet Schools Programs*, includes a listing of aerospace topics within a curriculum context of 25 subject areas. (Appendix F) He then states, "This clearly illustrates that if one understands the inclusive scope of aerospace, it is apparent there is relevance to every possible educational subject or discipline and one or more facets of aerospace" (Strickler, 1994). Relating to all curricula areas with an interesting and exciting subject that has become a common current event in the world has proven to be a successful secondary theme for magnet schools (Appendix D).

Early research of secondary schools offering single introductory or basic ground school courses in aviation or aerospace verified student interest and success with such programs. Between 1967 and 1972, a series of three such research studies were completed on 17 separate secondary programs with a geographic location representative of the total continental United States (Traylor, 1972). Data collected on the effects of the aviation courses on high school students suggested that most had a real interest in flying and found

that the aviation class was of interest to them if not one of the most interesting they took even though the courses taught were elective and not required.

The students taking these courses, while representing a minority of students in the schools, were students who enjoyed some degree of status or prestige within the school social system. They experienced above average grades, attracted other students to activities in which they participated, and were motivated to continue their educational careers. Most of the students who participated in the courses were already oriented toward aviation favorably because the actual advisement of students to take aviation courses was nonexistent within the school structure.

In addition, research showed the courses had a student image of interest and relevancy that seemed to be pervasive throughout the schools in which they were offered. Students enrolled in the courses were generally of the opinion that the course was relevant, demanded time from them, and spoke to such needs as career exploration. Also, a part of the research concerned itself with the students ability to utilize some of the concepts learned in the aviation class to general science problems. In this area, students improved in their ability to solve these problems (Traylor, 1972).

One of the early individual magnet type research programs based on aviation was the Richmond, Calif., Unified School District program called "Learning through Aviation." This particular project was the first example of an aviation education program to have a positive influence on minority students and to use a control group to measure and compare educational and related goal attainment. As a result of the Richmond experiences, other school districts were motivated to plan aerospace magnet programs (Strickler, 1991).

The Roosevelt Junior High School in Richmond, Calif., was chosen in 1968 by Richmond authorities to develop an aviation magnet type program within the school for 25 disadvantaged inner city 13 year old boys. Research objectives included determining the feasibility of an interdisciplinary aviation program under the direction of average teachers, motivating a group of low and underachieving pupils, characterized by negative self-perception, behavioral problems, poor attendance, truancy, high rates of suspension and grades too poor for college entrance. The emphasis of the program was on learning. The study of aviation, learning to fly, ground school and dual flight instruction were professionally used as a highly motivational means to improve student academic results. All traditional subjects were taught and integrated with aviation related principles and information. The results were phenomenal. All of the flight students improved in grades and attendance. No such gains were made by the matched control group. Parents expressed high praise for the project and indicated raised expectations for their sons and believed that their sons were now more enthusiastic about school (Conway, 1969).

In 1975, follow-up interviews were completed with the Richmond Flight Group by the project evaluator, Lee Conway, and reported in the May 1976 Phi Delta Kappa Journal. Career results of the group are listed in Table VII.

TABLE VII

FOLLOW-UP CAREERS ESTABLISHED BY RICHMOND FLIGHT GROUP

Career Area	Number of Students Entering
Higher Education	10
Armed Forces	6
Industrial Jobs	5
Unemployed	2
No Interview	1

(Strickler and Dobson, 1978)

As Conway wrote in his article: "This longitudinal study has produced considerable hard data and qualitative results supportive of the flight project concept. Former project youths are demonstrably better off than controls in the areas of employment, advanced education, and avoidance of deviance. Finally, project youths appear to have grasped the linkage between advanced schooling and career potential as their essential and available source of power" (Strickler and Dobson, 1978).

This unique documented success of the Richmond project inspired other notable examples of the use of aviation as the central theme of secondary programs. One in particular was a whole school magnet concept, the August Martin High School, Queens, N.Y. Located near John F. Kennedy International Airport. This school was developed to replace the Woodrow Wilson Vocational High School which had deteriorated from enrollment of 3,100 students in the 1940s to 802 students in June 1965. As Dr. Mervin K. Strickler, Jr. wrote in his description of the development of the new magnet program for the school: "Average daily student attendance had also declined

from a high of over 80 percent to only 50 percent of the students enrolled attending classes daily by the late 1960s. Using the evidence of the Richmond experiment, parents, leaders from the aviation industry, community organizations, labor and education formed a committee to see what could be done about the deteriorating high school. The result of the efforts of the community of interests sanctioned by the New York City Board of Education in October 1969 was to create a comprehensive high school with emphasis on air transport careers" (Strickler, 1980).

From the inception of the new program, August Martin has had student attendance records among the highest in New York. Its graduates have entered careers in aviation and gone on to post secondary education. For many other school districts, the school, like the Richmond Project, has served as a model for using aviation/transportation as a curriculum theme to plan a magnet school.

In the 1976-77 school year, Randall Junior High School, in the District of Columbia, was converted to a magnet high school with two elective themes—aerospace and marine science. Development of this school was a direct result of the Richmond project. Detailed evaluations, published in 1977 and 1978, noted a big jump in enrollment, higher positive attitudes than a control group, and improved student-teacher relations. Other outstanding results showed that the percentage of students who were certified in activities granting vocational certificates ranged from 60 percent to over 80 percent, the absence rate for students dropped from 18 percent to 11 percent and two-thirds of those students who were potential or actual dropouts by survey decided to stay in school because the program offered them something of interest (Goldberg, 1977).

In 1974, Embry-Riddle Aeronautical University was awarded a contract by the U.S. Office of Education to conduct a magnet type upward bound program using aviation as the theme. The final report of the project pointed out that the overall goal was to motivate financially disadvantaged high school students to continue their education. Results at the end of the first year showed all 21 high school seniors in the program went into postsecondary education programs and 69 percent of the total group improved their grade point average along with other increased results in reading levels. The program was continued in subsequent years and in each instance, positive results were attained (Strickler, 1991).

In 1978, The FAA sponsored a first ever study of the use of the Richmond Learning through Aviation techniques to be conducted in a psychiatric institutional setting for teenage patients. The purpose of the study was to investigate the effects of a specially designed flight training program on the behavior and school performance of teenagers who were hospitalized with psychiatric problems. As Doctors Novello, Youssef, and Rothenberg, who directed the study, stated: "Aviation could be an excellent means of directly confronting these teenagers' educational and psychological conflicts and provide a dramatic and useful vehicle to facilitate the overall treatment" (Novello, Youssef, and Rothenberg, 1979).

This program was successful as a valuable adjunct to psychotherapy and as a means of stimulating motivation in the educational aspects of the overall treatment program. On all measures, the flight group exceeded the performance of the control group. The findings in the academic area were consistent with the Richmond project where flight group students exceeded the control group in academic progress, self esteem, and a sense of mastery of one's fate in life.

The study reported several additional findings. Flight group members enjoyed gains in areas of self-confiding, trust, resistance of peer pressure, independence, and interpersonal communication. The study authors concluded by saying, "The fact that the project was conducted and that it accomplished its goals is a tribute to the power of aviation as a unique educational and emotional tool" (Novello, et al, 1979).

None of these secondary aviation magnet school type studies that were undertaken since 1967 had negative conclusions. Taken together they provide ample evidence that aviation as a theme in education works for all types of students ranging from students who enjoy status within the school social system with moderately superior grade point averages and who are active in school activities to those who come from disadvantaged areas and are part of a group of low and underachieving pupils characterized by behavioral problems, poor attendance and grades too poor for college entrance.

Because no overall study has been made of the current status and impact of secondary aviation magnet schools, the insights and conclusions of this study can make a contribution to future developments of this magnet theme in improving secondary education.

CHAPTER III

METHODOLOGY

INFORMATIONAL PROCEDURES

Information was first collected to identify the various secondary aviation magnet programs in existence. Initially, lists of schools said to be of this type were obtained from the Federal Aviation Administration, Magnet Schools Assistance Program, U.S. Department of Education, National Conference on Aviation Magnet Schools registration lists for 1991, 1992 and 1993, and Magnet Schools of America. Additional school contacts were received through the Congressional Research Service, Library of Congress, and the National Association of State Aviation officials.

For each school identified, a letter and reply card, provided in Appendix A, was sent. From that mailing to 297 contacts and a subsequent telephone and fax follow-up, 229 schools said they did not have a secondary aviation magnet program. Sixty-eight schools responded with information that they were considering adopting, or had already started some type of aviation magnet program. Of that number, 33 schools were considering or planning a program and 35 schools were identified as having a current secondary aviation magnet program. In summary, out of a total of 297 schools initially contacted, 35 schools actually had an active aviation magnet school program. Program administrators of these schools were then sent the letter provided in Appendix B with a copy of the survey instrument provided in Appendix C.

The survey instrument sought data concerning program characteristics, organization, curricula, and evaluation methods. The instrument also

requested quantitative and subjective data concerning resource support utilized for the program, evaluation, and additional data on community awareness and benefits.

Information compiled by the FAA served as one basis to develop the direction of inquiry for the survey. Research accumulated from previous material about aviation education at the secondary level provided other concerns which were addressed (Mitchell, 1990). Another basis of inquiry resulted from teacher guidelines developed for secondary aviation programs in the introduction volume to Above and Beyond, The Encyclopedia of Aviation and Space Sciences (Strickler, 1968).

OPERATIONAL PROCEDURES

The development of the survey format and questions was conducted through a multi-step development and validation process. The first step was to present the first draft of the questions to the committee chairman for evaluation. The questions were based on background information developed by the FAA, previous secondary level studies about aviation education, and published teacher guidelines for secondary aviation courses. The second step was to gain input from representatives of the Federal Aviation Administration responsible for the National Aviation Magnet School Conference and the Executive Director of the Magnet Schools of America organization. The third step in this process was to have the document reviewed by a research organization staffed by specialists from Wichita State University who are experts in conducting surveys and designing instrument formats. At this point, the instrument was ready to present to two pilot schools to determine practicality and identify any communication problems with the format or questions.

The revised draft of that survey instrument was then sent to the researcher's committee chairman and the University Institutional Review Board for final approval. This completed the developmental and validation process for the instrument.

Because of the sample size of the number of aviation magnet schools participating in the study, a high response rate was desirable. To accomplish this, multiple efforts were made to follow up with program administrators at each school. A maximum of three telephone and fax follow up contacts to those who had not responded by the stated deadline date were made. If the program administrator was not available or did not respond after three telephone and fax attempts, that school was dropped from the survey pool. As a result, 34 of 35 survey instruments sent to the aviation magnet schools were returned. According to research authorities, this response rate should be considered successful because it exceeded an acceptable base line rate of 55 percent for similar research response (Perry, 1988).

RESEARCH DESIGN AND ANALYSIS

The findings of this study, including qualitative and quantitative data, are presented in a descriptive format. Findings included program characteristics, program organizations, and issues related to the curricula. Objective and subjective responses are also recorded in a descriptive format related to program resources, evaluation, and community involvement. A summation of the data was then used to form a basis for conclusions concerning secondary aviation magnet schools.

CHAPTER IV

FINDINGS AND DISCUSSION

INTRODUCTION

This chapter presents the findings obtained through the identification and survey of secondary aviation magnet schools. The first objective of the research was to identify the number and location of secondary aviation magnet schools. The second goal was to describe programs in terms of their content and structure. Chapter IV presents the data collected in this study from which conclusions and recommendations about these schools can be made.

PROGRAM SURVEY

The survey questionnaire utilized a series of questions covering the areas of program characteristics, organization, curricula, evaluation, resources, and community awareness which allowed the respondents to identify their own aviation magnet school program. The questionnaire is part of the data collection procedure described in Chapter III.

The group of respondents were the program administrators at each of the 35 secondary aviation magnet schools. Research objective number one was met by listing the 34 schools and program administrators responding to the survey request. Table VIII contains this listing.

TABLE VIII

SECONDARY AVIATION MAGNET SCHOOLS BY NAME, LOCATION, CONTACT AND CURRICULUM

(Including Identification Number for Each School)

---

1. South Mountain High School
   5401 South 7th Street
   Phoenix, AZ 85040
Contact: Lewis Davis
Curriculum: Aerospace magnet school, grades 9-12

2. Aviation High School
   36th Street & Queens Blvd.
   Long Island, NY 11101
Contact: Eileen B. Taylor, Principal
Curriculum: Aviation Maintenance Program

3. August Martin High School
   156-10 Baisley Blvd.
   Jamaica, NY 11434
Contact: Leslie Gurka
Curriculum: 4-year magnet school in aviation

4. Washburn High School
   Minneapolis, MN 55409
Contact: James Colby/Ed Kimball
Curriculum: Aviation & Aerospace, grades 9-12

5. Highland Springs Technical Center
   15 South Oak Avenue
   Highland Springs, VA 23075
Contact: Richard Upchurch
Curriculum: Aviation tech. & pilot, grades 9-12

6. Catalina High School
   3645 East Pima Street
   Tucson, AZ 85716-3399
Contact: Robert Reynolds
Curriculum: Aviation magnet, grades 9-12

7. East High School CAB/VOC/East
   215 North First Ave. East
   Duluth, MN 55802
Contact: Jim Arndt
Curriculum: Aerospace technology, grades 11, 12

8. Southside Center for Applied Technology
   1784 Harrodsburg Road
   Lexington, KY 40504
Contact: Wayne King
Curriculum: 2-year Aviation Technology program

9. Winston-Salem/Forsyth County Schools
   PO Box 2513
   Winston-Salem, NC 27102-2513
Contact: John Smoot
Curriculum: Aviation Technology Vo-Tech

10. Samuel F.B. Morris High School
    6905 Skyline Drive
    San Diego, CA 92114
Contact: John Shacklett
Curriculum: Aerospace program

11. Suffolk Aviation Academy
    2075 Smithtown Avenue
    Ronkonkoma, NY 11779
Contact: Michael Weisz
Curriculum: Aviation Careers and Aviation Maintenance

12. Westchester High School
    7400 Manchester Avenue
    Los Angeles, CA 90045
Contact: Ronald Keating
Curriculum: Math-Science Aerospace, grades 9-12

13. William Fleming High School
    3649 Ferncliff Ave. NW
    Roanoke, VA 24017
Contact: Tom Pearman
Curriculum: Flight Training

14. Lakewood High School
    4400 Biercrest Ave.
    Lakewood, CA
Contact: Dean C. Gilbert
Curriculum: Aerospace Technology Magnet, grades 9-12

15. Walter F. George High School
    800 Hutchens Road SE
    Atlanta, GA 30354
Contact: Jim Berto
Curriculum: Transportation Magnet

16. Shawnee Aviation High School
    4018 West Market Street
    Louisville, KY 40212
Contact: Michael Rowland
Curriculum: Aviation and Travel Tourism Career Preparation

17. Delcastle Technical High School
    4018 Newport Road
    Wilmington, DE 19804
Contact: Albert E. Leonard
Curriculum: 4-year vocational technical school

18. Aviation High School
    4101 North Marginal Road
    Cleveland, OH 44114
Contact: Joseph Takacs
Curriculum: Aviation Magnet School, grades 9-12

19. Wilco Area Career Center
    500 Wilco Boulevard
    Romeoville, IL 60441
Contact: Linda Helton, Director
Curriculum: 1-year secondary & post-secondary

20. Chief Sealth High School
    2600 SW Thistle
    Seattle, WA 98126
Contact: Joan Butterworth, Principal
Curriculum: High School

21. Skyline High School
    7777 Forney Road
    Dallas, TX 75227
Contact: Jerry Smith
Curriculum: Aeronautical Cluster

22. Horizon High School
    5601 East Greenway Road
    Scottsdale, AZ 85254
Contact: Rebecca Dee Bussey
Curriculum: Aeronautics Magnet, grades 9-12

23. Minuteman Regional Vo-Tech School
    758 Marrett Road
    Lexington, MA 02173
Contact: Eugene A. Sanford
Curriculum: Aerotechnology Program

24. Polytech High School
    Kent County Vo-Tech School District
    Woodside, DE
Contact: Harry Batty, Jr.
Curriculum: Aviation Cluster

25. Hialeah High School
    251 East 47th Street
    Hialeah, FL 33013
Contact: Robert Holcomb
Curriculum: Flight, Airport and Maintenance Operations

26. Edison Technical & Occupational Education Center
    655 Colfax Street
    Rochester, NY 14606
Contact: Gardner Soule
Curriculum: Air Transportation

27. Gateway Institute of Technology
    5101 McKee Avenue
    St. Louis, MO 63110
Contact: Bradley Ports
Curriculum: 3-year program

28. San Jose Unified School District
    Magnet Programs
    1605 Park Avenue
    San Jose, CA 95126
Contact: Sandra Frank
Curriculum: K-12 Program, involving three elementary programs, one middle school and one high school

29 Chandler High School
    350 North Arizona Ave.
    Chandler, AZ 85224
Contact: Charles Miller
Curriculum: Aerospace, Airframes & Powerplant

30 West County Tech
    12110 Clayton Road
    Town and Country, MO 63131
Contact: Rick Deppe
Curriculum: Aeronautical Technology

31 Davis Aerospace Technical High School
    10200 Erwin Street
    Detroit, MI 48234
Contact: Robert Gartin
Curriculum: Grades 9-12; Private Pilot, Airframe & Powerplant, Radiotelephone License

32 Ribault High School
    3701 Winton Drive
    Jacksonville, FL 32208
Contact: Mary Beth Powden
Curriculum: Grades 9-12, Aviation/Aerospace

33 Alfred E. Beach High School
    3001 Hopkins Street
    Savannah, GA 31405
Contact: Essie Stewart Johnson
Curriculum: Military Science, Aviation Science

34 Sterling Aviation Sciences High School
Houston Independent School District
3830 Richmond Avenue
Houston, TX 77027
Contact: Dee Bates, Director/Magnet or Patrick Cherry, Coordinator
Curriculum: Flight Training, College Prep

Secondary aviation magnet schools are located throughout the United States. There is no geographical apportionment involved in the identification process. Of the 18 states represented, there was a frequency range of one to four courses per state. The response group consisted of 34 of 35 identified secondary aviation magnet schools for a 97.1 percent rate of participation (See Chapter III). This rate exceeded the base line standard of 55 percent proposed by Perry and represented a wide diversity of aviation magnet school programs.

PROGRAM CHARACTERISTICS

Research objective number two was met by the following analysis of program characteristics reported in the survey of 34 secondary aviation magnet schools. Schools responding to the survey included the venerable Aviation High School, Long Island, N.Y., established in 1936 and a relative newcomer, Catalina High School, established in Tuscon, Ariz. in 1993. Table IX identifies the year each program was established. Of the 34 secondary aviation magnet schools listed, 18 programs started in the 1990s.

TABLE IX

YEAR PROGRAMS ESTABLISHED

1.	South Mountain HS	1988	18.	Aviation HS (Ohio)	1974
2.	Aviation HS (N.Y.)	1936	19.	Wilco Area	1978
3.	August Martin HS	1971	20.	Chief Sealth HS	1975
4.	Washburn HS	1991	21.	Skyline HS	1991
5.	Highland Springs TC	1990	22.	Horizon HS	1987
6.	Catalina HS	1992	23.	Minuteman Vo-Tech	1989
7.	East HS	1970	24.	Polytech HS	1984
8.	Southside Ctr.	1990	25.	Hialeah HS	1989
9.	Winston-Salem/Forsyth Cty	1976	26.	Edison Tech	1974
10	Samuel F.B. Morris HS	1978	27.	Gateway Institute	1974
11.	Suffolk Aviation	1975	28.	San Jose USD	1991
12.	Westchester HS	1991	29.	Chandler HS	1990
13.	Wm. Fleming HS	1987	30.	West County Tech	1991
14.	Lakewood HS	1989	31.	Davis Aero Tech HS	1943
15.	Walter F. George HS	1984	32.	Ribault HS	1991
16.	Shawnee Aviation HS	1989	33.	Alfred E. Beach HS	1992
17.	Delcastle Tech HS	1974	34.	Sterling Aviation HS	1975

The largest school reporting was Aviation High School in New York with 1,900 students and 165 faculty. The next largest schools were Lakewood, High School, Lakewood, Calif., with 480 students and 10 faculty, August Martin High School, Jamaica, N.Y., with 336 students and 60 faculty and Shawnee Aviation High School, Louisville, Ky., with 325 students and five faculty. The rest of the schools had an average of 100 students with one or two faculty.

The percent of minority students in the aviation magnet schools is about the same ratio as exists in the district at large. In two exceptions, schools had a lower ratio because the programs were new and minority recruitment had just started.

Minority faculty members were employed at 16 (48 percent) of the schools. At four of the schools, the percentage of minority faculty compared to

the total faculty was higher than the minority student percentage of the total number of students.

Educational levels of the faculty were about evenly split between those holding masters and bachelors degrees. Only 10 of the schools report hiring part time faculty for an average of 1.7 instructors per school. Information in Table X shows the enrollment and faculty status for each of the schools.

TABLE X
SECONDARY AVIATION MAGNET SCHOOLS: STUDENTS, FACULTY AND PART TIME STATUS

	School	Number of Students	% Minority Students	Number of Faculty	% Minority Faculty	Part-Time Faculty
1.	South Mountain HS	336	48%	6	33%	1
2.	Aviation HS (N.Y.)	1,900	82%	165	27%	0
3.	August Martin HS	450	96%	5	40%	0
4.	Washburn HS	118	42%	4	0%	3
5.	Highland Springs TC	45	10%	2	0%	2
6.	Catalina HS	70	49%	1		
7.	East HS	57		1		0
8.	Southside Ctr.	27	22%	1		0
9.	Winston-Salem/Forsyth Cty	26	16%	1		0
10.	Samuel F.B. Morris HS	85 to 100	50%	2	0	1
11.	Suffolk Aviation	120	20%	4	25%	0
12.	Westchester HS	268	70%	11	40%	0
13.	Wm. Fleming HS	32	25%	1	0%	2
14.	Lakewood HS	480	63%	10	20%	0
15.	Walter F. George HS	150	99%	3	66%	1
16.	Shawnee Aviation HS	325	39%	5	40%	0
17.	Delcastle Tech HS	47	11%	1	0%	0
18.	Aviation HS (Ohio)	305	55%	24	18 - 35%	0
19.	Wilco Area	15	20%	4	19 - 25%	4
20.	Chief Sealth HS	90	10%	2	20 - 0%	0
21.	Skyline HS	152	80%	6	21 - 0%	0
22.	Horizon HS	250		2		
23.	Minuteman Vo-Tech	3	0%	1	0%	1
24.	Polytech HS	12	25%	1	0%	0
25.	Hialeah HS	100	70%	3H.S. 45 College	64%	0
26.	Edison Tech	25	32%	2.5	0	1
27.	Gateway Institute	12	20%	2	0	0
28.	San Jose USD	2,452 (K-12)	78%	120	1%	1
29.	Chandler HS	12	67%	2	0%	0
30.	West County Tech	17	30%	1	100%	
31.	Davis Aero Tech HS	310	90%	34	30%	0
32.	Ribault HS	26	50%	2	0%	0
33.	Alfred E. Beach HS	37	60%		50%	
34.	Sterling Aviation HS	124	64%	1	0%	

All of the schools reported a trend indicating increased enrollments. Two schools, Highland Springs Technical Center, Highland Springs, Va., and Samuel F.B. Morris High School, San Diego, Calif., reported increases in female enrollments and each school had a different type of aviation program from the other. Table XI lists answers from each school on enrollment trends. The schools report a general positive trend in line with enrollment surveys reported for other types of magnet schools.

TABLE XI

ENROLLMENT TRENDS

	School	Comments
1.	South Mountain HS	Enrollment has doubled each year.
3.	August Martin HS	Increase.
5.	Highland Springs TC	Increase in females from 10 percent to 35 percent.
8.	Southside Ctr.	Steady increase in students each year.
10.	Samuel F.B. Morris HS	Very stable; a few more females.
11.	Suffolk Aviation	Expect to increase 20 percent per year.
12.	Westchester HS	Demand for this program has increased by double the number of applications over its first year.
13.	Wm. Fleming HS	Enrollment continues to increase even though the course offerings have decreased.
14.	Lakewood HS	Because of shifting demographics in Long Beach, minority enrollment has dropped from the feeder middle schools. Increase in the number of magnet programs within the district has also decreased minority enrollment.
15.	Walter F. George HS	Enrollment in the Diesel and Aviation components of the program has been less than expected. Efforts are being made, however, to familiarize students with the expanded career opportunities in these tow areas.
16.	Shawnee Aviation HS	Stable (increasing in count by 85 students/year).
18.	Aviation HS (Ohio)	Enrollment has been stable.
19.	Wilco Area	First year—difficult to identify trends.
20.	Chief Sealth HS	Ethnic percentage has changed dramatically over the past five years.
23.	Minuteman Vo-Tech	We are using all means of outreach to begin our program, won't be able to answer this question until next September.
24.	Polytech HS	Increasing.
25.	Hialeah HS	Down this year. We usually serve 40-50 students. We are aggressively pursuing 9th graders through a totally revised 9th grade exploratory program.
27.	Gateway Institute	Minority students seem to be unprepared for entry into the program at a higher level. They seem to lack the necessary math skills. Being a new program, we can only increase in enrollment. We project approximately 26-28 students in the program this coming fall.
28.	San Jose USD	Increasing minority enrollment in the district overall.
29.	Chandler HS	Small increase.
30.	West County Tech	Enrollments have doubled this year.
32.	Ribault HS	No trends as yet. School desegregation policy allows one black student to enroll for every white student enrolled.
34.	Sterling Aviation HS	The number of students in flight instruction has fluctuated between 100 and 125 students in grades 9-12.

The final question in the survey section on program characteristics deals with the types of funding obtained by the schools. Most of the schools receive funding from a combination of state and local sources. Two of the schools received substantial single state grants to start their programs and two other schools started solely with federal grant money. Perhaps more significant is the finding that eight schools received all their funding from local sources. Information in Table XII gives the program funding sources of the surveyed schools.

TABLE XII

PROGRAM FUNDING SOURCES

	School	Federal	State	Local
1.	South Mountain HS	Fed/St*		
2.	Aviation HS (N.Y.)			100%
3.	August Martin HS		100%	
4.	Washburn HS	56%	22%	20%
5.	Highland Springs TC			
6.	Catalina HS		60%	40%
7.	East HS			100%
8.	Southside Ctr.			95%
9.	Winston-Salem/Forsyth Cty		20%	80%
10.	Samuel F.B. Morris HS		80%	20%
11.	Suffolk Aviation			100%
12.	Westchester HS		80%	20%
13.	Wm. Fleming HS			100%
14.	Lakewood HS	60%	35%	5%
15.	Walter F. George HS			100%
16.	Shawnee Aviation HS		15%	85%
17.	Delcastle Tech HS		66%	34%
18.	Aviation HS (Ohio)	5.6%	47.5%	9.2%
19.	Wilco Area		100%	
20.	Chief Sealth HS	Fed/St*		
21.	Skyline HS	85%	15%	
22.	Horizon HS			
23.	Minuteman Vo-Tech	10%	35%	55%
24.	Polytech HS	Fed/St*		
25.	Hialeah HS		100%	
26.	Edison Tech			100%
27.	Gateway Institute		50%	50%
28.	San Jose USD	100% (to establish program)	10%	
29.	Chandler HS		50%	50%
30.	West County Tech		50%	50%
31.	Davis Aero Tech HS	10%	10%	80%
32.	Ribault HS	90%	10%	
33.	Alfred E. Beach HS			100%
34.	Sterling Aviation HS			100%

* These schools received primary funding from both federal and state sources but the exact percentages were not reported.

The highlights of the section on program characteristics include the high percentage levels of minority enrollments in the secondary aviation magnet schools and the improving enrollment trends in the long-established and newly developing schools.

PROGRAM ORGANIZATION

Research objective number three was met by the following aviation magnet school description of program organization. The additional information returned with the survey by most schools demonstrated that they had developed very specific mission statements for the programs. In general, these statements were closely tied to career preparation, promotion of integration, and a high quality academic program. Table XIII shows rankings of the top three mission statements.

TABLE XIII

PRIMARY FORMAL OBJECTIVES

School	Primary Mission by Number of Schools
Career preparation for the aerospace industry	15
Promote an integration program	6
Provide a high quality education program	5

When asked about main issues addressed in establishing the programs, 21 or 62 percent of the 34 schools emphasized a response to community/industry needs for technically skilled graduates. A majority built the curricula around career development, mainly local in nature. Other

issues concerned motivating students to stay in school, decreasing the number of dropouts, and promoting integration.

Specific local needs, interest and support were primary factors in establishing the theme of aviation in the magnet school. Career awareness, hands-on training, industry needs, and minority opportunities were the four most common phrases used by the program administrators to describe program issues in their responses.

CURRICULA

The fourth research objective was met by the following description of the curricula as reported by the 34 schools in the survey. Curricula at these schools emphasized meeting the academic requirements of the various states and providing hands-on aviation and aerospace training. Several schools include private pilot ground school and actual flight training as part of the program. More than one-half of the schools offer either airframe, powerplant, or both maintenance courses which is the most popular emphasis. Other schools offer a broader technology type program, air traffic control training, and travel and tourism.

With the exception of 11 schools who emphasize Airframe and Powerplant (A&P) curricula, most of the other schools offer combinations of the above listed subjects. The types of aviation or aerospace courses taught by secondary aviation magnet schools are listed in Table XIV.

TABLE XIV

AVIATION PROGRAM CURRICULA BY COURSES TAUGHT

Courses Taught	Number of Schools
Aviation Maintenance	18
Aviation Ground School	17
Flight Training	13
Aviation Ground School or Flight and Maintenance	12
Air Traffic Control	5
General Aerospace Technology	4
Travel and Tourism	2

The number of individual aviation or aerospace courses offered in addition to the academic courses required to meet state graduation requirements ranged from one to 20. Lakewood High School offers the 20 courses in a broad aerospace technology program. South Mountain High School, Phoenix, Ariz., offers 13 separate courses in a career-based aerospace program whereas Samuel F.B. Morris High School offers a combination of 11 aviation and technology-based courses.

The 11 high schools concentrating on a technical program, in addition to seven other high schools with aviation maintenance training as part of their magnet curriculum, offer a combination of courses in airframe, powerplant, or both subject areas in order to meet the FAA Part 147 requirement of 573 training hours to obtain an A&P license. In addition, some of these schools also offer courses in aviation electronics. One school, Aviation High School in New York offers an optional fifth year in high school in order to allow a student to acquire both an A&P license from the FAA in addition to acquiring a high school diploma.

A second school, Skyline High School, Dallas, Texas, will cover about two-thirds of the requirement for an A&P license and has established a tech/prep program with a local community college to allow students to enroll and complete requirements for both parts of the A&P. A third school, Lakewood High School, has established a 2+2+2 program which allows students completing aerospace technology courses to receive advanced placement credits at two area colleges offering technology degrees. A definite trend exists with several of the schools to develop close ties with local colleges and universities in the local area or state to provide a post secondary education direction for these students.

Although not all schools provided curricula guides on the aviation program or courses with their completed survey, the most complete guide submitted came from South Mountain High School. This curriculum guide covered all aviation courses offered including goals, needs, educational philosophy, student profiles, prerequisites, learning objectives, and evaluation standards. In addition, the guide ties the total aviation magnet program together by describing program goals and student goals in a curriculum overview for all courses.

This particular guide was a model for showing how a magnet aviation theme curriculum was developed involving departmental cooperation, administrative support, parental participation, and business/industry endorsements. Most of the 34 program administrators indicated they had developed some form of a curriculum guide like the South Mountain model in organizing their program.

Technological support for the curricula of the schools varied. Most schools use a variety of audio-visual programs. Several use simulators and computers to enhance their courses. A number of comments were made in

the survey indicating that the program directors felt technological support greatly added to the interest and motivation of the students taking the courses.

Videos and computers were the most frequently mentioned technological aids used by the schools, although flight training simulators and desk computer flight simulators were also listed by a number of schools. Most of the schools cited a variety of training aids ranging from a wind tunnel to the use of local college laboratories for experiments and mockups. Three of the schools reported the use of their own aircraft for student flight instruction. The following chart indicates the main types of technological support used by the schools. (Table XV)

TABLE XV

TECHNOLOGICAL SUPPORT FOR COURSES

Equipment Type	**Number of Schools**
Videos	20
Computers	17
Flight Simulators	14
Desk Computer Simulators	6

PROGRAM EVALUATION

The fifth research objective was met by the following discussion of program evaluation methods as reported by the 34 aviation magnet schools in the survey. Reversing the dropout rate of students in their school districts, particularly among minorities, is one of the primary purposes of most

secondary aviation magnet schools. Most of the established programs reported dropout rates of less than 10 percent and several reported under five percent. These values are well below national averages, which for some populations are 30 to 75 percent. The newer programs have higher dropout rates particularly in the first student year for a variety of reasons. These range from lack of adequate promotion to newly imposed higher state academic requirements. On the other hand, five schools reported no dropouts at all. Table XVI lists the reported dropout rates for the schools at the time of the survey.

TABLE XVI

AVIATION SCHOOL DROPOUT RATES

School	Dropout Rate
1. South Mountain HS	10%
2. Aviation HS (N.Y.)	6.9%
3. August Martin HS	NA
4. Washburn HS	NA
5. Highland Springs TC	5%
6. Catalina HS	7%
7. East HS	NA
8. Southside Ctr.	5%
9. Winston-Salem/Forsyth Cty	8-10%
10. Samuel F.B. Morris HS	65% return for 2nd year 60% return for 3rd year
11. Suffolk Aviation	10%
12. Westchester HS	NA
13. Wm. Fleming HS	0% (last 5 years)
14. Lakewood HS	4%
15. Walter F. George HS	NA
16. Shawnee Aviation HS	Less than 2%
17. Delcastle Tech HS	0.5%
18. Aviation HS (Ohio)	6%
19. Wilco Area	0%
20. Chief Sealth HS	1%
21. Skyline HS	60% (Statewide requirement changes)
22. Horizon HS	NA
23. Minuteman Vo-Tech	NA
24. Polytech HS	40% (1st year)
25. Hialeah HS	22%
26. Edison Tech	4%
27. Gateway Institute	15% (1st year)
28. San Jose USD	0%
29. Chandler HS	0%
30. West County Tech	0%
31. Davis Aero Tech HS	2%
32. Ribault HS	10%
33. Alfred E. Beach HS	NA
34. Sterling Aviation HS	5%

Other measures of school program results mainly centered on using the FAA written exam, evaluation of post secondary educational activity by graduates, and other types of tests results for academic achievement and

general competencies. Schools also reported using comparison of enrollment to racial distribution in the district, flight evaluations of students, and comparing school objectives with student competencies.

Finally, the survey identified several schools with a formal tracking evaluation system which ranged from the use of Individual Vocational Education Plans (IVEP), a one year required state follow-up, a graduate status board on all graduates, placement and tracking cards updated at two and four years, to yearly surveys. Others use an informal system of interviewing graduates on return visits and requesting graduates to voluntarily return a survey. Table XVII summarizes the type of system used by those schools answering. More than one-half of the schools did not respond to this survey question possibly indicating a low priority or a lack of specific knowledge on this issue.

TABLE XVII

STUDENT TRACKING FOR PROGRAM EVALUATIONS

Type	Number of Schools
Survey	9
Informal	3
Guidance Office Function	2

RESOURCES

The sixth research objective of this study was met by the following discussion of resources utilized reported by the 34 aviation magnet schools in the survey. Not surprisingly, the single most cited government resource used

by the schools was the Federal Aviation Administration. Several schools relied on the local Air National Guard for speakers, equipment and facilities. State and local aviation commissions and State Departments of Transportation were also used as resources.The FAA through its regional and district offices offers a wide variety of audio-visual material, literature, speakers, equipment, training, field trips, and facilities to most of the schools in the survey. Table XVIII shows the breakdown.

TABLE XVIII

GOVERNMENT AGENCY RESOURCES

Agency	Number of Schools
FAA	23
Air Guard	5
Aviation/Airport Commissions	4
State Departments	3
NASA	2
Air Force/Navy	2

Industry and business tie-ins are also extensive, ranging from service on advisory committees to co-op partnerships that combined jobs with earned school credit. Several schools have established programs where specific companies will mentor all students in the aviation program. Other arrangements are made with businesses and government agencies where students will perform summer work on a work study basis. One regional airport commission provides internships programs in airport management.

Literally every type of aerospace and aviation business is locally involved with the schools, mostly by serving on the schools advisory committee.

But in addition to being field trip sites and providing speakers, scholarships, materials, and internship programs, they also provide used parts and equipment, provide use of company simulators, assist in training, offer special incentives and rewards, act as mentors, donate money and supplies, provide flights, and make available resource people for all courses and programs. Literally every school in the survey uses local industry and business contacts in all phases of their program.

In general, the schools who described having active advisory committees try to maintain a mix of government and business members. Table XIX lists the responses by number of schools as to who they have on their advisory committees.

TABLE XIX

ADVISORY COMMITTEE REPRESENTATIVES

Representative Source	Number of Schools
FAA	12
Company	11
Airline	10
FBO	9
University/College	7
Local Agencies	6
State Agencies	5

It is interesting to note that other representatives on the advisory committees represent aviation association members, Civil Air Patrol staff, travel agency employees, military representatives, parents, educational leaders, students, and retired military and aviation personnel. Most schools strive for broad representation on their advisory committees. Aviation High School in Cleveland, Ohio, has established two school-wide advisory committees with an additional advisory committee for each vocational program offered. The program director indicated that 140 businesses in the school area had been invited to join the advisory group with good results.

Most of the aviation magnet schools were doing some type of tie-in with feeder schools and local colleges. A primary method of promoting their schools seemed to be scheduled and regular visits to local middle schools, although some secondary magnet schools also visit elementary schools at the fourth grade level and above. Information in Table XX indicates the degree of school contacts with colleges and universities.

TABLE XX

CONTACTS WITH COLLEGES AND UNIVERSITIES

Category	Number of Schools
General tie-ins	23
Articulation agreements for credit or dual enrollment	15

Special programs adopted by some schools include contracting with colleges for flight instruction for students, using college computer equipment

and consulting services, and working with other magnet schools in holding a "Schools of Choice Night" in the Spring.

Sixteen schools described partnership work/study programs with both government and business organizations. These programs range from mentoring programs with a single, large business to internship programs with the FAA, airlines, FBOs, airport authorities, and NASA. Other programs involve a co-op work study program in the senior year and paid summer internships for students entering the 12th grade in the fall.

Based on the extent of involvement reported by the survey from government, industry and business sources, a key factor in the success of these programs appears to be student participation in activities outside the formal classroom.

COMMUNITY AWARENESS

Research objective number seven was met by the following discussion of community awareness techniques as reported by the 34 aviation magnet schools in the survey. Each of the survey schools participated in a variety of awareness activities as a key strategy in gaining community support for the magnet program. A list of these programs in order of number of times mentioned follows:

Activities of community awareness
(Listed in order of number of times cited)

- TV presentations (10)
- Local newspaper (6)
- Middle school visits (5)
- Newsletters (4)
- Open houses (4)
- Presentations to parents/civic groups (4)
- FAA safety meetings (3)
- Aviation career events (3)
- PTA visits (3)
- Advisory committees (3)

Other responses recorded in the survey mentioned only once included adult education, information teams, school video, aviation newsletter, camp, and awareness activities at every middle school.

Many schools aggressively recruit minorities. Highland Springs Technical Center uses a three-part strategy which includes:

1. Using minority role models in the aviation industry.
2. Encouraging minority students in the program to invite their friends to classes and on flights.
3. Including minorities in all publicity photos and brochures.

Another school, Washburn High School, works with professional aviation organizations such as the Negro Airmen International to spread the word about their program. Other activities are listed below in order of number of times mentioned as follows:

Recruitment of Minorities
(Listed in order of number of times cited)

Visit feeder schools (11)
Use school guidance department (3)
Use a brochure and video tape which shows minorities (3)
Use minority role models in industry (3)
Through the media (2)
Review minority student vocational choices (2)
Establish a quota system (1)

Although most schools seemed to carry out various activities, no school discussed having a well coordinated plan to create awareness within the school district or community except to regularly visit middle schools. Other activities appear to depend upon outside events.

When asked what the primary advantage of a secondary aviation magnet school is to a community, 20 of the program administrators said it was to develop specific skills while exploring careers. Seven of the program

administrators said the primary advantage was to gain a quality education and three said it was to enhance skills and careers with a quality education.

The survey also revealed some unique opportunities available from the secondary aviation magnet school not associated with other programs such as flight training, specialized computer training in aviation or aerospace technologies applications, or specific training for those industry jobs requiring FAA licenses.

Finally, the survey showed that these schools offer experience in partnership arrangements between the school, government, and business organizations which are not available in typical high school programs. These arrangements according to the Aviation High School of New York program administrator, "Enables students to leave us with a saleable skill," In the same vein, the program administrator for the Walter F. George High School in Atlanta, Ga., said that the partnership arrangements, "Encourage students to develop competencies necessary for lifelong learning and to become effective workers and citizens."

It would appear that in accomplishing the first research objective of this study (to identify the various secondary aviation magnet programs), that these schools are part of the general growth and development of magnet schools in the United States.

Secondly, the study has developed a picture of the secondary aviation magnet school which shows additional educational experiences not available in other secondary programs, i.e., flight training, student mentoring, and internships, etc. These features tend to create a high level of interest among high school students in aerospace and aviation which has attracted increasing enrollments from minorities and whites alike thus aiding desegregation efforts in their districts. Program administrators catagorize the enrichment

opportunities generally available in secondary aviation magnet schools as indications of the high quality of the courses.

Thirdly, the impact of these programs are perceived to be successful by program administrators in that they have reduced the dropout rate and raised the competency performance levels of students. Clearly, the aviation magnet school has attracted students to career preparation and higher academic performance.

The results of this study coincide with those of numerous studies of magnet schools conducted over the past 20 years. In addition, eight previous landmark aviation magnet type studies of a local nature were reviewed as a part of this research and they were found to parallel both the general magnet school results and this study as well.

In summary, study results (1) showed consistently lower dropout rates than those experienced by other secondary schools; (2) indicated a trend in the growth of enrollments; (3) revealed a pattern of substantial support by business and the community in the provision of student resources not available in other programs; and (4) demonstrated a positive influence on the challenge to achieve a racial balance equal to or better than the balance existing in the school district at large.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study identified and described the current status of secondary aviation magnet schools in the United States. Within the context of current issues in public education, it has explored factors behind the dramatic growth of magnet schools and the common relationships with the growth of aviation education.

Information gathered through this study has charted the development of aviation education programs and evolution into aviation magnet schools. Insights which reveal how aviation magnet schools address major education problems and how they impact the motivation and performance of students should assist those in the education and aviation fields to better understand the role and function of secondary aviation magnet schools.

Information concerning factors involved in organizing and operating a successful secondary aviation magnet school should be useful to those involved in aviation education. This study should also be useful to the aviation industry at large for analysis of the impact of secondary aviation magnet schools on meeting the skilled manpower needs of the industry as well as its influence on the future non-white proportion of the labor force. Recommendations for further research into the future potential of secondary aviation magnet schools are presented.

SUMMARY

This study was organized around seven primary research objectives: (1) to identify the number and location of secondary aviation magnet schools

(2) to describe program characteristics (3) to describe program organization (4) to describe program curricula (5) to describe program evaluation (6) to describe program resources, and (7) to describe community awareness techniques.

The problem on which this study is based arises because the public educational system is educating the vast majority of American students at too low a level. Traditionally, the goal of the single-minded U.S. educational system is to prepare students for college without concern that three of every four Americans never get an undergraduate degree. Even so, the majority of students are taught vocational and life skills to prepare them to earn a middle-class wage in factories. They receive a diploma, however, that actually represents an eighth-grade level of academic achievement.

At the same time in business and industry, the increased complexity of work and rapid changes in technology have made many basic jobs, like those in aviation, more complicated. Finding qualified and skilled workers in the aviation industry is a growing concern. National leadership at all levels is demanding that public schools raise standards dramatically and give students a higher quality education, reduce the dropout rate, and decrease racial isolation.

Since the early 1970s, magnet schools have developed into models of achievement for all students in the three problem areas mentioned above. During this same period, secondary aviation magnet schools have been a growing theme program among other types of magnet schools. Acceptance appeared to be a successful response to the need to raise educational standards. Therefore, the growth and the impact on student motivation and performance is reflected in this study.

A survey sought descriptions of the types of secondary aviation magnet school programs, how they work, and what effect they have had on educational reform issues. Consideration of aviation magnet school program characteristics, organization, curricula, program evaluation, resources utilized, and community awareness should give those involved in aviation education additional information with which to improve the effectiveness of their programs.

The available literature revealed that magnet schools have an increasing role in urban secondary education and enroll an average of 20 percent of high school students in large urban districts (Clune and Witte, 1990). Also, research in over 100 studies has shown that magnet schools can improve educational outcomes, specifically by lowering the dropout rate and reducing racial isolation by contributing to desegregation efforts.

Research has also shown a successful history of secondary aviation education programs leading to the development of secondary aviation magnet school programs. Beginning in the 1960s, studies completed on standard aviation courses and aviation magnet school programs showed the positive results in improving the level of student education, lowering dropout rates, and increasing desegregation.

This research appears to parallel research on magnet schools in general and has led to the development of one of the fastest growing magnet themes in recent years, aviation or aerospace. No national information, however, existed on aviation magnet schools apart from general magnet school statistics.

Because the number or location of current secondary aviation magnet schools was not known, a major goal of this study was to identify these schools by survey. Data collected from a variety of educational and aviation

sources finally identified 35 operating secondary aviation schools. A survey instrument was prepared requesting data concerning the current status of the school programs along with perceived reactions of the program administrators as to school results. The development of the survey was carried out through the use of a multi-step development and validation process. Research professionals from several fields participated in the development of the questionnaire and a pilot group of two schools was used to test the survey design and response content. Prior to the final administration, the instrument was presented to at least eight research professionals during the process. The instrument provided for the collection of objective data on the program that allowed an overall understanding of its role in the development of aviation education.

Data was collected by mail and fax using telephone follow-up calls. The telephone and fax follow-up technique allowed for a higher response rate than would have been expected from a mailed questionnaire. The response rate for this study was 34 of 35 aviation magnet schools (97.1%) responding with completed survey instruments.

CONCLUSIONS

1. Thirty-four of the 35 aviation magnet schools participated in the survey and ranged in existence from 59 years to less than one year.
2. In terms of characteristics, all schools reported minority enrollments equal to their district at large and increasing enrollment trends in general. Total enrollments per school ranged from 1,900 students to 100 students for the newer programs. The primary sources for funding came from a combination of state and local sources.

3. All schools had developed specific organization statements for the programs that were basically related to career preparation, promotion of integration, and high standards in the academic program. Most schools emphasized a response to community and industry needs for technical skilled graduates. Career awareness, hands-on training, local needs, and minority opportunities were common phrases used in program descriptions.

4. The curricula was designed to meet the academic requirements of the states and to provide a collection of hands-on/minds-on aviation training and career oriented courses. Other schools offer technology, air traffic control, and travel and tourism programs. Several schools include private pilot ground school and actual flight training along with career orientation courses in their program. The number of courses offered in the aviation programs varied from one to 20. Several schools offer articulation agreements with local colleges for continuation of aviation training or actual advanced standing credit.

   All schools developed curricula guides on their program and one school, South Mountain High School developed an outstanding model guide which integrated the entire curricula with program goals and student needs. The guide also shows how each is met leading to graduation in a four year program.

   Although technical support for the program varied, most schools used a variety of audio-visual programs, simulators, and computers in some of the aviation courses. Other training aids and mockups included using local college laboratories and equipment.

5. The survey reported that a primary evaluation goal of the schools was to reduce the dropout problem. Most schools reported rates of five to 10

percent which was well below national averages of 30 to 75 percent for various student groupings. Five schools reported no dropouts among evaluate programs included FAA written scores, other types of testing for academic work, flight evaluations, and formal tracking evaluation systems of graduates.

Several of the schools reported positive tracking results of graduates although the research obtained was minimal. The oldest program in this study, Aviation High School in New York, reported that 60 percent of their graduates completed FAA certificates, 20 percent advanced to post secondary education programs, and 10 percent went into the military.

Delcastle Technical High School located in Wilmington, Del., has tracked graduates for the previous 10 years. Out of 61 recent graduates, 26 went into the military, 25 went into industry, and 10 entered college. Lakewood High School in Calif., has projected that 2,000 graduates will qualify for technology careers in the next 10 years.

In the past seven years, South Mountain High School in Phoenix, Ariz., reports 120 program graduates, of which 35 percent have entered the military, 35 percent have entered community colleges (or taken local area entry jobs in aerospace) and 30 percent have enrolled in four-year colleges or universities. This data shows positive career program results even though limited by the fact that all aviation magnet schools have not established formal student tracking programs.

6. The FAA was the most common government resource used by the schools. The Air National Guard was the next followed by state and local aviation departments and commissions. Industry and business organizations and companies are also providing a wide range of resource help to the schools. Speakers, equipment, and facilities were the most

common form of assistance. Some schools received extensive support from a range of support areas including scholarships, mentors, and internships.

All resource organizations were also members of school advisory committees. These advisory groups were used by all schools on an elaborately organized and frequently used basis in all phases of the programs. Most schools reported attempts to establish broad representation on committees including parents and students.

Another source maintained by most schools was some type of tie-in with feeder schools and local colleges. Feeder schools, particularly at the middle school level, were a prime recruiting source for several respondents. At the college level, a variety of tie-in activities were reported including contracted flight instruction and consulting services.

Sixteen of the schools described partnership work/study programs with both government and business organizations. Other schools had established co-op work/study programs for senior students. These and other types of community involvement appear to be a key factor in student motivation and success in completing the courses with higher levels of academic achievement.

7. Acceptance and approval of what the aviation magnet schools are doing and community awareness programs were priority strategies for the program administrators. Every school participated in a variety of awareness activities including television, newspaper coverage, FAA safety meetings, and aviation career events. Other types of activities included active recruiting of minorities through the use of community role models, holding adult education classes at the school, and organizing visitation trips to the school for members of the community.

RECOMMENDATIONS

1. More research is needed on the support systems for aviation magnet schools. It is vitally important to know how parents and students choose to attend a secondary aviation magnet school. What kind of productive forces are created to cause parents and students to think about choices related to needs and values?
2. A great number of local studies exist on the evaluation of magnet schools in general and only a few local studies exist by comparison on aviation magnet schools. A full analysis is needed of the best of the local studies on educational change and curricular effects along with an effort to draw conclusions from the studies of aviation magnet schools and systems in different areas.
3. Specifically, two reasons exist for further studies for existing schools concerning secondary aviation magnet school programs: First, because additional secondary aviation magnet schools have or will soon come into operation and a wider base of experience for program development will become available. Secondly, other areas could be explored such as the impact of specific school policies, organization and process variables, and their relation to outcomes. Also an analysis of the extensive resource areas used by aviation magnet schools would seem to be useful in learning how to work more effectively with them in attainment of student goals.
4. Research is needed to determine what kind of secondary aviation magnet school would be the most successful. We have a variety of types of aviation magnet programs now available to investigate this and other issues. A study to this effect might well determine a new aviation magnet

version that could be more easily and frequently put into operation in school districts.

5. More up-to-date budget studies on aviation magnets are needed to examine sources, allocations, and effects of funding. Aviation magnets are using airplanes, simulators, computers and other expensive equipment. Guidelines on the determination of the most efficient and cost effective methods of utilizing this equipment in aviation courses should be established.
6. Research has not kept pace with the rise of magnet schools and their use in desegregation plans, especially aviation magnet schools. Much more information is needed on the conditions in which magnet schools contribute to school desegregation in relation to the local community, the school board, the superintendent, new money, and positive attitudes. This is especially important in determining what extent aviation magnet schools are successful in attracting whites from suburbs in comparison to other magnet schools in situations like that in Kansas City, Mo. It was a modest achievement when compared to the cost.
7. A follow-up study on tracking graduates of secondary aviation magnet programs would be useful. Several of the program administrators in the study did not report graduate follow-up information either because they had no system of graduate follow-up or because they were not aware of what information was available to them. This type of information is critical to the evaluation of the mission of the school because career development of students is a primary goal.
8. Research into the area of new and emerging trends in transportation education from aviation to global transportation would be a valuable

outgrowth of this aviation magnet school study. Earlier in this study, the 10 functional categories of aerospace were discussed as being related to all disciplines. A study of incorporating other areas of transportation into these categories as a part of an intermodal transportation magnet school curriculum could make a contribution. This curriculum could expand the benefits of an aviation magnet program to even more students and create additional career opportunities. A related list of questions for this research might include:

- What are the career preparation paths?
- Why are employers looking for literacy in certain areas?
- At what level of education might intermodal concepts and techniques be started?

9. It would be useful to know aviation's best fit in the traditional secondary school curriculum so that aviation magnet schools can effectively coordinate traditional subjects with aviation courses for more efficient learning.

CONCLUDING COMMENT

The public educational system in the United States remains in a crisis as the 21st century looms ever closer. Desegregation, high school dropout rates, and the quality of educational outcomes, the three major issues in the educational reform movements of the last several decades, remain unresolved for the vast majority of the nation's schools.

At the same time, because the school system and particularly the high schools have focused on preparing students for college even though over 75 percent of all Americans never get an undergraduate degree, a skilled manpower crisis has developed. Finding qualified people for business and

industry is a growing concern and qualified workers will become even harder to find in many industries like aviation. In addition, technological advances are making even the basic jobs in aviation more complicated.

Secondary aviation magnet schools seem to have the combination of higher standards, increased motivation, and heightened student interest to overcome many of these problems. In the process of identifying aviation magnet schools and describing their programs, it appeared that aviation magnet schools can also attract a range of students and achieve the desegregation goals of the school district while maintaining an effective education program.

Because a strong career component exists to the curricula, secondary aviation magnet schools should have a great appeal to business and industry. By the year 2020, about one-half of the school population in the United States will be non-white. By 2050, one-half of the nations total population will be non-white. A conclusion can clearly be drawn from this that secondary aviation magnet schools will become an increasingly important source of properly prepared employee candidates for the aviation industry.

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APPENDIX A

COVER LETTER AND REPLY CARD
FOR SURVEY INSTRUMENT: FIRST MAILING

Date

Name
Street Address
City, State Zip

Salutation

I am conducting a national survey of aviation magnet schools in cooperation with the Federal Aviation Administration. The FAA has identified you as a potential aviation magnet school contact in your area.

If you or someone else is involved in an aviation magnet program, I would like to include you in the survey. Please return the enclosed card with your name, address, willingness to participate and I will send you a survey form.

If you do not have an aviation magnet program but are interested in the survey results, return the card and I'll send you the survey report.

Thank you for your cooperation.

Sincerely,

Frank G. Mitchell

Enclosures

___ Yes, we'll participate in the national aviation magnet school survey. The contact and address for the survey is:

_____

_____

_____ Zip _____

___ No, we do not have a magnet school program, but I would like a survey report. Send to:

_____

_____

_____ Zip _____

APPENDIX B

COVER LETTER FOR SURVEY INSTRUMENT: SECOND MAILING

Date

Name
Street Address
City, State Zip

Salutation,

In cooperation with the Federal Aviation Administration, I'm surveying aviation magnet schools to develop a curriculum guide for districts interested in implementing aviation programs in their schools. The survey is also part of a dissertation study I am completing for an Ed.D degree. Could you take a few minutes to respond to the enclosed questionnaire?

Your feedback will help prepare an up-to-the-minute source book for new schools devoted to aviation. All survey results will be compiled and presented at a National Leadership Institute sponsored by the FAA on Aerospace Magnet Schools later in the year.

In appreciation for your response, your school will receive a set of Beech lithographs. The seven 14 inch by 20 inch posters represent a history of Beech aircraft, from the Staggerwing to the Starship.

In order to be included in the Institute presentation, your response should be returned by November 1. For your convenience, a pre-paid envelope is enclosed.

Sincerely,

Frank G. Mitchell

APPENDIX C

AVIATION MAGNET SCHOOL SURVEY

1992

AVIATION MAGNET SCHOOL SURVEY
1992

NAME _____ SCHOOL _____

PROGRAM CHARACTERISTICS

Year Program was established: _____

Number of Students in your Program: _____ % Minority Students _____

Number of Faculty with Program: _____ % Minority Students _____

Number of Part Time Faculty: _____ Please list their teaching assignment:

Please describe any trends in enrollments:

Educational Level of Faculty:

Ph.D _____ % Masters _____ % Bachelors _____ %

Aviation Training Background of Faculty: (Be specific—Aviation degrees, Aviation ratings. Attach, if necessary.)

Program Funding

Federal _____ % State _____ % Local Govt. _____ %

Other Sources: (Grants, Corporate Sponsors, etc.)

_____ _____ %

_____ _____ %

Program Organization

What are the formal objectives of your aviation magnet school? (Attach mission statement, if available)

What primary issues did you address in establishing the program? (Use space on back, if necessary.)

Curriculum

What is the emphasis of your curriculum? (Type of aviation and academic training)

What courses do your students take? (Attach curriculum and/or syllabus, if available.)

What kinds of technological support is used to supplement your program? (List off-the-shelf audio-visual programs, computer aviation simulators, etc.)

EVALUATION

What is the dropout rate of students in the program?

What other program results are measured? (Please attach any written summary, if available.)

Do you have a formal system for tracking your graduates? If so, how do you track them? (Please attach summary of results, if available.)

RESOURCES

What government agencies or resources participate in your program?

How do they participate?

What kinds of support do you receive from local industry and business for the program?

If you have an outside advisory committee, please indicate representation..

If you have any formal program tie-ins with feeder schools or two year or four year colleges in your region, please describe.

Please describe or attach any partnership work/study program used.

COMMUNITY AWARENESS

What programs do you use to build and maintain community awareness?

Do you actively recruit minority students? If so, how?

What are the primary advantages your school offers the community?

Thank you. Please return to:

Frank Mitchell
Beech Aircraft Corporation
Department 198
PO Box 85
Wichita, KS 67201-0085
Phone 316-676-8839
Fax 316-676-8808

APPENDIX D

TYPICAL SECONDARY AVIATION MAGNET CURRICULUM

PHOENIX UNION HIGH SCHOOL DISTRICT SOUTH MOUNTAIN HIGH SCHOOL CENTER FOR AEROSPACE EDUCATION

MISSION STATEMENTS

Phoenix Union High School District (PUHSD)

The primary mission of the Phoenix Union High School District is to provide a quality education which affords each student the opportunity to develop to his or her maximum potential regardless of personal handicap, ethnic, religious or socioeconomic origin. Quality instruction and effective management will be accomplished using the team approach so that exemplary service to the total community continues to be a hallmark of this school district.

Phoenix Union High School District Magnet Program

The mission of the Phoenix Union High School District (PUHSD) Magnet Program is to ethnically balance the student body at each comprehensive campus by attracting students to specialized learning opportunities which are designed to improve their academic achievement.

South Mountain High School

The mission of South Mountain is to create a community of learners. We believe that:

- Parental, community and staff involvement is essential for student achievement.
- Productivity is enhanced by a safe and orderly environment.
- High expectations will enhance success.
- All students and staff are responsible for their own learning and behavior.
- All students and staff deserve a quality education program.

South Mountain High School Center for Aerospace Education

The mission of the aerospace program is for all students to gain the knowledge and confidence that will lead them into a career in the aerospace industry. We believe that:

- Parental, community, staff and aerospace industry involvement is essential for student achievement.
- Using hands-on and high tech learning activities to enhance the students' learning capabilities will help our students make a more successful transition into the aerospace industry.
- Using the same high standards that are used in the aerospace industry in our classes will better prepare our students for their future in an aerospace career.

FOUR-YEAR COURSE OF STUDY

COURSES	CREDIT
First Year: Fundamentals of Aerospace	
English 1-2 or 1-2H (Honors)	1
Chem/Physics 1-2 or 1-2H	1
Algebra 1-2 or 1-2H	
Aerospace 1-2	1
Health/Aero (one semester)	1/2
Flight Safety (one semester)	1/2
Humanities 1-2	1
Practical Arts 1-2*	1

* Reading is required if placement test score is below 58%.

Suggested Humanities Classes: Art
Suggested Practical Arts Classes: Drafting, Lab 2000

Second Year: Career Choices	
English 3-4 or 3-4H (Honors)	1
Biology 1-2 or 1-2H	1
Algebra 3-4 or 3-4H	1
World Hist/Geography 1-2 or 1-2H	1
Aerospace 3-4	1
Foreign Language 1-2	1
Aerospace Design 1-2	1

Third Year: Career Decisions/FAA Written (Flight)
or
Career Decisions/Air Traffic Control

English 5-6 or 5-6 H (Honors)	1
Chemistry 1-2 or 1-2H	1
Geometry 1-2 or 1-2H	1
Am/Az History 1-2 or 1-2H	1
Human Relations	1/2
Accelerated Keyboarding	1/2
Aerospace 5-6 or Air Traffic Control 1-2	1

Fourth Year: Flight Maneuvers/Private Pilot Certificate
or
Air Traffic Control Simulation

English 7-8 or 7-8H (Honors)	1
Physics 1-2 or 1-2H	1
Calculus 3-4 or 3-4H	1
Free Enterprise/Govt. 1-2 or 1-2H	1
Aerospace Lab 1-2 or Air Traffic Control 3-4	2

Third Year: Career Decisions/Airframe and Power
or
Aeronautical Technology Applications

English 5-6 or 5-6H (Honors)	1
Chemistry 1-2 or 1-2H	1
Geometry/Trig 3-4 or 3-4H	1
Am/Az History 1-2 or 1-2H	1
Human Relations	1/2
Accelerated Keyboarding	1/2
Airframe and Power	2 or
Aerospace Tech Lab 1-2	1

Fourth Year: Airframe and Power
or
Aeronautical Technology Applications

English 7-8 or 7-8H (Honors)	1
Physics 1-2 or 1-2H	1
Calculus 3-4 or 3-4H	1
Free Enterprise/Govt. 1-2 or 1-2H	1
Airframe and Power	2 or
ICE 1-2	1

AEROSPACE COURSE DESCRIPTIONS

Aerospace 1-2 (K101) - Two Semester Course, Grade level
Prerequisite: None

Aerospace education provides the student with basic concepts underlying the cultural and technological impact of the aerospace age.

Flight Safety (K110) - One Semester Course, Grade Level 9
Pre/Corequisite: Aerospace 1-2

This course is designed to complement the required health course. Emphasis will be placed on factors which may influence the safety of individuals involved in aviation. Atmospheric conditions, diet, drugs, physical environment, conditioning, fatigue and their relationship to safety will be among the topics covered.

Aerospace 3-4 (K102) - Two Semester Course, Grade Level 10
Prerequisite: Aerospace 1-2 or Program Manager approval

This course is designed to introduce students to aerospace career opportunities. In addition, it serves as a guide and motivation to students regarding their career choices and future studies in the aerospace field. This course is designed for the second year student in a four-year aerospace magnet program. Goals of this course are to expose all aerospace students to the career base that exists in today's and future labor markets. Student outcome will be measured through comprehensive testing of information and knowledge gained through this course exposure.

Aerospace Lab 1-2 (K103) - Two Semester Course, Grade Level 12
Prerequisite: Aerospace 5-6 (with the FAA Pilot Written Examination passed and a current FAA third class medical)
Recommended: Human Relations in Aviation and Aerospace Careers. Two Hour Laboratory.

Student will receive classroom instruction, simulator training in state-of-the-art equipment and flight training in a single engine aircraft. All instructions will prepare them to successfully complete an FAA evaluation and acquire a private pilot single engine certification (private pilot license).

Aerospace 5-6 (K105) - Two Semester Course, Grade Level 11. Required for K103
Pre/Corequisite: Must be 16 years of age and of course, Aerospace 3-4 and Human Relations in Aviation is recommended.

Students will receive instruction in aviation fundamentals to include principles of flight, the flight environment, aircraft systems and performance, meteorology, navigation, flight planning and aviation physiology. Students will qualify for and receive an FAA Third Class Medical Certificate. When completed, students will be administered the FAA Private Pilot Written Examination which requires a minimum competency of 70 %. Successful completion of both the FAA Third Class Medical Certificate and the FAA Private Pilot Written Examination are required to be eligible for Aerospace Lab 1-2 (K103).

Air Traffic Control 1-2 (K120) - Two Semester Course, Grade Level 11
Prerequisite: Aerospace 3-4
Corequisite: Human Relations in the Aviation Industry

This course is designed to provide students an introduction to the Air Traffic Control profession. It offers an overview of the air traffic component of the National Airspace System (NAS) and develops an information base upon which a student can visualize the relationship between air traffic control, the other components of the NAS and the transportation industry. This course provides the student with the opportunity to obtain "hands on" experience regarding radio communications between the pilot and controller and interphone communications between ATC facilities. Proper terminology, phraseology and usage will be emphasized.

Airframe and Powerplant 1-2 (K106) - Two Semester Course, Grade Level 11
Prerequisite: Aerospace 1-2 and Aerospace 3-4
Corequisite: Human Relations in the Aviation Industry

This course will be an on-site training class taught at the Arizona Air National Guard at Sky Harbor International Airport. The students will be able to log the training time for licensing toward an Airframe and Powerplant license. This class will be taught the last two periods of the day. (Class time will start at 1:35 p.m. and end at 4:15 p.m.)

Airframe and Powerplant 3-4 (K106) - Two Semester Course, Grade Level 12
Prerequisite: Airframe and Powerplant 1-2

This course will be an on-site training class taught at the Arizona Air National Guard at Sky Harbor International Airport. The students will be able to log the training time for licensing toward an Airframe and Powerplant license. This class will be taught the last two periods of the day. (Class time will start at 1:35 p.m. and end at 4:15 p.m.)

Human Relations in the Aviation Industry (H110) - One Semester Course, Grade Level 11-12
Prerequisite: None

This course id designed to prepare students with the human relations skills necessary to be successful in work environments; to develop students' skills in decision-making, goal-setting and managing resources; to develop desirable attributes, qualities and abilities which will contribute to their success as employees and prepare students for changes that may challenge them in their future work environment.

Aerospace Tech Lab (K115) - Two Semester Course, Grade Level 11
Prerequisite: Aerospace 3-4
Corequisite: Human Relations in the Aviation Industry

This course will expose students to different technical areas where they will explore possible solutions, therefore enhancing their knowledge of structural design and developing their interest in different engineering areas. This course will apply mathematical and scientific principles in a hands-on lab.

APPENDIX E

SELECTED AEROSPACE TOPICS IN CURRICULUM CONTEXT

"SELECTED AEROSPACE TOPICS IN THE CONTEXT OF HOW FACETS OF AEROSPACE RELATE TO THE CURRICULUM"

Adapted from Chapter 2: The Scope of Aerospace, by Raymond J. Johnson and Jean F. Blashield of the publication entitled: An Introduction to Aerospace, edited by Dr. Mervin K. Strickler, Jr.

Agriculture
Aerial photography
Agricultural aviation
Australia's aviation
Crop dusting
Cloud seeding
Economic implications
Food and nutrition
Infrared radiation
International Agricultural Aviation Centre
International Flying
Farmers
Photosynthesis
Weather
Weather satellites

Art
Balloons
Commemorative stamps and medals
Da Vinci, Leonardo
History of aviation
Insignia
Interiors of aircraft
Kites
Medals and decorations
Model aircraft
Mythology
Objects of art
Photography
Pilot and crew wings
Science fiction
Trophies and awards

Astronomy
Asteroids
Astronautics
Astronomy
Astrophysics
Celestial mechanics
Celestial sphere
Comets
Constellations
Cosmic rays
Eclipse
Galaxies
International Years of the Quiet Sun
Interplanetary travel
Kepler's law
Light
Mariner probes
Meteors
Moon
Observatories
Orbiting observatories
Orbits and trajectories
Planetariums
Planets
Quantum theory
Quasar
Radio astronomy
Relativity theory
Solar system
Stars
Sun
Telescopes
Ultraviolet
Universe
X-rays

Biology
Animals in space Aviation medicine
Biosatellites
Bird flight
Circadian rhythm
Closed ecological system
Cosmos satellites
Extraterrestrial life
Hydroponics
Photosynthesis
Space biology

Business Law
Airports
Certification procedures
Crash investigation
Government contracts
Insurance
Legal implications
Patents
Police and fire services
Registration of aircraft

Career Guidance
Air traffic control
Army aviation
Astronauts
Careers
Charter flying
Cryogenics
Crystallography
Cybernetics
Flight attendants
Flight instruction
General aviation
Government in aerospace
Ground service and maintenance
Manufacturing
Occupations
Pilot and pilot certificate
Pilot training
Spacecraft design
Test pilots
Women in aerospace

Chemistry
Air
Alloys
Atoms
Atmosphere
Chemical energy
Closed ecological system
Cryogenics
Elements
Fuels
Gases
Lubricants
Propellants
Specific gravity

Earth Science
Air masses
Applications Technology Satellites
Astrogeology
Astronautics
Astronomy
Astrophysics
Atmosphere
Aurora
Aviation weather
Boyle's law
Charts
Compasses
Cosmos satellites
Density altitude
Discoverer program
Earth
Environmental research satellites
Explorer satellites
Geodetic satellites
Gravity
Greenhouse effect
Latitude and longitude
Lightning
Lunar charts
Magnetic course
Maps and mapping
Mariner probes
Meteorology
Navigational systems
Navigational techniques
Oceanographic research
Orbiting observatories
Pilotage
Precipitation
Ranger
Sounding rockets
Surveyor
Van Allen belts
Weather
Weather maps and charts
Weather satellites

Economics
Aerospace industry
Airports
Bush flying
Business aviation
Cargo aircraft
Commercial airlines
Commercial air transports
Crop dusting
Economic implications
Fixed base operator
Flight simulators
General aviation
Government contracts
Government in aerospace
Jet aircraft
Jumbo jets
Manufacturing
Production techniques
Program management
Supersonic transports
Utility aviation

General Science
Airplane
Astronomy
Atmosphere
Atoms
Barometric pressure
Bernoulli's principle
Bird flight
Clouds
Electricity
Energy
Engines
Fog
Galaxies
Helicopters

Jet aircraft
Launch vehicles
Man in flight
Matter
Mercury program
Photography
Planets
Radio communications
Satellites
Saturn rockets
Space stations
Stars
Sun
Walk in space
Weather
Weather satellites

Geography
Bush flying
Cartography
Charts
Compasses
Course plotting
European aerospace activities
Latitude and longitude
Magnetic course
Maps and mapping
Photography
Photogammetry
U.S.S.R. aerospace activities

Geology
Astrogeology
Geodetic satellites
Mountain, desert and jungle flying
Photogammetry
Ranger
Surveyor

Government
Aerospace industry
Air Commerce Act
Air traffic control
Apollo
Army aviation
Civil Aeronautics Board
Coast guard aviation
Crash investigation
FAA
Federal Aviation Regulations
Flight service station
Government contracts
Instrument Flight Rules
Marine Corps aviation
Mercury program
Military aviation
Military space program
NASA
National Airspace System
Naval aviation
Pilots and pilot certificates
Registration of aircraft
Visual Flight Rules

Health
Aerospace medicine
Animals in space
Astronauts
Circadian rhythm
Drug effects
Environmental control systems
Flight physical
Food and nutrition
Human engineering
Hypoxia
Life-support systems
Man in flight
Manned spaceflight
Man-powered flight
Pressurization
Sensory deprivation
Space suits
Temperature control
Weightlessness

History
Ace
Air Commerce Act
Air raid
Altitude records
Autogiros
Balloons
Barnstormers
Battle of Britain
Biographies
Bomber aircraft
Bush flying
Commemorative stamps and medals
Dirigibles
Distance records
Endurance records
First World War aircraft
Flying circus
Gliders
History of aviation
Korean War
Luftwaffe
Man-powered flight
Mythology
National Advisory Committee for Aeronautics
Rheims Air Meet
Science Fiction
Second World War aircraft
Speed records
Women in aerospace
World War I
World War II

Home Economics
Fabrics
Flight attendants
Food and Nutrition
Interiors of aircraft
Space suits

Industrial Arts
Aerial photography
Aircraft propulsion system
Avionics
Electronics
General aviation aircraft
Generators and alternators
Interiors of aircraft
Manufacturing
Materials
Metals and metallurgy
Occupations
Preventive maintenance
Production techniques
Refueling
Spacecraft design

International Relations
Air defense systems
Air forces of the world
Berlin airlift
Commercial airlines
DEW line
Federation Aeronautique International
Five Freedoms
International agreements
International Geophysical Year
International projects
Israeli-Arab Conflict 1967
Missiles
Political implications
Reconnaissance
Space law
Tracking systems and networks
United Nations

Mathematics
Binary numbers
Celestial navigation
Course plotting
Cybernetics
Dead reckoning
Doppler navigation
Escape velocity
Informational systems
Navigational techniques
Orbits and trajectories
Parabola
Telemetry
Weights and balances

Medicine
Acceleration
Aerospace medicine
Animals in space
Astronauts
Aviation medicine
Circadian rhythm
Closed ecological system
Decompression
Drug effects
Environmental control systems
Environmental simulators
Escape systems
Flight physical
High-altitude flight training
Human engineering
Hypoxia
Life-support systems
Man in flight
Manned spaceflight
Mercury program
Parachutes
Pressurization
Psychological factors of flight
Reentry vehicles
Sensory deprivation Space biology
Spaceflight training
Space medicine
Space suits
Technological projections
Walk in space
Weightlessness
X-rays

Meteorology
Air
Air masses
Atmosphere
Barometric pressure
Clouds
Convection currents
Earth science
Evaporation and condensation
Fog
Humidity
Precipitation
Turbulence
Weather maps and charts
Weather satellites
Wind

Physics
Acoustics
Aerodynamics
Aircraft propulsion systems
Airfoil
Airplane
Airspeed indicator
Alloys
Area rule
Astronautics
Attitude control
Automatic landing
Avionics
Bank
Bearing

Bernoulli's principle
Boyles's law
Carburetion
Center of gravity
Computers
Cryogenics
Crystallography
Doppler effect
Dynamic soaring
Electricity
Electromagnetism
Electronics
Energy
Engines
Escape velocity
Flight management
Fluid mechanics
Gas turbine engines
Ground-effect machines
Gyroscope
Heat energy
Heat shields
High-lift devices
Hydraulic systems
Hypersonic flight
Inertial guidance
Infrared radiation
Instrument panel
Lasers
Launching
Lifting-body vehicles
Maneuvers
Matter
Measurement of power
Metals and metallurgy
Newton's laws
Noise
Nuclear energy
Nuclear propulsion
pilot-static system
Plasma
Power management
Radar
Radiation
Radio
Reciprocating engines
Rendezvous and docking
Robots
Rotating combustion engines
Sailplanes
Semiconductors
Shock wave
Solid-state physics
Space propulsion systems
Supersonic flight
Television
Temperature scales
V/STOL aircraft
Wind tunnels
Wings
X-rays

Psychology
Astronauts
Aviation medicine
Cosmonauts
Flying safety
Gemini
Man in flight
Pilot training
Psychological factors of flight
Spaceflight training
Space medicine

Social Studies
Air defense systems
Air forces of the world
Airmail
Air taxis
Apollo
Army aviation
Atlas missile
Berlin airlift
Biographies
Blockhouse
Bombs
Careers
Cargo aircraft
Commercial airlines
Communications satellites
Crop dusting
Cybernetics
Demonstration teams
DEW line
Economic implications
Educational implications
European aerospace activities
Eurospace
Fighter aircraft
Fixed base operation
Flight (as passenger)
Flight test programs
Forest fire control
Gemini
General aviation Gliders
Gliding
Government in aerospace
Hangars
Helicopters
Heliports
High-speed surface transportation
History of aviation
Homebuilt aircraft
Instrument flight techniques
Insurance
Interplanetary travel
Israeli-Arab Conflict-1967
Jet aircraft
Jumbo jets
Kamikaze
Kennedy Space Center
Korean War
Launch facilities
Launch vehicles
Luftwaffe
Lunar bases
Lunar exploration
Manned Orbiting Laboratory
Manned spaceflight
Manufacturing
Mercury program
Military aircraft
Military implications
Military space program
Missiles
Mythology
NASA
Naval aviation
NORAD
Oceanographic research
Peenemunde
Polar flights
Police and fire services
Preflight training
Production techniques
Program management
Radio communications
Rescue and recovery service
Rockets and rocketry
Runways
Safety statistics
Sailplanes
Satellites
Saturn rockets
Search and rescue
Social implications
Space stations
Sport flying
Strategic Air Command
Supersonic transports
Systems engineering
Technological projections
Unidentified flying objects
U.S.S.R. aerospace activities
Utility aviation
Weaponry
Wind tunnels
X-series aircraft

Speech and Communications
Aerospace Terminology
Air traffic control
Communications satellites
Ground control approach
Morse code
Phonetic alphabet

VITA

Frank Gordon Mitchell

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Doctor of Education

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Area of Specialization: Aviation and Space Science

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