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**WHAT EVIDENCE EXISTS TO VERIFY
THAT LEARNING THROUGH AVIATION WORKS?**

Mervin K. Strickler, Jr.

Educators and advocates for change of our schools in general, and to increase student performance in particular are increasingly turning to aviation education, learning through aviation, and/or aerospace education. Two major forms of learning through aviation are found. The first is simply the study of aviation for its own sake. Studying ground school and then going on to learn to fly is an example of this. A higher, more sophisticated form is that found in specialized high school and undergraduate college and university programs such as those in Aviation High School in New York or Embry Riddle Aeronautical University in Daytona Beach, Florida. The second form of learning is the central purpose of this brief paper.

This paper is concerned with the uses of aviation as a central motif, core, thread, or magnet around which to design worthwhile educational programs, activities, projects, courses, and learning experiences in order to facilitate learning--learning not just aviation but also learning basic subjects which most people feel good schools should provide. For purposes of this paper, elementary and secondary education are the main examples used.

Within five years after the Wright brothers made their historic first controlled flight, an imaginative physics teacher, H. LaV. Twining of the Los Angeles Polytechnical High School, used aviation examples to facilitate learning in his classes. His 1908 initiative is the first recorded example of using aviation to encourage learning of basic scientific principles. Strickler (1968) went on to point out "Although it still lacks a place in the curriculums of the majority of schools and colleges, aviation and space education is producing a growing interest today, kindergarten through the university" (p. 307).

In 1993 many schools and colleges still do not use learning through aviation. However, there are many more examples today than in 1968. There would undoubtedly be more if educators realized that learning through aviation works. But what is the evidence?

The landmark study that demonstrates the powerful influence that learning through aviation can provide students was done in the 1960s despite the fact that imaginative teachers had been using aviation as a means to facilitate learning since 1908.

It should be understood that what this paper briefly describes is the use of the study of aviation as an educational means to learning goal ends. While many

millions of people have studied aviation successfully, comparatively fewer students have had the opportunity to use the study of aviation to assist them in learning basic subjects or disciplines.

THE ROOSEVELT JUNIOR HIGH PROJECT

The first documented example of a program matching a group of students with a control group was at Roosevelt Junior High School in Richmond, California starting in 1968. The basic aim of the study was to determine if the use of the study of aviation would improve the performance of a group of generally nonperforming students. All the students needed such remedial help. As Conway (1969) described the Learning Through Aviation experiment in his final report:

This study summarizes the effects of an educational experiment which used a light, single engine airplane to generate basic instructional and behavioral changes in an inner city junior high school class. The project involved 25 disadvantaged area, 13-year-old boys and their parents, four regular staff teachers, two pilot instructors and a college student tutor.

Evaluative research sought to determine

the feasibility of an interdisciplinary aerospace program under the direction of average teachers, in motivating this 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.

Research objectives included a determination of the value of the flight program in terms of increased motivation. That is, the extent the flight program has succeeded in (a) motivating students to achieve academically, (b) motivating students to attend school more regularly, (c) motivating students to become more involved for a greater percentage of their classroom time in instructional and less disruptive and resistant behavior, (d) elevating the level of self-esteem and aspiration of the pupils, (e) improving the chances of higher education for the pupil and (f) altering the perception of the teachers and parents of these youths as regards their scholastic ability. (p. 1)

Clearly, the objectives of this educational experiment were monumental. Conway (1969) described the evaluative research design, instruments used, and base line data as follows:

The evaluative research design provided for constant retrieval, analysis, and feedback of relevant data, thereby allowing a qualitative as well as quantitative assessment of outcomes. The establishment of an onsite evaluation station at the project school furthered this assessment and served to meet the diverse feedback requirements of respondent populations (e.g., teachers, pupils, administrators) with often divergent perspectives. The willingness of the schools to cooperate fully was essential in this regard.

Research instruments included the following: Staff Confidential Schedule, Pupil Attitude Inventor, Parental Interview, Instructor Logs, SRA Math Test, Gates

Reading Survey.

The group selected for the flight program had the following characteristics: (a) all male, (b) 80% Black, (c) average age 13.3 years, (d) a resident of the disadvantaged or "target" area for a minimum of five years, (e) low and underachievement as measured by standardized tests and grades in academic subjects, (f) I.Q. scores ranged from a low of 78 to a high of 104, (g) one or more significant behavioral problems associated primarily with school and/or family background. This group was matched with a control group at another junior high school.

Experimental group students were found to range from average to below average in reading ability. In no case did any of the original group evidence a very good ability in reading. (p. 3)

Anecdotal and other data clearly demonstrated that the students in the program were in trouble. School attendance, discipline problems when in school, poor study habits, lack of self-esteem, and perceptions that they were losers were manifested by students, teachers, and even some parents.

The genius of this program was that the emphasis was on learning. The study of aviation, learning to fly, ground school, and actual dual flight instruction were professionally used as a highly motivational means to the important school curriculum ends. All of the traditional school subjects were taught. However, each teacher of these subjects (and none had an aviation background) was given a short, intensive exposure to ground school subjects and an orientation flight. The teachers were asked to relate the various ground school subjects to their disciplines wherever possible. The flight students soon discovered that there were important areas of relevance between their ground and flight study and experiences and their regular school studies. The results were phenomenal. Students began to relate geography to flight planning and industrial arts to model aircraft building and structures studies; in addition, students improved communications skills by writing and talking about their flight interests and experiences, and they learned to apply mathematical

What Evidence Exists that Learning Through Aviation Works?

principles to navigation problems. In short, the students demonstrated beyond any doubt that learning can be enhanced by the use of the study of aviation. No such gains were made by the matched control group.

All of the flight students improved in reading ability, grades, and school attendance. For example, the control group averaged fourteen days of absence during the first year, and the flight group averaged two days.

Follow-up interviews with each of the flight students' parents revealed high praise for the project. Also, parents indicated that their expectations for their sons were raised. Following are some excerpts from the interviews as reported by Conway (1969):

I was very excited and thrilled about the program. All the neighbors and friends of ours were very happy for Bob and wished their sons could have been chosen.

Donald likes it. He does his homework steadily now. This is a new habit . . . the neighbors and relatives envy us. We are very proud. . . . Donald writes his brother in Viet Nam about his flying and his brother writes him back to do well 'cause it's an opportunity he never had.

I was afraid of flying at first, but through the program, Steven and I learned a great deal. Steven is now more interested in school. He wants to go to school more now.

The flying and all made a difference for Billy. It kept Billy out of trouble all year. He is looking forward to being in the flight program again and wants very much to become a pilot. This has made a better student out of him. For the family, it has given us a little prestige and honor to have a child off this street to be in the flying program.

Elmer now wants to have an aviation job. Mr. White (husband) feels that Elmer's chances in life are greater now. He is more capable. The

neighbors think it is great . . . but I think some of them are even jealous and act hostile to Elmer. (p. 18)

All of the parents expressed pride in the fact that their sons were in the flight program. Further, they felt their sons were now more enthusiastic about school.

The foregoing information represents only highlights of the Learning Through Aviation historic Richmond project. Space does not permit more details here.

In addition to touching the lives of the students, parents, staff, and others in the community, the Richmond project has had a far-reaching influence on education in other parts of the nation.

By 1975 follow-up studies of the 25 flight group students showed that 5 were serving in the armed forces (4 in the Air Force), 10 were in higher education institutions, 5 had found well paying jobs in industry, 2 were unemployed, and 1 could not be located for an interview. As Conway (1976) wrote:

This longitudinal study has produced considerable "hard" data as well as 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. (p. 574)

The obvious documented success of the Richmond project inspired other notable examples of the uses of the airplane, space and transportation, and other attractive topics to serve as the central motif for planning educational programs. Following are some programs that owe their origins to the knowledge gained in the Richmond experiment.

AN AVIATION HIGH SCHOOL

The August Martin High School in the Baisley Park section of Queens, New York, near John F. Kennedy International Airport, was created based on the research demonstrated in the Richmond project. In the case of the August Martin School, an entire high school curriculum was designed with an emphasis on aviation and related

transportation careers. This school was developed to replace the Woodrow Wilson Vocational High School which had deteriorated from enrollment of 3100 students in the 1940s to 802 students in June 1965.

As Strickler (1979) has written, "Average daily student attendance had also declined from a high of over 80% to only approximately 50% of the students enrolled attending classes daily by the late 1960s" (p. 3). Using the evidence of the California experiment, "parents, leaders from the aviation industry, community organizations, labor and education formed a committee to see what could be done about the deteriorating Woodrow Wilson Vocational High School" (p. 3). The result of the efforts of the community of interests sanctioned by the New York City Board of Education in October of 1969 was to create "a comprehensive high school with emphasis on air transport careers" (p. 3).

In December 1971 the new school opened. It was named August Martin for one of the pioneer black pilots flying for U.S. airlines. Martin was killed in 1968 while flying a relief flight for the Red Cross to Biafra.

Since the first graduating class of August Martin in 1975, its graduates have followed careers in aviation and transportation and gone on to postsecondary education. From its inception, August Martin has had student attendance records among the highest of any school in New York. For many parts of the nation, August Martin has served as a model for communities that want to use aviation/transportation as a central curriculum theme to plan a magnet school. All of this stems from the experiences of the Richmond, California, flight project.

In the 1976-77 school year, a District of Columbia junior high school was converted to a dual thematic approach to learning via becoming a high school with two elective themes--aerospace and marine science. This school was a direct result of the Richmond project. Detailed evaluations of the *Randall Aerospace and Marine Science Project (RAMS)*, an *Evaluation Study* may be found in the evaluation studies by Goldberg (1977, 1978).

OTHER INNOVATIVE PROGRAMS

In a report of examples of Learning Through Aviation, Strickler and Dobson (1978) reported on the successful 1974 Embry Riddle Aeronautical University program that resulted from a contract from the U.S. Office of

Education to conduct an Upward Bound Program: "The overall goal of the project was to use aviation to motivate financially disadvantaged high school students to continue their educational experiences into postsecondary education" (p. 9). The Embry Riddle Upward Bound project was a direct result of the experience gained in Richmond. A modified version of this program continues at the present time at Embry Riddle.

In 1978 the Aviation Education staff of the Federal Aviation Administration (FAA) sponsored a first ever study of the use of the Learning Through Aviation techniques to be conducted in a psychiatric institutional setting for teenaged (14-17) patients. As described by Novello, Zakhour and Rothenberg (1979) the project was entitled "Sky Challenge for Teens":

The purpose of this 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. Although aviation education has previously been employed as a motivation technique in the education of disadvantaged and under-achieving youths. . .this study, as far as the authors are aware, marked the first time that a formalized flight program has been integrated into an overall psychiatric treatment program. (p. 1)

Among the problems for which the group of teenage students had been admitted to the Washington Psychiatric Institute were runaway, truancy, drug and alcohol abuse, antisocial acts, sexual promiscuity, depression, suicide attempt, and psychosis. As Novello, et al (1979) pointed out, the students faced "the customary developmental conflicts of adolescence with despair: trust vs mistrust, autonomy vs dependence, realistic self-appraisal vs omnipotence, identity vs diffusion" (p. 2). They further stated:

a "Sky Challenge" could be an excellent means of directly confronting these teenagers' educational and psychological conflicts and, furthermore . . . providing a dramatic and useful vehicle to facilitate the overall treatment. A "ground school" component

What Evidence Exists that Learning Through Aviation Works?

could be utilized to stimulate and motivate toward classroom learning, particularly because it would be dramatically related to exciting in-flight aspects of the programs. The flights would be presented as a personal challenge to the selected teenagers and, through clinical interviews with staff, the participants would be assisted in relating their feelings, fantasies, etc. about the flights to their own underlying adolescent conflicts. (p. 2)

While this study is limited because of the small number of participants and because there was no control group, clearly it did demonstrate progress in a number of areas for the participants. These were demonstrable gains in self-esteem, self-confidence, trust, resistance to peer

pressure, parental pride, independence, improved communication, and mastery of fear as well as the content of the aviation ground school subjects studied.

One must conclude that there is ample evidence that Learning Through Aviation does work. However, there is need for current carefully planned projects with adequate controls to verify the effectiveness of contemporary programs. New studies should be designed to make use of available technology such as high fidelity flight simulation and computer assisted instruction. Most important of all, many more thousands of young people who are in critical need of improving their learning capabilities should be exposed to the effective learning that the study of aviation makes possible when properly understood and utilized.□

Mervin K. Strickler, Jr., after graduating from Clarion State University in Pennsylvania, received an Ed. D. degree from Stanford University with areas of specialization in aviation and education, the first such degree awarded. He originated and headed the U.S. Army Air Corps College of Aeronautics. Strickler has received the Frank G. Brewer Trophy, the Air Force Decoration for Exceptional Civilian Service and the Federal Aviation Administration Award for Distinguished Service.

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