Preparing Aviators for the 21st Century: A 3-Year Case Study of Service Learning in the Aviation Classroom

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ABSTRACT

This 3-year qualitative case study of service learning in undergraduate aviation classes measures the affective domain learning outcomes of required service learning projects vs. optional service learning projects. A literature review on democratic citizenship suggests a gap in learning materials available to help students become responsible and engaged citizens. Development of the service learning component is described, including critical thinking, problem solving, and developing a clear connection between the course objectives and service activities. The study details three measured outcomes of the affective domain: receiving, responding and valuing. Three semesters of required service learning activities are compared with three semesters of optional service learning activities using descriptive statistics and chi-square analysis. Findings indicate that when service learning is required, students respond at a significantly higher rate than when the service learning is optional. However, students who voluntarily completed the optional activities were found to value the experience to a greater extent than students who were required to complete the projects.

INTRODUCTION TO SERVICE LEARNING

In 1938, John Dewey wrote a treatise on what he called the theory of experience. Dewey maintained that the goal of education was to help people become effective members of a democratic society. Students, he believed, needed real-life, outside-the-classroom experiences rather than just a unidirectional, authoritarian education in order to become respected and conscientious members of society. Following Dewey's logic, this paper discusses the definition of service learning, reviews the current literature on service learning and discusses an action research project conducted on incorporating service learning into the collegiate aviation curriculum. On a small scale, the study seeks to reaffirm the idea that civic responsibility is learned through service and that students gain knowledge of citizenship, politics, and government through valuing their participation (Colby, Ehrlich, Beaumount & Stephens, 2003).

Dewey's theory of citizenship and service learning states that experience arises from two principles: continuity and interaction. Continuity dictates that each event a person experiences will influence his or her future, for better or worse. The idea of interaction relates to the situational influence on one's experiences, where experience serves as a function of the interaction between one's prior experiences and the present situation. Furthering this thought, Mendel-Reyes (1972) discusses how service learning connects personal and political transformation. Through involvement in their community, students transform themselves into citizens, and their society becomes one that welcomes and promotes active citizenship (Benson & Harkavy, 1998).

Service learning provides a mechanism for students to become acclimated into their ultimate roles as citizens and leaders of tomorrow. There are several definitions of service learning and for the purposes of this discussion, the following definition will be employed: Service learning is a form of experiential learning where students and faculty collaborate with communities to address problems and issues, simultaneously gaining knowledge and skills and advancing personal development. There is an equal emphasis on helping communities and providing valid learning experiences to students (Astin & Sax, 1998; Bounous, 1986; Eyler & Giles, 1997, 1999; Batchelder & Root, 1994; Keen & Keen, 1998; Daloz, Keen, & Keen, 1998).

LITERATURE REVIEW: SIGNIFICANCE AND PURPOSE

A Disconnected Nation

Current writings on the teaching of democratic citizenship present the critical issue of the "troubling gap in the materials available to help students become responsible and engaged citizens of their communities" (Gerston, 2002, p. xiii). Writing to future educators, policy makers, and leaders, Gerston asks the question, "Where are the passions that drive young people into the political process? What is keeping them out?" (p. 15). In his experience as a senior scholar with the Carnegie Foundation for the Advancement of Teaching, Thomas Ehrlich attributes today's lack of passion as a student-community disconnect. Students fail to see how policies are created and communities are formed, through the act of service (as cited in Gerston, 2002, page ii).

Researchers state that service-learning has the following positive affects:

1. Increased student personal development such as sense of personal efficacy, personal identity, spiritual growth, and moral development (Astin & Sax, 1998; Astin, Sax & Avalos, 1999; Rockquemore & Schaffer, 2000);
2. Increased interpersonal development and the ability to work well with others to facilitate cultural and racial understanding (Astin & Sax, 1998; Keen & Keen, 1998; Driscoll, Holland, Gelmon, & Kerrigan, 1996; and Vogelgesang & Astin, 2000);
3. Increased development of leadership and communication skills (Astin & Sax, 1998; Dalton & Petrie, 1997; Eyler & Giles, 1999; Freidus, 1997; Rhoads, 1997, 2003 ; Sledge, Shelburne & Jones, 1993; Peterson, 1998, Vogelgesang & Astin, 2000; Wade &Yarborough, 1996);
4. Increases students' sense of social responsibility and citizenship skills (Astin & Sax, 1998; Astin, Sax & Avalos, 1999; Batchelder & Root, 1994; Dalton & Petrie, 1997; Driscoll, Holland, Gelmon & Kerrigan, 1995; Eyler & Giles, 1999; Eyler, Giles & Braxton, 1997; Fenzel & Leary, 1997; Giles & Eyler, 1999);
5. Participation in service learning impacts academic outcomes as shown through demonstrating the complexity of understanding, problem analysis, critical thinking, and cognitive development (Batchelder & Root, 1994; Eyler & Giles, 1999; Eyler, Root & Giles, 1998; Osborne, Hammerich & Hensley, 1998);
6. Service-learning experiences contribute to career growth (Astin & Sax, 1998; Astin, Sax & Avalos, 1999; Driscoll, Holland, Gelmon & Kerrigan, 1996).

These six effects support the impact of service learning on students' civic experience and identify a missing piece in the growing knowledge about service learning: universities and faculty must play a greater role in engendering the civic mission of society (AASCU, 2004; Eyler & Giles, 1999).

Role of the University

Universities as employers within a community are powerful social, political, and economic units whose decisions directly impact their surrounding communities (Altbach, Berdahl & Gumport, 2005). Ramalay (2000) examines higher education's relationship and responsibility to the community, focusing on the comprehensive university and advocating the replacement of the traditional concept of research, teaching, and service with the "richer and more multidimensional terms of discovery, learning, and engagement" (p. 233).

To prepare students to meet the responsibilities of living in a democratic society, institutes of higher education teach the importance of voting, participating in local governance, and staying informed about social and political issues (Jacoby, 2003). Staying informed of these responsibilities helps students develop a sense of personal responsibility to their community and nation. Astin (1999, 2000) challenges the academy to an institutional commitment to revitalize democratic education, asserting collaborative partnerships between universities and communities helps to engage students in academically-linked service and restores student connections to knowledge and understanding of civic affairs. Effective introduction of a service-learning component into any curriculum necessitates careful pre-

planning and a thorough follow-up to ensure that as educators, we are not defining the community's need for the community, but rather defining it with the community (Stanton, Giles & Cruz, 1999). Jacoby (2003) recommend that when planning community events for students, the service component can be tied to tangible learning objectives in the classroom and can be equally effective if the learning objectives evolve from the service event itself (Rhoads, 1997). Students need to understand that educators and community leaders place a high value on community service and expect individuals to participate.

DISCUSSION

Service Learning: A Trend for Higher Education?

Recent discussion of the importance of service learning is gaining momentum in the classroom and on campuses nationwide. The American Project for Civic Engagement and the American Democracy Project are two of the major service-learning initiatives that have won widespread recognition and are helping to affirm the university's responsibility to the community by responding to social issues and educating students to be lifelong learners and citizens for community and democracy. Faculty, students, university administrators, and community partners alike have shown increased interest and support for service learning. Specifically, the Campus Compact organization, which promotes service learning, has grown from fewer than 20 universities in 1985 to over 900 member universities in 2005 (Rose, Rose & Norman, 2005), a trend that shows no sign of abatement (Smith-Paríolá, 2006). Some universities have gone so far as to provide incentives for faculty to implement service learning in their courses (St. Cloud State University, 2006). The service learning component should not be presented as an additional component to the course (i.e., more work for the instructor and students) but should be integrated into the course as a tool to teach course, department, college and university goals and programmatic learning outcomes (Feather-Gannon, 2004).

Developing the Service Learning Component

Research conducted on the outcomes of service learning in an aviation classroom employed systematic instructional design (SID), which employs three distinct steps: learner/contextual analysis, task analysis, and identifying the learning domains (Bloom, 1956; Bloom, Krathwohl, & Masia, 1956; Morrison, Ross & Kemp, 2004). In the first step, the learner, and contextual analysis, the learner's characteristics are identified. Aviation students, like those in other science and engineering disciplines, differ from students majoring in the humanities, social science, and education in that they tend to want to know facts and figures, and how the aircraft operates. Students do not always understand the relevance of learning citizenship and volunteerism from their aviation courses. When creating a social-skills component in the hard sciences, the first thing faculty must do is understand their audience's personality characteristics and learning styles. Are your students traditional-aged or non-traditional? Are they male or female, or both? What are their academic and work backgrounds? Taking stock of, and recording, your student demographics is important in designing the service-learning component before moving into the next phase, task analysis.

Task analysis, according to Morrison, Ross, and Kemp (2004) is perhaps the most important step in the instructional design process. In designing a service-learning objective however, there are not specific tasks, rules, or procedures that are followed because the students are not learning cognitive or psychomotor skills, but rather learning within the affective domain. The critical incident method therefore is used to analyze attitudes, which will be assessed before and after the service learning experience. Survey students on the following factors: a) if, and how often, the student has participated in community service or volunteer activities, b) what the activity involved, c) how well the student liked the experience, and d) why the student did or did not like the experience. Compile the results in conjunction with the demographic data and move on to the next phase, identifying the learning domains to be associated with the learning activity.

Bloom's taxonomy indicates that the three learning domains: cognitive, affective, and psychomotor, can be found in any and all learning objectives (Bloom 1956; Anderson, 2001; Morrison, Ross, & Kemp, 2004). The objectives of service learning for our aviation students fall into the affective domain, but could also include a psychomotor domain if a specific skill is also being learned (marshalling on the flight line, for example).

Three major areas comprise the measurement dimensions: self report, record, and observation. The learning outcomes for this study are stated as: The student will observe, record, and self- report their service learning experiences, leadership potential, sense of belonging, and civic responsibility through involvement in meaningful community service.

In the aviation courses used in this case study, the objective was to have students receive the message about the service learning project, respond to the requirement through participation, and value the experience (as measured before and after the event/s).

Assessing Service Learning

The process of learning is a multi-faceted activity and can be accomplished through reading, writing, listening, talking, thinking, and doing. Educators unfamiliar with civic learning might question how the learning is assessed. Bresciani and Sabourin (2002) indicate that assessments for service learning components should include the following student learning outcomes: critical thinking, problem solving, and developing a clear connection between the course objectives and service activities. Additionally, the student development aspect (in this case, civic responsibility) is also assessable (using pre-and post-tests) by determining the student's commitment to service, understanding of civic responsibility, and development of self esteem and personal reflection. In this study, the specific outcomes sought were to develop the connection between the course objectives (knowledge base in aviation fundamentals) and the service activities (an activity linked to the aviation community, giving the student greater exposure to the industry). Additionally, the student's level of commitment to service, understanding of civic responsibility, and personal reflection were measured through the affective domain in their written assignments.

To better understand the measured outcomes, the definitions of the learning activities taking place within the affective domain are defined. *Receiving* refers to the student's awareness of the service learning component in the class and to the student's willingness to attend the service learning activity. *Responding* refers to active participation on the part of the student. At this level the student chooses whether or not to respond to the assignment by submitting a written proposal for their service learning project. In this case study *valuing* is defined as the worth or value a student attaches to the service project. The essential element characterizing the learner's attitude is a result of their appreciation of the service learning project. *Valuing* can be shown in terms of acceptance of the value, where the student attaches a value to the service learning component, and a preference for a value, where the student presents a commitment towards the service learning project.

RESEARCH METHODOLOGY

The two research questions explored in this case study were: 1) How many students achieved each of the stated learning outcomes (receiving, responding, valuing)? 2) To what extent does required vs. optional service learning activities play in the differences in the learning outcomes? In this research, measurement of the affective domain of the service-learning component of the aviation courses was conducted using quantitative, descriptive statistics and chi-square analysis. The dependent variable is considered to be the service learning activity and the independent variables are the required and optional activity. The Chi square statistic is appropriate for determining significance between categorical variables, and in this case, the categories were required vs. optional. The null hypothesis for this study would indicate that no difference in the levels of participation or learning outcomes would be expected. Each of the affective domain variables is assessed and then measured. The first assessment, measuring the receiving component, was a multiple choice quiz covering

the content of the course syllabus, administered at the beginning of the term. In order to proceed with any other assignments in the class, students must complete the syllabus quiz. While this measurement is not awarded points, it is required, and confirms that the students have received the information. After having read the syllabus and taken the quiz on the content of the syllabus, students should be fully aware of the requirements of the course and the expectation regarding the service-learning component. All students should score 100% on the receiving component.

The second measurement taken in this course is assessment of the student proposal (responding). The service learning proposal requires the student to respond to the course requirement by writing a 1-page proposal describing the activity they plan to undertake and detailing how it meets the course requirements. The guidelines for the service learning projects allow flexibility for the selection of the project location and emphasis, provided there is a link to aviation. The instructor provides suggestions on possible service learning opportunities including volunteering at fly-ins, aviation pancake breakfasts, FOD-walks (foreign object debris collection, or roadside/runway trash pickup); air shows, reading aviation stories to grade-school children, etc. Once the possibilities are presented to the students, they must indicate in writing to the instructor their preferred activity, where, and when. No grades are given at this point, but proposals are evaluated in two areas: Does the proposed project serve a need identified by an aviation community partner? And, is the proposed project addressing an organizationally-defined or community-defined need rather than a student-defined need? If the answer is 'no' the proposal is returned to the student for revision, if the answer is 'yes' the requirement is noted as successfully completed.

The third measurement is the reflection paper (valuing), describing the service learning project's personal value and outcomes. This paper is a recorded reflection of the student's attitude of the completed project, a written evaluation of the activity in terms of how they valued the experience. Students are asked to provide an affective description of how valuable the experience was in terms of how they value the project as it relates to their future in aviation or their career, how they felt about themselves and their experience performing the project, and the likeliness of their voluntarily participating again. Students who complete the reflection paper are awarded the full points for the project. It is important to note that this assessment is not graded based on whether or not the student valued the experience, but whether or not they completed the project and completed the reflection paper. For the purposes of this research, the reflection papers were scored on whether or not the student made value-laden statements, for example:

Respond statements: students are simply reporting the activity they participated in—value statements are not clearly defined. An example of a *respond* statement:

"On September 30, at the airport we did a FOD walk to clean up the runways and the taxiways it was fun. The majority of the garbage was small rocks and pieces of garbage that had blown onto the airport."

Value statements: students are reporting about the activity they participated in, and value statements are evident and might include statements indicating a high level of personal enjoyment of the activity, feelings of time well-spent, feeling that the experience was valuable to the community and his/her future in the industry, and the student's perception of the learning experience, etc. This variable is more difficult to determine but when each student's answers to these questions examined, the differences in valuing becomes more apparent. Examples of valuing statements have included:

> "I accomplished a lot from this experience. I've made many friends; I was involved in every step to make the event possible. During the process I feel that have gain a lot of people skills, I felt that I came out as a leader in this event because my effort made a difference for this event."

> "First of all, it was a great possibility to get in contact with the real stuff (airplanes) compared to the theoretical background, which is taught in the lecture. And furthermore a good example

what can happen if the airplane hits a foreign object."

"What I enjoyed the most about this volunteer activity was being surrounded by aviation people with the same interests as me. Many of them had already reached their aviation goals, and it was great to hear how they accomplished them."

"Next time I volunteer in an aviation setting I would like to take a more active role in actually helping to plan and run the event. This would give me an opportunity to see the real world side of the industry."

Statistical Analysis

To understand the impact of the service learning curriculum's effectiveness, descriptive statistics are used to answer the research questions. The dependent variable is defined as the learning activity itself and the independent variable is whether the activity was optional or required for the course. The results answer the questions: How many students achieved each of the stated learning outcomes (receiving, responding, valuing)? Which approach (required service learning vs. optional service learning) was most successful in producing said outcomes? Chi square analysis was used to determine whether there was any significant difference between the student learning outcomes in the required activities and the optional activities.

The data was collected over six semesters in two courses, Introduction to Aeronautics and Introduction to Air Transportation. Both of these courses are 100-level general education courses. Approximately 80% of students enrolled in either course are aviation majors, 20% are non-aviation majors taking the course to fulfill general education requirements. The author taught Introduction to Aeronautics each semester and Introduction to Air Transportation once a year.

Two teaching methods were utilized in this research: requiring students to complete the service-learning project and making the service-learning project optional (extra credit). The data (see Table 1) was analyzed as course and teaching method vs. learning outcomes. Descriptive statistics were used (frequency, percentage) to indicate the numbers of students receiving, responding, and valuing (as determined by the assessments described previously). The number of students receiving equals the number of students in the course section since students must complete the syllabus quiz before moving on to any other coursework.

FINDINGS

The frequency and percentage of students who received and responded are shown in columns 2 and 3. The frequency and percentage of students who responded and indicated value statements in their reflection papers are shown in columns 4 and 5. The means for responding and valuing were calculated as well to show at-a-glance the differences in means of responding/valuing in the required and optional sections.

The non-parametric statistic, chi-square was calculated for this data for two reasons: the data is categorical (the assessments were conducted on the basis of whether or not students responded and whether or not they indicated that they valued the experience) and the data contains two independent groups (required project and optional projects). As shown in Table 1, a chi-square analysis was performed on the sample of students in Introduction to Aeronautics (required vs. optional) as well as Introduction to Air Transportation (required vs. optional).

The results of the first chi-square calculation ($p>.01$, $df=2$) suggest that the students in Introduction to Aeronautics who were required to participate in the service learning project responded to and valued the experience significantly more often than those students whose service learning projects were optional. The same held true for the students in the Introduction to Air Transportation courses ($p>.05$, $df=1$): students who were required to participate responded and valued significantly more often than those students for whom the project was optional.

Significance to Our Teaching

What do these results mean in terms of teaching a service-learning component in aviation? In the sections of each course

(Introduction to Aeronautics and Introduction to Air Transportation), the chi square results were significant in the category *responding*: Introduction to Aeronautics, $\chi^2 = 26.73$, which was significant at $p<.01$, and Introduction to Air Transportation, $\chi^2 = 5.96$, which was significant at $p <.05$. Not surprisingly, the chi-square values and significance in the valuing category were not significant: Introduction to Aeronautics $\chi^2=1.38$ and Introduction to Air Transportation $\chi^2=1.20$. These numbers suggest that in the course sections where the service learning component is required, students respond at a significantly higher rate than when the service learning component is optional. The numbers also suggest that when a teacher can get the students to respond, students will correspondingly value the experience. The literature tells us that moving students to this mode of learning is more difficult than teaching them facts and figures—in many cases, it requires them moving outside of their comfort zone. Requiring the service learning project in these aviation courses is essential to having more students value the experience—if left to their own choice, students will opt-out of doing something that they are unfamiliar with and which puts them outside their zone of comfort. If we are to change our institutions and communities, it is essential that we require our students to complete these components in our courses.

The second notable result from this research is that those students who are not required to complete the service-learning component show 100% valuing rates across-the-board, as compared with those students who are required to do the projects (while significantly high, it is not 100%). This is to be expected—not all students who are required to complete service learning projects are going to value them, whereas those students who voluntarily complete the projects are likely to value the experience.

What Students Have Said About Their Experiences

The service learning activity allows students to combine their love of aviation and flying with a civic activity that promotes aviation, and sometimes inspires others in the community toward a love of aviation (teaching young children the basic concepts of aerodynamics using paper airplanes, or reading stories of the first female and minority aviators). The single negative response received from a student participating in this activity was a speeding ticket received while traveling to the service learning site!

In three years and over 1,400 documented hours of aviation service-learning, there have been several success stories worth noting. One freshman aviation major chose to volunteer at a large regional air show, and was given the name of the air-show director. After indicating his willingness to provide time and service to promoting aviation to the community, he was offered the opportunity to 'shadow' the air show director for the entire weekend event, which involved meeting and greeting VIPs from the community, the military, and even meeting the Blue Angels flight team pilots. He learned about the busy and complex job of an air show director, and was invited back again the next year, as a paid intern.

A group of female students contacted an elementary school and offered to spend time reading aviation stories to first-grade children. They researched a variety of age-appropriate books that would represent the history of aviation as well as the achievements of women in aviation. The story time was a success and the children asked questions of the young female pilots about when and how they knew they wanted to be pilots, and what they loved about flying. The young women were so moved by the children's inquisitiveness, that they scheduled time to read to other classes. In both of these examples, the true nature of service learning was experienced by all parties involved; rather than just volunteering in order to earn a grade, the students and community shared and developed a civic-minded approach to learning.

Table 1. *Service Learning Project Assessment/Learning Outcome Res*ults

Group: Teaching method/sample sections	# Students Received	# Students Responded	% Students Responding	# Students Valued	% Students Who Valued
SL Project is Required (3 sections)					
Introduction to Aeronautics	35	34	97.14%	32	94.11%
Introduction to Aeronautics	19	16	84.21%	16	100%
Introduction to Aeronautics	59	47	79.66%	45	95.74%
Mean		32.33		31	
SL Project is Optional (3 sections)					
Introduction to Aeronautics	10	5	50.00%	5	100%
Introduction to Aeronautics	31	14	45.16%	14	100%
Introduction to Aeronautics	15	8	53.30%	8	100%
Mean		9		9	
Chi Square (p>.01) (df=2)	na	26.73		1.38	
SL Project is Required (2 sections)					
Introduction to Air Transportation	22	20	90.90%	20	100%
Introduction to Air Transportation	35	31	88.57%	30	96.77%
Mean		25.5		25	
SL Project is Optional (2 sections)					
Introduction to Air Transportation	27	25	92.95%	25	100%
Introduction to Air Transportation	21	8	38.09%	8	100%
Mean =		16.5		16.5	
Chi Square (p>.05) (df=1)	na	5.96		1.20	

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

First and foremost, students need real-life, outside-the-classroom experiences in order to fulfill the needs of the industry. With service learning, students link personal and social development with academic and cognitive development. Eyler and Giles (1999) affirm that in service-learning models, the student experience enhances understanding and this understanding leads to more effective action. In the aviation industry, the future of service learning is exemplified by Southwest Airlines' *Share the Spirit* program in which employees reach out to individuals, families, and entire communities, providing help where it is needed, through programs like: *Trunk or Treat* – Southwest Airlines Corporate Communications office works with local church organizers and offers a safe trick-or-treat experience for nearly 600 local children; *Guts and Glory* –the airline donates roundtrip tickets to the annual Crohns & Colitis Foundation of America's Walks and Runs, to raise funds for research of Crohn's disease and ulcerative colitis; *Sharing the Back*

to School Spirit – During the "Back to School Action Day" at the Alice Griffith Community of Opportunity in South San Francisco, Southwest Airlines provided school supplies for backpack giveaways, goody bags for the residents, and more than 60 Southwest employees worked in the community garden, cleaned up the housing development and played games with the neighborhood kids; or Southwest's *Operation Phone Home* that partnered with the USO and its Operation Phone Home program, to provide phone cards for the troops, donating more than $50,000, which translated into a million units of call time for our troops (Southwest Airlines, 2007). When our students have already demonstrated their responsiveness and valuing of service learning, employers like Southwest Airlines will stand up and take notice (Freitag, 200; Freiberg & Frieberg, 1996).

Second, aviation education programs need to adopt and implement a core philosophy that our students as young aviation professionals need real-life outside-the-airport experiences in addition to their classroom learning. Service learning has and will continue to play an important role in preparing aviators for the 21st century.

Additional research needs to be conducted in this area of aviation education, measuring whether the service learning experience is valued by the community—are the recipients finding the same level of value and satisfaction with the activities as are the students? When this question is answered, the service learning experience can be evaluated from a 360-degree perspective and our faculty will have the data needed to further support the need for and value of service learning in the aviation classroom. Until then, we do know that students who are compelled to complete service-learning projects overwhelmingly value their experiences and even begin to characterize service to others as a lifelong activity.

Finally, creating a successful service learning experience for the student involves planning and designing a learning component that both the student and the community can value. As this research has shown, when the instructor cares about designing and requiring a meaningful activity, the students will in turn care about the activity by responding and valuing the experience. Instructors who value service learning will make it a required component of their courses and students who value service learning will complete the project whether it is required or optional.

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APPENDIX A

A list of service learning projects that students participated in throughout the case study include:

FOD walks

Airport fly-in support

Air show support

Community Aviation Day activities

Aviation Expos in a variety of capacities (around the state and region)

Washing the University airplane fleet

Fundraising for the University Aero Club

Reading aviation stories to elementary school children (the stories and theme of stories is chosen by the university student)

Paper-airplane folding and flying contests with school children (teaching aerodynamics)

Young Eagles program

POW hot-air balloon rides

Road clean up (around the airport)

Operation Santa rides (C-130)

Visits to old high schools to talk about aviation to high school students

ATC Tower tours

Aviation banquets

Civil Air Patrol activities