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# AVIATION/AEROSPACE TEACHER EDUCATION WORKSHOPS: PROGRAM DEVELOPMENT AND IMPLEMENTATION

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## ABSTRACT

This proposal is for an Aviation/Aerospace Teacher Education Workshop. The workshop will be offered to elementary school teachers. During the course of the workshop, the teachers will become familiar with aviation fundamentals and issues, and with ways to incorporate aviation topics into their normal curricula to enhance education. The proposal is organized in two parts. Part I deals with issues of program development. These issues include program intent, benefit to the sponsoring institution, program model, credibility, co-sponsorship and potential problems. Part II deals with problems specifically related to program implementation.

## Part I

### PROGRAM DEVELOPMENT

#### Program Intent

The Aviation/Aerospace Teacher Education Workshop will be important to both the aviation and education communities. These workshops have been recommended by the Illinois Task force for Aviation/Space Education (1988) as a way of encouraging aeronautical education. The Task Force was sponsored by the Illinois State Board of Education and the Illinois Department of Transportation - Division of Aeronautics and was composed of a Blue Ribbon Task Force of professionals in both fields. The Task Force endorsed two initial premises:

“Great technological challenges are being met by a dynamic aerospace industry that requires the intellect and dedication of motivated young people and an understanding public. Aerospace touches the lives of every citizen, yet the awareness of career opportunities, the economic impact, the beneficial spin-offs are little understood by the average citizen” (p. ii).

and that

“The need for widespread aviation/space education in our schools and the public arena has never been more evident than today” (p. ii).

But the need is not only specifically for aviation education, but for science education in general. Newspaper and popular magazine articles constantly

bemoan the test scores of American students in the sciences when compared with other countries. According to Strickler (1980), trained educators see aerospace education as **basic education** and use aerospace as a motivating and meaningful medium through which they are able to teach the basic academic subjects. They take advantage of the interests that students have in aviation and space to teach such basic subjects as geography, English, mathematics, science, physical education, arts, business, etc.

The aviation community also has a great need to diversify—to encourage the participation of women and minorities. Currently, only an average of six percent of all pilots are women. Early exposure to the potential opportunities may help encourage future participation by this segment of society.

If there are so many advantages to aviation/space education, why is it not taught more in the schools? According to Marcec (1988), the regular classroom teacher looks at aviation/space as another technical science area in which they do not know the terminology and do not understand the concepts. Familiarizing teachers with the topic, and especially how it can be correlated with non-science subject, may increase their participation.

### **Sponsorship**

A college or university is a logical sponsor of this workshop. Many institutes of higher learning have a threefold mandate which includes teaching, research, and public service. These workshops would certainly help meet the public service requirement. Boyle (1981) states that “Educational institutions should be responsible for facilitating the use of knowledge to serve the public” (p. 65).

Sponsorship of these workshops may also help an institution maintain support throughout its state for its other programs by showing that it is interested in promoting the general welfare of the state. An institution’s willingness and eagerness to help the Department of Education implement this recommended course in the furtherance of improved elementary education by providing sponsorship and making its facilities available may also help win political support in a time of budgetary constraints.

The facilities funded in conjunction with an aviation program are usually excellent for offering such a workshop. These may include air traffic control radar facilities, commercial air terminals, general aviation ramps, flight training facilities and training aircraft, flight simulators, computer aided aviation instruction classrooms, antique aircraft, and aircraft maintenance and restoration facilities. The ability to call on the professionals working in these facilities for input and participation is definitely an important asset. The overall experience for the teachers in being exposed to these facilities, and being able to participate in hands-on activities, will potentially leave a positive memory and elicit support and understanding for aviation.

The relationship that will be established with the teachers will also be important to the sponsoring institution in the long run. The teachers, when counseling their students, will hopefully mention this resource to them, thereby encourag-

ing a steady flow of students. As students become educated about aviation in their classes, even if they elect not to fly or pursue aviation as a career, they will at least be able to analyze issues dealing with aviation more knowledgeably. Hopefully, they will support aviation in a time when the industry appears to be under fire.

### **Program Model**

There are a number of ways to discuss the model of program development suitable for this program. According to Boyle (1981) a model of program development is used as a rationale for selecting procedures. His institutional classification seems to apply to the type of program being proposed. "Many professionals, such as teachers...are required to earn a certain number of units per year to update their knowledge in their field. They enroll in courses or workshops designed to develop or improve their understanding of new information and research as well as techniques" (Boyle, p. 11). The objectives, which are developed from the knowledge within the discipline are, according to Boyle, often part of a larger problem-solving effort. In this case, the problems which need to be addressed include: increasing cultural diversity in technically-oriented fields, improving science skills in American students, and updating teacher competence and competitiveness.

The viewpoint to be used will have elements of the naturalistic as elucidated by Houle. Planning decisions will be made using practical contexts of action through a deliberative process in a specific context. Included, but not limiting, will be ideas from the Classical viewpoint of program development proposed by Tyler. The four questions posed by Tyler ask: what result does the program plan to obtain; through what type of educational experiences will these results be obtained; through what type of organization; and how will achievement be evaluated? The answers to these questions are all essential to a program. However, many other questions must also be answered.

The situation must be properly analyzed and the educational design chosen on this basis. Elements of Knowles and Donaldson seem especially important for consideration in development and utilization of experience. Teacher education must take into account the reality of the environment the teacher operates in and the individual teacher's expertise in this area. Failure to do so will definitely result in alienating this population. Respect for the experiences of the teachers is essential to the success of the program. Their participation in developing curricula ideas from the knowledge provided them, as a goal of the workshop, is also essential to its success.

Communication and relationship building, as espoused by Donaldson (1990) is also extremely important. The power to influence teachers and to gain continuing support for the program and for aviation in general, rests with the ability to build confidence in the sponsor's expertise and ability to understand the educator's workplace.

### **Potential Difficulties**

Among the difficulties which might be encountered, gaining teacher participation looms paramount. A great deal of the incentive for teachers to enroll in the workshop must come from their ability to achieve continuing education units (CEU) that can be used to proceed toward an advanced degree or as a basis for fulfilling mandatory CEUs leading to an increase in salary. Educational institutions need to provide innovative ways for teachers to obtain these CEUs (Boyle). These credits must be offered to participating educators. The program will have potential economic benefit to the teachers and improve participation if, as a result of obtaining credits, they receive a raise.

Weekend and summer workshops have also become less attractive to teachers as salary constraints make it difficult to receive pay for participation. Ideally, a grant can be obtained to pay the teacher's full cost of enrollment as well as provide a stipend for participation. A NASA grant that stipulates a portion of the money be used to promote and support these Aviation/Aerospace Teacher Education Workshops is one potential source of funding. This program plan will be used as a basis for application for funding.

### **Program Credibility**

Even if the above issues of credit and pay are addressed, teachers will not willingly waste their off-time on a program of little value to them. The program must have credibility to achieve enrollment. Association with an institution of higher learning automatically confers some credibility. However, additional credibility can be offered through the establishment of an advisory committee composed of co-sponsors and program developers.

### **Advisory Committee**

It is essential that the prime representative on this committee act as a stimulator (Apps, p. 83) to "sell" the program to the other advisors and co-sponsors. The other roles he lists must also be filled—analyst, facilitator, and encourager. There must be someone to provide expert knowledge in at least two domains: (1) aviation subject matter and, (2) presentation of material to elementary school children. The program developer must also be able to establish linkages between the diverse groups involved in the program and establish comfortable working relationships based on mutual trust. The less pleasant role might be one of "nagger", ensuring all work is performed on schedule. Another name for this role, as suggested by Dahl, is administrator. The role of entrepreneur is also important. While ideally the costs of the program will be covered by grant money, the variety of support needed to make the program viable must be gained.

Teachers will be enrolling not simply for aviation knowledge, but for ideas on how they can use this knowledge in their classrooms. It is essential that an elementary school teacher be included in the program planning and activity development to ensure that the program remains relevant to the concerns of the

teachers. The teacher should also be involved with program implementation to provide insight into elementary training needs. Boyle (1981) feels that having client representation will speed up the process of change and reduce resistance to the program (p. 95). He also feels that those who are involved will aid in dif-fusing information about and legitimizing future programs.

The ability to offer course credit will be based on the ability to build faculty contacts willing to sponsor the program and also participate. Potential co-sponsors and advisory board members should ideally include appropriate departments such as Education or Engineering. The State Department of Educa-tion, State Division of Aeronautics, the FAA, NASA, and the Civil Air Patrol (CAP) are all organizations which actively promote Aviation/Aerospace Teacher Education Workshops and which lend support through planning aid and the provision of resources and speakers. Their participation would also lend additional credibility to the program.

An additional obstacle to the participation of the teachers might be their fear of being burdened with additional material they must now shoehorn into an already overcrowded schedule. It must be emphasized to them that the purpose of the workshop is to show how easily aviation topics and examples can be incorporated across their curricula to enhance education.

The Aviation/Aerospace Teacher Education Workshop will benefit both the sponsors and attendees. The big winners however, will be the students. They will have teachers better able to prepare them for the technological challenges they will encounter in the century to come.

## Part II

### PROGRAM IMPLEMENTATION

Part I addressed issues related to program development. Part II will address planning issues specifically critical to the implementation of an effective pro-gram. These issues include the solicitation of advice and program support, loca-tion and length of the program, learning objectives, learning activities, and program evaluation.

**Advice and Support.** There are many levels of support and advice that will be needed in ensuring an effective program. Caffarella (1988) talks about the need for support on the local, regional, state and community levels. Working within a university environment, this partially translates to support from within the sponsoring college. School systems within the host state, sponsors, and the trainees themselves must also be consulted. Munson (quoted in Caffarella) said that within these areas support must come from three major groups: top manage-ment, the immediate supervisors or potential training participants, and the train-ees themselves.

**Internal Support.** Within the Aviation Department of the sponsoring institution, active involvement should be sought from the Director, Assistant Director, Head of Pilot Training, and the Chief Pilot. At a minimum, their support must be rendered in the form of authorizing release from normal duties for workshop organization. Optimally, however, their active involvement will enable utilization of their expertise for advice on implementation and scheduling. Their participation in events, possible acting as instructors or resource persons, and assisting with the awarding of certificates at the end of the program, will also add greatly to the credibility of the program.

It is essential that teachers receive graduate or CEU's for attending the workshop. The appropriate colleges within the university should be consulted for advice on obtaining this credit for teachers. Any requirements for classroom hours, curriculum content or instructor qualifications must be planned for in advance to insure against last minute surprises. Participants must be notified in advance of any credentials or other paperwork required for presentation at the workshop.

**External Support.** School principals and science program coordinators also need to be recruited for support of the program. By accepting the program as valid and offering in-house certification credit where appropriate, they may encourage attendance by their teachers. They may also be able to offer advice on developing curriculum ideas that will conform to any applicable state educational goals.

The support and advice of the trainees themselves is vital to the continuing success of the program. If any teachers are currently using aviation materials in their classes, they can be used as instructors or resource persons for a portion of the workshop. The success of future programs will depend on favorable word-of-mouth recommendations.

**Advisory Committee.** While an advisory committee is needed for program development, one is also needed for implementation. These two committees may be composed of the same, different, or additional members. Caffarella (1988) says that subject experts, process experts, organizational leaders, and consumers are types of people needed on an advisory committee. An appropriately staffed advisory committee can add a great deal of prestige and credibility to a program, making participation desirable.

Aviation experts can be provided from within the Aviation Department. The teachers, however, will be most concerned with how the material can be used effectively in their classrooms. An expert in elementary educational practice needs to be included in the planning process.

The process expert will be the program planner but may include others with similar functions within the institution such as Conference and Institutes.

Organizational leaders that may be consulted for advice include NASA, FAA, CAP, aviation professional organizations, and the state Department of

Transportation/Division of Aviation. These organizations may also be interested in sending speakers to participate in a portion of the workshop.

Last, but absolutely not least, is participation by the consumer. This involves the inclusion of an elementary school teacher on the advisory committee. The advice supplied by this individual can help insure that the program is addressing needs and supplying information of use and interest to the participants.

**Program Location and Length.** This Aviation/Aerospace Teacher Education program is proposed as a one-week resident program at the sponsoring university or college and will be limited to an enrollment of 25. University facilities are one of six types of commonly used facilities listed by Caffarella (1988) and seem to have clear advantages for this type of program. The setting will provide prestige and credibility for the program and allow it to be conducted in an atmosphere of serious intent and scholarship. Teachers are probably used to studying in this type of environment from their undergraduate education. This familiarity will hopefully lead to a frame of mind that will allow concentrated instruction to be effective. The one-week time frame for the course will allow enough class hours to be accumulated to qualify for one unit of CEU credit.

The resident aspect of the course will eliminate family distractions and allow the participants to concentrate fully on the material being presented. Participation by teachers from other parts of the state will be easier if a long nightly commute is eliminated. Some teachers may not find it possible to leave their families for that period of time while others will look forward to the break. Flexibility in arrangements can be allowed for and residency offered but left optional.

Arrangements can be made at dormitories for guest accommodations and meals. The dormitories are often within walking distance of classrooms where morning sessions can be held. The classrooms should be spacious enough to allow group projects to take place and be equipped with audio-visual equipment.

After lunch, a bus can depart from the housing facilities for an afternoon field trip. When returning to campus, the bus could make a number of stops at points of interest to drop off participants wishing to sightsee or shop. The participants can also spend free time in the afternoon and evenings at the library to prepare the written assignments required to obtain course credit.

### **Program Objectives**

Houle states that any learning activity is a force field in which many other purposes than the professed goals are in operation. An explicit objective may be the professed goal—the intended result of a specific training activity (Caffarella, 1988). The other purposes may be thought of as implicit objectives. It is important for the program planner to be aware of both explicit and implicit objectives in order to design learning activities that will orchestrate between them and enable them to be met. There are three major categories of learning outcomes: (1) knowledge acquisition, (2) skill building, and (3) attitude change. Educational objectives focusing on the learners, are based on these possible out-

comes and are composed of three components—performance, conditions, and criterion (Cafarella, 1988).

**Explicit Objectives.** The explicit objectives of the workshop fall primarily in the knowledge and skill building domains. At the outcome of this workshop, the participants will be able to explain aviation fundamentals. They will be able to recognize the applicability of aerospace education across the curriculum and be able to prepare lesson plans that incorporate aviation themes. The participants will also be able to describe issues facing aviation today.

**Implicit Objectives.** The implicit objectives for the workshop seem to fall primarily into the attitude domain. One objective is for the participants to become advocates for aviation in general. The participants will accept and recognize aviation as a motivating and meaningful medium through which to teach basic academic subjects as well as technical material. They will endorse the use of aviation across their curriculum and select to use lesson plans incorporating aviation themes. Another implicit objective is to build good will toward the sponsoring institution(s).

### **Learning Activities**

A variety of instructional techniques will be used to obtain the explicit and implicit objectives. This workshop will provide continuing professional education to elementary school teachers and must address preferred learning styles. Adults in general, according to Knowles, prefer a problem-based orientation. Teachers in particular want hands-on experiential learning experiences that have immediate and practical application in their classroom. A combination of lecture, guest lectures, simulations, video, demonstrations and hands-on projects, case studies, group projects, written assignments, and field trips will be used during the week-long course of the workshop.

A knowledge base does not need to be developed during each unit of instruction. This will be accomplished primarily through lectures, group projects, and demonstrations. It is extremely important that each lecture present not only subject content but suggestions for, and examples of, integration into a primary curriculum. Skill building will occur through case studies, hands-on projects, and written assignments. Attitude changes will occur through the interaction of all the designated learning activities (Cafarella, 1988).

### **Program Evaluation**

It will be important to evaluate this program in a number of different ways. The overall value of the program and its ability to meet the stated objectives must be evaluated to determine if the program should be continued as is, modified, or discontinued. It is also important to evaluate each unit of instruction for effectiveness and relevance for the participants.

There is a danger in over evaluating, especially in terms of participant dissatisfaction. In terms of formative evaluation, two short evaluation cards could be provided to the teachers each day. One card could be at the classroom desks in the morning and collected as participants leave for lunch. The second card could be on the bus seats when returning from the afternoon field trip, filled out en route and collected when leaving the bus. Evaluation of specific program activities will be less reliable the farther removed in time from the actual learning experience and should therefore be done immediately following the session to be evaluated. The teachers may actually appreciate the fact that their opinions are being solicited. These evaluations may also aid in making timely changes in the format of following lectures to help ensure the success of the program.

Questions to be asked about the morning sessions concern content, speakers, teaching methods, and overall usefulness. Field trips can be evaluated in much the same way. These questions can be posed on a Likert-type scale, allowing the participants to agree or disagree along a continuum. Space should also be included for general comments from the participants. This may allow comments and suggestions not previously considered to be brought to the forefront. Teacher responses should not be unduly restrictive.

Summative evaluations to determine to what extent the course objective were met can occur through a questionnaire mailed to participants six months after course completion. This form can solicit information on how the teachers are using aviation in their classes, as well as their overall impression of the usefulness of the program to them and their students.

### **Summary**

An Aviation/Aerospace Teacher Education Workshop has the potential to be a first-rate program. The content matter is solid, facilities excellent, and objectives worthwhile. From the moment the teachers are greeted by a student contingent to assist them with their check-in procedures, they will be able to make contacts with teachers of similar interests from around the state and will be given the time to build strong relationships. The good feelings they will leave with will hopefully translate into positive action in support of aviation.

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