MINIMIZING CONSTRUCTION COSTS TO ENHANCE THE FINANCIAL VIABILITY OF GENERAL AVIATION AIRPORTS

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Summary and Conclusions

This paper establishes a three-step process for minimizing construction costs to enhance the financial viability of general aviation airports. First, the need for each improvement is justified in a systematic manner. Then, a project scope commensurate with the potential usage of the facility is defined. Finally, innovative and efficient construction procedures are employed to minimize construction costs.

Major conclusions reached are:

1. Traditional needs analysis and benefit-cost techniques are too subjective to be used to justify airport construction. Return on investment analysis offers the best procedure for objectively evaluating the merits of a project.
2. Alternative project scopes should be tested using return on investment analysis to define the most appropriate project scope.
3. Airport officials must examine a broad range of innovative and efficient construction procedures.

Introduction

The difficulty of generating additional revenues to enhance the financial viability of general aviation airports has resulted in a closer evaluation of techniques for minimizing construction costs. Traditionally these techniques have involved the use of efficient construction procedures, lower construction specifications, and inexpensive construction materials. While these options are valid for reducing construction costs, minimizing such costs requires a more comprehensive approach.

The objective of this paper is to present a three-step process for minimizing airport construction costs, so as to enhance the financial viability of general aviation airports. The three steps are to:

1. Justify the need for each construction option in an objective and systematic manner.
2. Establish a project scope that is consistent with and appropriate to the airport's utilization.
3. Utilize the most innovative and efficient construction procedures.

The remaining sections of the paper will elaborate upon these three steps.

Justify The Need For Construction

The first step in minimizing airport construction costs is to carefully evaluate each proposed project to insure that it is needed.

The definition of a need is a highly subjective matter which varies with the individual's perspective. A new runway may be considered a need to an airport manager, but a luxury that can be deferred to a cost-conscious budget analyst.

The perception of needs is also influenced by the party which incurs the major share of the cost of construction. For example, when the Federal Aviation Administration (FAA) furnishes 90 percent of a project's cost, it may be viewed as more of a need than when the local airport sponsor must finance the construction entirely with its own funds.

Sometimes a project is considered a need simply because of the economic benefits it ostensibly will generate. Thus a runway is extended under the assumption that the ability to accommodate jet aircraft will attract industries that utilize business aircraft and create jobs.

While these different interpretations of needs may make it difficult to objectively derive a list of facility requirements, airport needs analysis is traditionally undertaken as a part of the master planning process.

Needs analysis entails establishing a set of measurable criteria which can be used as a reference to gauge the necessity of a potential improvement. When the current and projected aviation activity at the airport is compared with the criteria, activity that exceeds a given threshold signifies the need for a project. Where airport rehabilitation is concerned, when facilities fall below a minimum tolerable condition index, restoration or replacement is in order.

Examples of criteria that are used to identify airport needs are listed in Table 1.

The origin of these commonly used criteria is FAA Order 5090.3A, Field Formulation of the National Airport System Plan. This document establishes a set of needs criteria in order to define facility requirements for all airports in the national system. The cost of the needs that are identified provide a basis for the FAA to justify its airport funding program and its annual appropriation request.

A closer evaluation of these criteria reveal that they do not meet sound cost-effectiveness standards and thus result in an inflated perception of needs.

The crosswind runway criteria does not take into account the number of aircraft operations at the facility. With 94 percent wind coverage (one percent less than the 95 percent standard technically signifies the need for the crosswind runway), only about 22 days a year excessive crosswinds would preclude aircraft activity. At a low activity general aviation airport with an average of 50 operations a day, this amounts to a deferral of 1100 takeoffs and landings a year. Since a substantial amount of the traffic at general aviation airports (let us say 50 percent) is of a training nature, deferring such activity to another day would not result in undue hardship. While admittedly some of the remaining 550 operations may be of an essential business nature, the inconvenience to those operators may not be worth the substantial dollar outlay for the construction of a crosswind runway.

The criteria for the construction of a parallel taxiway, 20,000 itinerant operations (aircraft takeoffs and landings that go beyond the local traffic area) is equally suspect. The rationale behind this threshold value, is that when runway activity reaches a certain level, peak-hour conflicts between aircraft taxiing on the runway and those that wish to take-off and land there result in unnecessary delay. However, 20,000 itinerant operations a year is equvalent to an average of 54 operations a day and a potential 100+ a day during peak periods. Assuming a peak-hour acitvity of 25 aircraft operations, delays to aircraft would be nominal and would not merit the construction of a parallel taxiway.

Table 1. Airport needs criteria.

Criteria	Project Need
Less than 95 percent wind coverage on given runway	Crosswind runway
Greater than 20,000 itinerant operations for a given runway	Parallel taxiway
Runway at greater than 60 percent of its practical annual capacity	Parallel runway
More than 500 annual itinerant operations by critical aircraft	Runway lengthening

Source: Field Formulation of the National Airport System Plan (NASP), FAA Order 5090.3A, 1977.

The criteria for the construction of a parallel runway, 60 percent of practical annual capacity (PANCAP) suffers from two weaknesses. First, PANCAP is an extremely conservative estimate of an airport's capacity. A review of the FAA's terminal area forecasts as well as individual master plans reveals that airports typically exceed their PANCAP by 20-25 percent without any adverse effects. Secondly, the 60 percent criteria assumes a priori that once an airport reaches 60 percent of its capacity, continued traffic growth will cause it to reach saturation in the near future (i.e. within five years).

One solution to the problems cited above is to make the needs criteria more precise and/or stringent. Thus, the crosswind runway criteria should include an itinerant operations value, and the threshold values for determining the need for new or extended runways and taxiways could be raised. However, the major shortcoming that remains, and one that plagues traditional needs analysis is that a potential project is classified as a requirement without regard to its costs.

Some analysts resort to benefit-cost analysis to gauge the need for a project. This methodology involves measuring the net benefits that a proposed construction option offers, and comparing them with the cost of construction. The net benefits offered by a project consist of the benefits to the airport in terms of additional revenue, benefits to the user resulting from time savings, and benefits to the community attributable to primary and secondary employment impacts.

While theoretically valid, problems with the application of benefit-cost analysis makes it difficult to determine accurately the relative merit of an array of projects. The inability to precisely and consistently quantify certain intangible benefits, the tendency to double count benefits, and the inclination to count redistribution as net benefits, make the results of benefit-cost analysis highly subjective. In fact, with little effort the analyst can justify the construction of most projects.

A preferable alternative to benefit-cost analysis for evaluating airport projects is the return on investment (ROI) approach. This methodology entails comparing the additional revenue generated by a particular project with the cost of its construction and financing. (Both costs and revenues are discounted to present value to allow legitimate comparisons.) If the ROI exceeds one, then the project is justifiable.

Because ROI analysis does not attempt to quantify numerous intangible or immeasurable benefits, it offers a more objective procedure for evaluating the feasibility of a given construction option. Another advantage is that it allows the local airport sponsor to guage the financial viability of a project in terms of the cost that it incurs. The availability of federal and/or state funds to defray sponsor costs enhances the prospects for achieving a positive financial return.

Before one can actually justify the need for a proposed construction option using a return on investment technique, a clear definition of the project scope is in order. The next section describes the use of ROI for estimating the proper project scope.

Establish Project Scope

The scope of a project can be defined in terms of its magnitude or in the quality of materials employed to construct it. Often times scope is directly related to the aircraft for which it is designed, although it may hinge upon the number of aircraft operations. Table 2 lists various project needs and issues related to the scope of construction.

Determining the proper project scope requires a careful analysis of the following factors:

1. The critical aircraft currently using the airport and the number of annual operations by that aircraft.
2. The most reasonable projection of critical aircraft to use the airport and number of operations by that aircraft.
3. Assumptions regarding the percentage of gross weight to be accounted for in the design. An examination of typical aircraft stage lengths will reveal whether the facility should be designed to accommodate maximum gross weight, 90 percent of gross weight, or 60 percent of gross weight.
4. Standards regarding design geometrics and specifications associated with a given aircraft type.

Caution must be exercised in gearing the scope of a project to a forecasted aircraft type. Unless the forecast of usage by a more demanding aircraft is reasonable, and the number of operations by those aircraft are significant, raising the project scope may not be warranted.

An analysis of the above factors allows the development of several alternative project scopes that can be subjected to ROI analysis. This methodology is applied through the following steps:

1. Define the dimensions of each project alternative.
2. Determine the cost of each alternative using a unit cost procedure, or a more precise estimate if possible.
3. Calculate the net revenue that would be generated by the construction project. This net revenue would be equivalent to the additional revenues brought in by either larger and/or more aircraft operations, less any maintenance costs and other expenses incurred.
4. Select a discount factor reflecting the cost of financing the construction and

Table 2. Project needs and issues relating to scope.

Project Need	Issue Regarding Scope
New runway	Length, width, strength
Parallel taxiway	Length, width, strength
Apron expansion	Dimensions and strength
Runway lighting	Low, medium, high intensity
Fire/crash/rescue station	Number of bays
Runway overlays	Thickness and material

apply to future revenue streams to allow consistent comparisons of costs and revenues.

5. Select the alternative that yields an ROI greater than one. If there are more than one, select the highest ROI calculation.

Minimizing Construction Costs

Once it is determined that a project is justifiable and its scope is properly defined, efforts must be made to minimize the cost of the ensuing construction. This is accomplished through sound planning, flexible design standards, stringent pavement maingenance programs and careful project management.

Sound planning prior to the initiation of construction can have a significant impact on cost containment. Projects should be sited with economy of construction in mind. For example, changing the orientation of a crosswind runway so that it offers 95 percent rather than 97 percent coverage, still acceptable even by FAA standards, may offer substantial savings in grading and avoid the relocation of facilities in the path of the original site. In this case one must consider the tradeoff between the optimal siting of a project from a convenience standpoint and the cost savings realized from siting modifications.

The development of a good Airport Layout Plan (ALP) is a crucial aid to achieving lower construtions costs. This plan provides for the orderly expansion of a facility as warranted, without unnecessary disruption to or relocation of existing facilities. Thus runway extensions should not require the expensive removal of hangars or buildings.

Planning to minimize the duration of construction also offers significant cost savings. Wherever it is feasible to close down a portion of the airport, and thereby accelerate construction, labor savings and better utilization of equipment yield substantial cost advantages.

The utilization of innovative and/or flexible design standards can also help minimize construction costs. Since general aviation airports do not need to be constructed to the same stringent standards as those served by scheduled air carriers, more flexible design standards offer sizeable cost savings.

Design criteria should be established which take into account the availability of local materials. This reduces the cost of shipping materials to the construction site.

The contractor should be given the latitude to select construction materials within the confines of specification boundaries. The cost and availability of construction materials can be assessed prior to the acceptance of the project design.

It is also wise for the airport sponsor to hold a preconstruction conference with interested contractors to confront those issues which can significantly affect costs. Incentives should be provided to develop design modifications that meet specifications (for example, split savings) wherever possible.

Stringent pavement maintenance programs can reduce the frequency of resurfacing projects, one of the major cost categories faced by the airport sponsor. This generally entails establishing an objective and systematic pavement rating index to determine the most cost-effective timing of projects and keeping pavement sealed and levelled.

Once the actual project construction proceeds, a final measure for holding down costs is the institution of careful project management practices. This is needed to insure the efficient phasing of construction, proper use of labor resources, and the monitoring of construction to ensure that the project meets all required specifications. This should be undertaken by the project manager in coordination and cooperation with the appropriate airport officials.

ALTERNATIVE FINANCING MEASURES FOR GENERAL AVIATION AIRPORTS

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Summary

Obtaining financing to underwrite improvements at general aviation airports has historically been a difficult task. This paper examines the strengths and weaknesses of four financial instruments: general obligation bonds, revenue bonds, municipal corporations, and industrial development bonds; and then discusses the major factors used to determine a community's bonding potential.

In the years ahead, more general aviation airports will have to become self-sufficient to finance badly needed capital improvements. Although some airports may be able to obtain subsidies by demonstrating their social value, there are no free lunches. Airport managers will need to become more innovative in searching out methods for financing improvements and the communities they represent will need to take action to enhance their revenue and bonding potential.

Introduction

Historically it has been difficult to finance capital improvements at general aviation airports. Even when federal funds are available, some airport sponsors have been unable to secure local matching revenues.

General aviation projects an image that interferes with the ability to garner financial support from the local citizenry. It encompasses such a wide variety of flying activities that its mission is somewhat vague in the minds of the non-aviation public. Furthermore general aviation is