U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Consolidated AC includes Change 1

Subject: Change 1 to AIRPORT MASTER PLANS

Date: May 1, 2007
Initiated by: APP-400

AC No: 150/5070-6B
Change: 1

1. PURPOSE. This Change adds a new drawing, the Runway Departure Surfaces Drawing, into the Airport Layout Plan drawing set. The requirement to add this drawing is based on the new 40:1 and 62.5:1 departure surfaces added to Appendix 2 under Change 9 of FAA Advisory Circular 150/5300-13, Airport Design. It also incorporates a reference to FAA Advisory Circulars 150/5300-16, 17, and 18, which is recently published guidance on conducting aeronautical surveys.

2. CHANGE TEXT. Changed text is indicated by vertical bars in the margins.

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Benito DeLeon, Director
Office of Airport Planning and Programming

U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: AIRPORT MASTER PLANS

Date: July 29, 2005
Initiated by: APP-400

AC No: 150/5070-6B
Change:

1. PURPOSE. This Advisory Circular (AC) provides guidance for the preparation of master plans for airports that range in size and function from small general aviation to large commercial service facilities. The intent of this AC is to foster a flexible approach to master planning that directs attention and resources to critical issues. The scope of each master plan must be tailored to the individual airport under evaluation.

2. CANCELLATION. This publication cancels Advisory Circular 150/5070-6A, *Airport Master Plans*, dated June 1985. Chapter 10 and Appendix F of this document cancel Chapter 1, Section 5, *Airport Layout Plan*; Appendix 6, Section 2, *Typical Airport Layout Plan*; and Appendix 7, *Airport Layout Plan Components and Preparation*, of Advisory Circular 150/5300-13, *Airport Design*, dated September 1989.

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PART I: THE PROCESS OF PREPARING MASTER PLAN STUDIES

Chapter 1 Introduction

101. PURPOSE AND APPLICATION

This Advisory Circular (AC) provides guidance for the preparation of master plans for all airports. Its intent is to foster the development and adoption of a flexible approach to master planning that devotes resources and attention to critical issues. Planners should tailor an individual master plan to the unique conditions at the study airport. As a result, master plans for individual airports will vary in what elements they include and in the level of detail.

An airport master plan is a comprehensive study of an airport and usually describes the short-, medium-, and long-term development plans to meet future aviation demand. The category of study that includes master plans and master plan updates can therefore be thought of as a continuum that varies by level of detail and associated effort.

The elements of a master planning process will vary in complexity and level of detail, depending on the size, function, issues, and problems of the individual airport. The technical steps described in this AC are generally applicable, although each step should be undertaken only to the extent necessary to produce a meaningful product for a specific airport. However, study elements for large and/or complex airports may involve unique technical analyses beyond those detailed in this AC. The sponsor, the sponsor's consultant, and FAA representatives must carefully prepare a scope of work that reflects the circumstances of the individual airport.

102. INTENDED USERS

This publication is intended primarily for use by members of the aviation community, especially those directly involved in preparing master plans: airport sponsors, airport staff, airport consultants, FAA representatives, and state aviation officials. It will also be useful to airport board members; municipal officials; state, regional, and local planning personnel; and the general public.

103. NEED FOR NEW GUIDANCE

Methods and techniques associated with airport master plan studies have evolved since the last version of this AC was published in 1985. This update incorporates current industry methods and procedures commonly employed in the preparation and documentation of master plan studies.

104. FUNCTION OF MASTER PLAN STUDIES

a. Airport master plans are prepared to support the modernization or expansion of existing airports or the creation of a new airport. The master plan is the sponsor's strategy for the development of the airport.

b. The goal of a master plan is to provide the framework needed to guide future airport development that will cost-effectively satisfy aviation demand, while considering potential environmental and socioeconomic impacts. The FAA strongly encourages that planners consider the possible environmental and socioeconomic costs associated with alternative development concepts, and the possible means of avoiding, minimizing, or mitigating impacts to sensitive resources at the appropriate level of detail for facilities planning.

c. Each master plan should meet the following objectives:

1) Document the issues that the proposed development will address.

2) Justify the proposed development through the technical, economic, and environmental investigation of concepts and alternatives.

3) Provide an effective graphic presentation of the development of the airport and anticipated land uses in the vicinity of the airport.

4) Establish a realistic schedule for the implementation of the development proposed in the plan, particularly the short-term capital improvement program.

5) Propose an achievable financial plan to support the implementation schedule.

6) Provide sufficient project definition and detail for subsequent environmental evaluations that may be required before the project is approved.

7) Present a plan that adequately addresses the issues and satisfies local, state, and Federal regulations.

8) Document policies and future aeronautical demand to support municipal or local deliberations on spending, debt, land use controls, and other policies necessary to preserve the integrity of the airport and its surroundings.

9) Set the stage and establish the framework for a continuing planning process. Such a process should monitor key conditions and permit changes in plan recommendations as required.

105. ORGANIZATION AND USE OF THE ADVISORY CIRCULAR

a. **Structure of the Advisory Circular** – The Advisory Circular is presented in two parts:

1) ***Part I – The Process of Preparing Master Plan Studies*** provides an introduction to the Advisory Circular, an overview of master plan studies, and a summary of the pre-planning process.

2) ***Part II – Elements of Master Plan Studies*** provides a detailed discussion of the various elements of master plan studies, including the components of master plan technical reports and the plan drawings that accompany them.

b. As noted above, Part II of the AC details the individual elements of a master plan study. Although they are presented in the order found in a typical master plan report, issues in some chapters may have a direct bearing on those in other chapters. Environmental and financial feasibility considerations, for example, must be considered throughout the process. These cross-linkages are explicitly identified in the relevant chapters of Part II.

c. The AC includes several appendices of supplemental materials. Appendix A presents a glossary of terms that are commonly used in airport master planning. Appendix B provides a list of useful reference materials, including other advisory circulars, FAA orders, appropriate Code of Federal Regulations, Transportation Security Regulations, security-related publications, FAA reports, and general airport publications. Appendix C provides a listing of potential stakeholders in the public involvement program of the master planning process. Appendix D provides a discussion of environmental factors in airport master planning. Appendix E provides guidance on the site selection process. Appendix F shows the general guidelines in preparing the airport layout plan drawing set.

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Chapter 2 Content of Master Planning Studies

201. TAILORING STUDIES TO THE NEEDS OF INDIVIDUAL AIRPORTS

The guidance in this AC covers planning requirements for all airports, regardless of size, complexity, or role. However, each master plan study must focus on the specific needs of the airport for which a plan is being prepared and the scope of a study must be tailored to the individual airport. Therefore, in a given study certain master planning elements may be emphasized while others may not be considered at all. Although the FAA does not require airports to prepare master plans, it strongly recommends that they do so.

The intent of this AC is to foster a flexible approach in the preparation of airport master plans, enabling planners to focus their resources and effort on critical issues. As a scope of work is developed, the planners and airport sponsors must make decisions regarding two key questions: (1) what type of study should be conducted, and (2) what level of detail should be assigned to the individual elements of the study?

202. TYPES OF MASTER PLANNING STUDIES

a. The master planning process will vary with the size, complexity, and role of the study airport and may include a variety of supporting studies. However, all master planning studies will fall within one of two basic types: Airport Master Plans or Airport Layout Plan (ALP) Updates.

b. **Airport Master Plans** – An airport master plan is a comprehensive study of the airport and typically describes short-, medium-, and long-term plans for airport development. Master planning studies, that address major revisions are commonly referred to as "Master Plans," while those that change only parts of the existing document and require a relatively low level of effort tend to be known as "Master Plan Updates." In common usage, however, the distinction refers to the relative levels of effort and detail of master planning studies. In most cases, the master plan will include the following elements:

1) ***Pre-planning*** – The pre-planning process includes an Initial Needs Determination, Request for Proposal and Consultant Selection, Development of Study Design, Negotiation of Consultant Contract, and Application for Study Funding.

2) ***Public Involvement*** – Once the consultant team is under contract and has been issued a notice-to-proceed, establish a public involvement program and identify and document the key issues of various stakeholders.

3) ***Environmental Considerations*** – A clear understanding of the environmental requirements needed to move forward with each project in the recommended development program.

4) ***Existing Conditions*** – An inventory of pertinent data for use in subsequent plan elements.

5) ***Aviation Forecasts*** – Forecasts of aeronautical demand for short-, medium-, and long-term time frames.

6) ***Facility Requirements*** – Assess the ability of the existing airport, both airside and landside, to support the forecast demand. Identify the demand levels that will trigger the need for facility additions or improvements and estimate the extent of new facilities that may be required to meet that demand.

7) ***Alternatives Development and Evaluation*** – Identify options to meet projected facility requirements and alternative configurations for each major component. Assess the expected performance of each alternative against a wide range of evaluation criteria, including its operational, environmental, and financial impacts. A recommended development alternative will emerge from this process and will be further refined in subsequent tasks. This element should aid in developing the purpose and need for subsequent environmental documents.

8) ***Airport Layout Plans*** – One of the key products of a master plan is a set of drawings that provides a graphic representation of the long-term development plan for an airport. The primary drawing in this set is the Airport Layout Plan. Other drawings may also be included, depending on the size and complexity of the individual airport.

9) ***Facilities Implementation Plan*** – Provides a summary description of the recommended improvements and associated costs. The schedule of improvements depends, in large part, on the levels of demand that trigger the need for expansion of existing facilities.

10) ***Financial Feasibility Analysis*** – Identify the financial plan for the airport, describe how the sponsor will finance the projects recommended in the master plan, and demonstrate the financial feasibility of the program.

c. **Airport Layout Plan Updates** – An update of the airport layout plan (ALP) drawing set should be an element of any master plan study. In fact, keeping the ALP current is a legal requirement for airports that receive Federal assistance. An update of the ALP drawing set will reflect actual or planned modifications to the airport and significant off-airport development. An accompanying ALP Narrative Report should explain and document those changes and contain at least the following elements:

1) Basic aeronautical forecasts.

2) Basis for the proposed items of development.

3) Rationale for unusual design features and/or modifications to FAA Airport Design Standards.

4) Summary of the various stages of airport development and layout sketches of the major items of development in each stage.

An ALP drawing set update is an appropriate alternative to a full master plan whenever the fundamental assumptions of the previous master plan have not changed. If there have not been any major changes in airport activity or improvements that have had unanticipated consequences, a master plan update is not necessary. Another situation where only an ALP update would be appropriate is the examination of a single development item, such as runway safety area improvements. As indicated above, an ALP update will typically involve fewer elements than a full master plan study, including only the aviation demand forecasts, an assessment of facility requirements, a facility implementation and financing plan, and an airport layout plan drawing set. If additional steps are required to complete the ALP update, a full master plan study is probably a better choice.

203. LEVEL OF STUDY DETAIL

Although almost every master plan includes the full list of elements discussed above, the complexity of the individual elements will vary, depending on an airport's size, function, and particular issues and problems. Each element should be analyzed only to the extent required to produce a meaningful product for that particular airport. The planning process should consider the facility planning needed to enable a seamless transition to subsequent projects.

The scoping process used by the airport sponsor, the sponsor's consultant, and the FAA to develop a work program for the planning study should determine the appropriate level of detail for each study element. The availability of planning information from Federal, state and local organizations may eliminate the need for developing similar information in a study effort. Chapter 3 contains additional information on the scoping process, while Part II provides greater detail on the various elements of an airport master plan.

204. PRODUCTS OF THE MASTER PLANNING PROCESS

a. The products of the master planning process will vary with the complexity of the effort. Master plans can include the following deliverables:

1) ***A Technical Report*** contains the results of the analyses conducted during the development of the master plan. For complex studies, interim reports may be produced to facilitate coordination with various government agencies, tenants, users, the general public, and other interested parties. At the conclusion of the study, the interim reports are assembled into the final technical report.

2) ***A Summary Report*** is useful in bringing together pertinent facts, conclusions and recommendations for public review. Such a report is an excellent place to highlight the economic benefits that flow from the airport to the communities it serves.

3) ***An Airport Layout Plan Drawing Set*** contains a graphical representation of the proposed development in the master plan and is typically produced as a separate set of full-sized drawings. In addition, the ALP drawing set is typically included in the Technical Report in reduced form.

4) ***A Web Page*** – Many airport sponsors maintain a public access web page with general information about the governmental unit involved and specific information regarding

the airport or airports operated by the sponsor. The Internet provides an excellent forum for the distribution of information on the progress of the study and its final findings and recommendations.

5) ***Public Information Kit*** – Throughout the master plan study, airport sponsor representatives may be asked to speak to community associations, civic clubs, and other organizations with an active interest in the airport. Visual aids such as models, summary brochures, or computer presentations are excellent tools to use at these events to maintain support for the airport development program.

b. The master plan technical report, summary report, and airport layout plan may be produced as paper versions and/or in an electronic format, as determined by the airport sponsor and FAA. The electronic format will ease distribution of the final reports after the initial printing is exhausted.

c. It is again emphasized here that the level of complexity of each of these products should be determined during the development of the study design. The airport sponsor and the FAA have the flexibility to assess the level of detail that is appropriate for the individual airport and may identify other deliverables that should be produced to support the study effort.

205. MASTER PLAN REVIEWS BY THE FAA

a. The recommendations contained in an airport master plan represent the views, policies and development plans of the airport sponsor and do not necessarily represent the views of the FAA. Acceptance of the master plan by the FAA does not constitute a commitment on the part of the United States to participate in any development depicted in the plan, nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public law. The FAA reviews all elements of the master plan to ensure that sound planning techniques have been applied. However, the FAA only approves the following elements of airport master plans:

1) ***Forecasts of Demand*** – The master plan forecast should be reviewed to ensure that the underlying assumptions and forecast methodologies are appropriate. Paragraph 704.h of this guidance should be used to determine consistency of the master plan forecast levels and the Terminal Area Forecast (TAF). Inconsistencies between the master plan forecast and TAF must be resolved, and the forecast approved, before proceeding with subsequent planning work.

2) ***Airport Layout Plan*** – All airport development at Federally-obligated airports must be done in accordance with an FAA-approved ALP. Furthermore, proposed development must be shown on an approved ALP to be eligible for Airport Improvement Program (AIP) funding. FAA approval of the ALP indicates that the existing facilities and proposed development depicted on the ALP conforms to the FAA airport design standards in effect at the time of the approval or that an approved modification to standard has been issued. Such approval also indicates that the FAA finds the proposed development to be safe and efficient.

Chapter 3 Pre-planning

Planners, along with airport sponsors, must make two major decisions in tailoring a study to the needs of an individual airport: what type of study to conduct and what level of detail to use for the individual elements of the study. This chapter outlines these and other steps of the pre-planning process.

301. INITIAL NEEDS DETERMINATION

a. **Identifying General Need for Study** – The airport sponsor usually identifies the need for a planning study, based on existing or potential shortcomings in the existing plan or airport. These deficiencies may be the result of demand exceeding capacity, the introduction of new aircraft types, or the emergence of a critical environmental problem. The airport sponsor's strategic vision or business plan for the airport may drive the need for a planning study. In addition, national, state, or regional planners may have identified issues requiring the airport sponsor's attention. Alternatively, airport users, such as the scheduled airlines and general aviation pilots, may have identified needs that prompted the airport sponsor to undertake a study. The airport sponsor should formulate priorities to establish which issues are most important. Periodic meetings between the airport sponsor and FAA representatives offer an excellent opportunity to review these issues.

b. **Determining Type of Study** – Deciding whether the study in question will lead to a master plan or to an ALP update largely determines the elements to be included and the required level of effort. Even at this early stage of the process, the airport sponsor and the FAA should be able jointly to determine what type of study is appropriate. The sponsor usually will not make decisions regarding specific variations on the basic study type until the consultant has come on board. Although a master plan study will always include a technical report and an airport layout plan drawing set, supplemental products, which may often be related to public outreach efforts, will usually be determined during the scoping process.

302. REQUEST FOR QUALIFICATIONS AND CONSULTANT SELECTION

a. The current version of AC 150/5100-14 *Architectural, Engineering and Planning Consultant Services for Airport Grant Projects* provides important guidance for consultant selection, and its use is recommended. Another useful reference is "Guidelines to Selecting Airport Consultants" published by the Airport Consultants Council, an aviation industry trade association.

b. As a general rule, airport sponsors hire a consultant to prepare planning studies. Before soliciting statements of qualifications (SOQs) from consultants, the airport sponsor should have a clear understanding of the issues that have defined the need for the study. This information should be provided in the Request for Qualifications (RFQ) that the airport sponsor will issue.

c. The sponsor should assemble an unbiased and technically qualified selection panel to conduct the consultant selection. The qualifications of a firm should be judged on its

experience in similar work and its staff's professional credentials. The planning team that is proposed by the consultant should include firms with relevant experience that can commit to complete the study in the amount of time specified. It is not uncommon for several firms to join together in a master planning effort for the purpose of providing specialized skills or local knowledge and expertise.

d. The sponsor should avoid the use of elaborate submittal requirements or interviews, which add substantially to the cost of the selection process for both the sponsor and the prospective consultants. If the sponsor determines that interviews or requests for additional information are necessary, the sponsor should limit this activity to a short list of three to five firms selected by the evaluation panel.

e. If sponsors anticipate an Environmental Assessment (EA) or Environmental Impact Statement (EIS), they should consult with the local FAA Airports office to determine the appropriate time to begin the consultant selection process. If a sponsor or the local FAA Airports office anticipates the need for an Environmental Assessment, the sponsor should select a qualified environmental contractor to prepare the EA. Sometimes, it may be appropriate for the sponsor to expand the scope of the master plan consultant's responsibilities to include the EA. When the sponsor or the FAA have substantial concerns that the EA may suggest that an action may cause significant impacts, the appropriate FAA Airports office should select the contractor to prepare the EA. This is because if the EA shows that significant impacts would occur, the FAA must select the contractor to prepare its EIS. FAA's selection of the EA contractor in this case saves time by eliminating the need for later contractor selection to prepare the EIS.

303. DEVELOPMENT OF STUDY DESIGN

a. The second decision in designing an effective planning study is to determine the level of detail or depth of analysis for each element. The airport sponsor and the selected consultant should negotiate these basic decisions as the work program is established.

b. The airport sponsor, the consultant, the FAA, and others (as appropriate) begin this process by (1) identifying the airport development issues to be addressed in the master plan and (2) determining the types of analyses and level of effort needed to address each issue individually. Known as "scoping," this is an important step in designing any planning study.

c. The sponsor and the selected consultant should address a broad range of topics during the scoping process. As the scoping process proceeds, the planners must remember that each master plan study is unique and the appropriate scope of work will vary from airport to airport. The airport sponsor is encouraged to develop a scope of work that is appropriate to the circumstances of the individual airport. Some of the specific topics that should be addressed at this time include:

1) ***Goals and Objectives*** – Discuss key airport development issues that the master plan will attempt to resolve. This discussion should answer questions such as: "Why is this master plan study being conducted?," "What are the key issues that need to be addressed in the future development of the airport?," and so forth.

2) ***Data Availability*** – Review the availability of activity forecasts and capacity assessments produced by state and regional system plans and FAA Terminal Area Forecasts and decide how to use them. If these data are not used, the reasons should be discussed with and accepted by all parties, including the FAA. This is especially true for low activity airports where demand/capacity relationships are usually not a critical consideration. Current inventory data may also be available to the consultant as a result of continuous planning efforts by the airport sponsor. Use of these data may reduce the need for new data collection efforts or surveys by the consultant.

3) ***Forecast Horizons*** – Although 5-, 10-, and 20-year time frames are typical for short-, medium-, and long-term forecasts, some studies may want to use different time frames. For any forecast horizon, the short-term forecast should support a capital improvement program, the intermediate-term a realistic assessment of needs, and the long-term a concept-oriented statement of needs. Schedules for airport development that are directly related to demand levels should be tied to those demand levels, rather than dates, since the actual demand will often vary from that forecast, particularly as the time frame increases. At some airports, it may be necessary to look beyond the 20-year time frame to protect the airport from incompatible land use development. The need to do longer range planning must clearly be justified during the scoping process.

4) ***Environmental Considerations*** – Identify the level of environmental documentation that is likely to move forward with the recommendations of the completed master plan study. Sponsors, in consultation with the appropriate FAA Airport's environmental specialist, should identify whether an Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required or whether categorical exclusions may apply. As noted previously, if sponsors anticipate an EA or EIS, they should consult with the local FAA Airports office to determine the appropriate time to begin the consultant selection process. Consideration should also be given to the appropriate state environmental regulations and the need to develop applicable documentation.

5) ***Schedules*** – Agree upon schedules showing milestones for the completion of technical products and for coordination and review. The schedule should clearly indicate decision points beyond which work should not proceed without FAA or airport sponsor approval, such as FAA review and approval of the master plan forecast.

   Realistic schedule development is important. From a practical standpoint, adhering to the schedule for a complex study, such as a long-range plan for a high activity airport, is very difficult. Less complex studies should not have such a problem. In any case, the schedule for a master plan study should be firm so that all reviewers are aware of their responsibilities with respect to it. The airport sponsor should emphasize the importance of meeting planning process deadlines.

6) ***Deliverables*** – The specific draft and final products of the planning process, and the general level of detail, should be listed in the scope of work and include the number, type, and format of paper reports, drawings, and electronic files.

7) ***Coordination and Public Involvement Program*** – For less complex studies, the FAA, the airport sponsor and the consultant may be the only participants as long as they coordinate with appropriate local officials, stakeholders, and ensure citizen participation through public information sessions. These sessions may be conducted separately or in conjunction with other public meetings. Often written updates for regional or state aviation, transportation and comprehensive planning agencies will be sufficient.

   For complex studies, it may be necessary to organize formal policy, technical, and review committees that meet regularly and use structured communications systems, including public hearings, public information workshops, and web-based information sharing tools. The committee membership may consist of representatives of local, state, and Federal government agencies as well as airport tenants, user groups, community associations, and business organizations. In addition, the active participation of the FAA concerning airspace management, navigational aid and approach aid installation, designation of instrument runways, potential financing of planning and development, and safety and security matters is essential.

   The local FAA Airports office can coordinate the involvement of the FAA organizations that are interested in the development of the airport. Advice from the airlines concerning aircraft types they plan to use and other operational and financial matters will also be essential to the development of an effective plan.

   The airport sponsors staff probably will participate in the day-to-day activities of the planning study. A large airport sponsor will likely have a more extensive management and staff structure than the sponsors of smaller airports.

8) ***Budget*** – Development of the work scope and the associated fees is usually an iterative process. The work scope contemplated in early draft narratives may require fees that exceed a sponsor's budget. Planners must adjust the scope of work, the proposed fees, or the available budget until all three components have been balanced to the satisfaction of the sponsor, the consultant, and the FAA.

d. Careful attention to the development of the scope of work for the master plan study sets the stage for a successful study. Establishing a sound scope of work will also allow the sponsor, consultant, and the FAA to develop a budget that meets the goals and objectives of the study. Failure to do so may result in a study that is lacking vital details that affect the decision making process. It is important to note that Federal planning grants cannot be amended to cover increased costs. If additional work is needed beyond the original scope of work, an additional grant would probably be required. Many of the decisions made at this point will have an impact on the degree of difficulty that is encountered as the development program moves from planning to implementation.

304. NEGOTIATING CONSULTANT CONTRACTS

After scoping the study and negotiating a price for the consulting services, a contractual arrangement must be negotiated.

a. The recommended type of agreement between the airport sponsor and the consultant is a firm, fixed price contract. This is advisable whenever the level of effort can be fairly well predicted and where reasonable fees can be established at the outset. This type of contract imposes a minimum administrative burden and provides incentives for effective cost control and contract performance.

b. Where the level of effort or duration of the study is uncertain, a cost plus fixed-fee contract or a time and materials contract may be required. Also, some airport sponsors, recognizing that master planning often uncovers unanticipated issues that need study, add an on-call component to their consultant contract, which allows the scope and fees to be developed as new tasks are identified. These contract provisions typically provide for payment on a time and materials basis, but not to exceed a specified amount. The use of such contracts must be well justified if Federal financial assistance will be provided. The FAA does not recommend contracts based on a cost-plus percentage of cost and they are not permitted if Federal financial assistance will be provided for the study.

c. Advisory Circular 150/5100-14, *Architectural, Engineering and Planning Consultant Services for Airport Grant Projects,* is also a good reference for guidance on the options for a contract format. The procedures in this AC must be followed if Federal funds are involved.

305. APPLICATION FOR FEDERAL FUNDING

Almost all master planning studies for public airports receive Federal funding. The point at which a sponsor submits a grant application to the FAA varies with the individual study. For large and complex master plans, the sponsor should divide the total grant funding into two phases. The initial phase can fund early tasks such as the definition of issues, inventory of existing conditions, preparation of forecasts, and determination of facility requirements. The second phase grant application could be prepared after the study team has gained a better grasp of the key issues and a more precise cost estimate of the effort needed to complete the master plan. The FAA should be involved in the overall process as early as possible. The FAA can advise the sponsor on the best strategy for obtaining funding and on questions of the eligibility of the elements of the proposed scope of work.

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PART II: ELEMENTS OF MASTER PLAN STUDIES

Part II of this Advisory Circular provides detailed discussions of the elements of a typical master plan study. As noted in Chapter 1, the elements to be included in a particular study will vary depending on the size, function, and challenges facing the study airport. The following key elements of master plan studies are discussed in Part II of this Advisory Circular:

- Chapter 4: Public Involvement Program
- Chapter 5: Environmental Considerations in Airport Master Planning
- Chapter 6: Existing Conditions
- Chapter 7: Aviation Forecasts
- Chapter 8: Facility Requirements
- Chapter 9: Alternatives Development and Evaluation
- Chapter 10: Airport Layout Plans
- Chapter 11: Facilities Implementation Plan
- Chapter 12: Financial Feasibility Analysis

Each chapter in Part II ends with a section titled "Documentation Guidelines." These guidelines are not mandatory, and planners should use their discretion in adopting only the guidelines that are consistent with their negotiated scope of work. Planners also have the flexibility to adopt other documentation guidelines that they feel are better suited to the particular circumstances of a study. Appendix B contains a comprehensive listing of other planning documents and guidelines that may be helpful.

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Chapter 4 Public Involvement Program

The first task in a master plan study, after the consultant receives a notice-to-proceed, is the creation of a public involvement program. The level of public involvement in airport planning should be proportional to the complexity of the planning study and to the degree of public interest. Most planning studies will fall between the minimal requirements of a small airport study and extensive public involvement required of a large and complex study. Particularly complex studies may merit the use of a consultant experienced in the public involvement process.

Figure 4-1: Public Meeting

Source: Portland Airport Project Advisory Committee

Over the course of the study, the public involvement program will encourage information-sharing and collaboration among the airport sponsor, users and tenants, resource agencies, elected and appointed public officials, residents, travelers, and the general public. Collectively, these various groups form the stakeholders who have an interest in the outcome of the study. An effective public involvement program should provide these stakeholders with an early opportunity to comment, before major decisions are made; provide adequate notice of opportunities for their involvement; and should provide for regular forums throughout the study.

401. TIMING

Public involvement has its greatest impact during the early stages of the planning process, before irreversible decisions have been made and while many alternatives can be considered. When the stakeholders become involved before major decisions or commitments are made, the planners can better deal with issues of community concern and improve the chances of reaching a consensus on controversial matters. If stakeholders become aware that the important decisions were made before they were invited to participate, they may distrust the planners. In addition, when public involvement opportunities are not provided until late in the planning process, there may not be enough time to make significant changes. The tendency, instead, will be for planners to merely defend previously determined courses of action, rather than exploring any new alternatives. An effective public involvement program will usually avoid such an undesirable outcome.

402. TOOLS AND TECHNIQUES

The study team may use a variety of forums, such as committees, public information meetings, small group meetings, and public awareness campaigns in a public involvement program. The selection of a specific platform depends on the particular complexities associated with the airport, the expected public interest in the master plan, the practices and policies of the airport sponsor, and budget considerations. In addition, it may be necessary to consider the special needs and sensitivities of low income and minority populations, consistent with the provisions in Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. Although the public involvement program is important to the master plan effort, planners must balance the need for stakeholder involvement with the costs of such a process. Complex, large, or unfocused stakeholder groups can impede meaningful input, unnecessarily raise study costs, and frustrate participants as they struggle to communicate with the study group.

a. **Committees** – Committees that facilitate the public involvement program often include a Technical Advisory Committee (TAC) and a Citizen's Advisory Committee (CAC). The TAC is responsible for providing input and insight on technical issues. Committee members typically have a high level of technical competency associated with some aspect of aviation or airport operations and are major stakeholders in the airport's operation. The CAC serves as a sounding board and information exchange group for stakeholders, reviews the planning team's plans and proposals, interacts with the planning team members during the review, makes consensus recommendations to the planning team, and finally gives its recommendations on the finished plan to the airport sponsor. The membership of the CAC should be representative of all stakeholders.

   In reviewing the master plan, the TAC will evaluate its technical merit, while the CAC will weigh the recommendations against community goals, values, and needs. The committees are advisory, however, and have no decision making power of their own. In establishing these committees, the airport sponsor does not delegate its authority and responsibilities to them. The specific roles of such committees should be clearly defined at the outset and carefully explained at the initial meeting to prevent later misunderstandings. The size of both the TAC and CAC should be kept manageable. In some cases, it may be appropriate to combine the committees into a single group.

   The public involvement program should also include a management/policy/oversight committee to advise the planning team on policy decisions that will likely need to be made throughout the study. Committee members would typically include senior airport or airport sponsor staff that have the responsibility for decision making for the airport.

b. **Public Information Meetings** – Traditional public hearings, where stakeholders are given the opportunity to make public statements about the study, are not a good forum in which to conduct a continuing discussion of issues and alternatives because of the formal and inflexible nature of such hearings. An "open house" format with interactive information stations staffed by knowledgeable staff or consultants is more informal, yet a very effective method by which to engage the public and stakeholders in soliciting their opinions on development options. A public information meeting using the open house format will permit stakeholders to visit a meeting site at their convenience and visit with

planners on an informal one-on-one basis. A short slideshow or videotape, which all attendees can view upon arrival at the open-house site, may be a useful introduction to the study process. If a more formal meeting is desired, starting with an open house and moving into a more formal forum can be effective.

The number of public information meetings to be held over the course of the study can vary depending on the complexity of the study. It may also be necessary to hold meetings in more than one location to provide adequate geographic coverage for communities affected by the planning proposals. Public information meetings are typically held in the evening to provide most people the opportunity to attend. In some unique conditions, such as with a large elderly population, a day meeting may be needed. Complex projects may require that these meetings be scheduled throughout the day.

c. **Small Group Meetings and Briefings** – Small group meetings may be held throughout the study to provide opportunities for detailed discussions of plan alternatives. These informal sessions allow study team members to learn about local concerns. Such meetings may be scheduled with community boards, elected officials, civic organizations, and other interested organizations.

d. **Public Awareness Campaign** – An effective public awareness campaign is an essential part of the public involvement program. It is instrumental in generating initial stakeholder involvement, in maintaining stakeholder interest throughout the program, and in keeping the general public informed of the progress of the study.

1) ***Informational and Educational Materials*** – Informational materials designed to educate a broad audience about all aspects of the study may be distributed to stakeholders. These materials might include fact sheets, flyers, press releases, newspaper ads, and general information packets. Planners should provide translations of this material if the airport is located in an area where English is not the first language for a large percentage of the residents. A mechanism should be provided for individuals or organizations to add their names to a mailing list to receive these materials.

2) ***Web Pages*** – Web pages, with interactive or self-guided presentations, as well as electronic copies of study documents, are increasingly used as part of a public awareness campaign. Planners often link the master plan web page to the airport's web site.

e. Public involvement programs can place special requirements on an airport planning team. The team must be sensitive to the interests of stakeholders and have a positive attitude toward their participation in the planning process. The members of the team must also be aware of the extra time and personal effort that will be required, since they will have to meet regularly with the stakeholders at committee and public information meetings.

The same planners who work with the stakeholders at the various stakeholder forums should do the actual planning. Experience shows that planners must gain the confidence of the stakeholders and overcome their initial concerns before any real progress can be

achieved. Extensive public involvement from start to finish in the planning process enhances all plans and proposals and satisfies the goals of long-range planning.

403. IDENTIFY THE STAKEHOLDERS

The types of stakeholders will vary at each airport, depending on the size of the airport and the complexity of the planning issues. The following is a list of the general categories of potential stakeholders, from which a list of appropriate participants can be developed:

- Users and tenants
- Groups and individuals from within the sponsor's organization
- FAA personnel from the appropriate Regional and Field offices
- Resource agencies and other governmental units with regulatory or review authority
- Other interested groups

The individuals from a particular stakeholder group must be able to effectively represent their interests in discussions with the master plan preparation team. Furthermore, they should present the consensus view of the stakeholder group and not a special interest minority opinion. Although planners should make every effort to identify and communicate with all appropriate stakeholders early in the master plan process, it may also be necessary to add stakeholders as the study progresses. They must also be able to take study information back to their group to keep them informed throughout the planning process. Appendix C contains a more detailed list of potential stakeholders.

404. IDENTIFY KEY ISSUES

a. The identification of key issues is an early product of a well-designed public involvement program. Recall that the pre-planning activities identified in Chapter 3 included establishing which issues are of greatest concern to the airport. The results of that effort are essential in determining the type of study to be completed and in developing the scope of work. These will probably not include all issues that are of concern to each of the stakeholders. Discussions with the stakeholders (through use of the tools and techniques described earlier in this chapter) will help identify a broader set of problems, challenges, and opportunities that should be examined. These key issues will shape policy decisions, influence technical criteria and standards, and help identify development alternatives.

b. Once the key issues are identified, the sponsor may want to modify the study approach to address any important issues that had not been previously included in the proposed study. Some issues may be raised during this process that are not appropriate to include in the master plan study; these should be addressed outside of the master plan effort. The airport sponsor may establish a separate forum to handle such issues.

405. DOCUMENTATION GUIDELINES

a. Document Key Issues – Accurate documentation of the key issues is essential, because stakeholders will track how the planning team addresses them throughout the study. Grouping the critical issues into major functional categories, such as facilities, business,

operational, properties, and environmental issues, will help planners understand the stakeholders' concerns. The documentation should divide issues into those that will be addressed by the master plan study and those that will be addressed in a different forum.

b. Document Public Involvement Program – Documentation of the public involvement program should appear in an appendix to the Master Plan. Copies of committee rosters, meeting minutes, advertisements, newsletters, and other elements of the Public Awareness Campaign can be placed in an appendix as the official record of the public involvement program. This documentation should be revised regularly over the course of the study rather than being prepared at the end of the process.

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Chapter 5 Environmental Considerations

501. GENERAL

a. The purpose of considering environmental factors in airport master planning is to help the sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing. By using existing maps of the airport area, prior environmental documents, and the Internet, planners and environmental specialists can get an excellent overview of sensitive environmental resources in and around the airport. The planner should understand that the consideration of environmental factors in the evaluation of alternatives should be tailored to each airport's size, unique setting, and operating environment, and will typically not be as detailed as that in subsequent environmental reviews. The consideration of environmental factors in the planning process will typically result in an inventory (overview) of the airport's environmental setting, the identification of potential environmental impacts of airport development alternatives, and the identification of environmentally related permits that may be required for recommended development projects.

b. The FAA recommends that the planning process consider the needs of subsequent environmental review processes. The master plan should include thoroughly supported project justifications and thorough documentation of alternatives that meet the planning need and are reasonable and feasible (environmentally as well as technically); and should note any affects of the airport development alternatives on sensitive environmental resources. Considering environmental factors in master planning provides useful information and planning principles that will help expedite the environmental review of projects.

c. Planners should develop each chapter of the master plan with environmental considerations in mind. Normally the environmental considerations should not be in a stand-alone chapter, but should be incorporated into the appropriate chapters, such as existing conditions and alternatives development and evaluation.

d. When considering environmental factors in master planning, the planner and environmental specialist do not need to follow the specific impact categories outlined in FAA Order 5050.4, FAA Airports guidance for complying with NEPA. Rather, FAA Order 5050.4 should be consulted as a guide to help planners identify potential environmental impacts specific to the study airport that should be considered as planning continues.

e. During the master plan scoping process, planners and environmental specialists should attempt to identify key environmental issues that will be involved in analyzing airport development alternatives to ensure that the master plan budget provides enough resources to analyze them. If such early identification is not possible, planners should propose an initial budget for the issues that may be identified during the master planning inventory and data collection process. If additional environmental issues are uncovered later in the planning process, the planner can prepare a separate scope and budget for a more detailed

analysis. However, sponsors and planners should be aware that Federal planning grants cannot be amended and the more detailed analysis would need to be accomplished in a separate study.

f. Planners, in consultation with environmental specialists, should consider appropriate Federal environmental laws and regulations when analyzing proposed airport development alternatives. There are approximately 40 Federal laws, executive orders, and regulations protecting particular parts of the environment, such as the Clean Air, Clean Water, Endangered Species Acts, and an Executive Order on Protection of Wetlands. There are also many state and local environmental laws and regulations that should be considered in the master planning process.

g. During the master plan scoping process, planners should try to identify any potential short-term capital development projects that might be recommended in the master plan that are known to trigger additional environmental processing, such as safety related projects. For such projects, the airport sponsor should consider beginning the environmental processing before the master planning process is completed. Otherwise, the various agencies and public involved may perceive that the NEPA analysis is biased because a recommended alternative was selected in the master plan before the NEPA process began. This guidance can be extended to longer-term projects in the case of new airports or major reconfigurations of existing airports.

h. Planners should recognize the need to achieve a balance between the manmade and the natural environment. Although every proposed development project will have some impact on the natural environment, the use of prudent planning criteria, along with sound environmental data and analysis, will help minimize unavoidable environmental impacts and the delay of project design and construction.

502. ENVIRONMENTAL CONSIDERATIONS IN MASTER PLANNING ALTERNATIVES ANALYSIS

a. In the airport master planning process, the planner, along with an environmental specialist, should identify potential key environmental impacts of the various airport development alternatives so that those alternatives that avoid or minimize impacts on sensitive resources are considered. The planner should understand that the consideration of environmental factors in the evaluation of alternatives should be tailored to each airport's size, unique setting, and operating environment, and will typically not be as detailed as that in subsequent environmental reviews. The evaluation of potential environmental impacts should only be done to the level necessary to evaluate and compare how each alternative would involve sensitive environmental resources

b. Project justifications and the analysis and selection of alternatives, including an explanation of why certain alternatives were not carried forward, should be completed and documented in the master plan before the NEPA process is started. Only those alternatives that could solve the identified problems and have aeronautical utility should be forwarded for NEPA analysis. (See Appendix E, "Consideration of Environmental Factors in Airport Master Planning," for additional discussion of this topic.)

c. Environmental factors should be considered during the development and analysis of airport project alternatives. This can help an airport sponsor propose recommended alternatives that FAA may eventually select as its preferred alternative during the NEPA processes. This in turn greatly facilitates the decision making process FAA must complete as part of its project approval process. It also reduces or eliminates the prospect of having to later update the Airport Layout Plan if the sponsor's recommended alternatives are not selected as the preferred alternative during the NEPA processes.

   1) The facility requirements and alternatives analysis chapters of the master plan should provide sufficient documentation regarding the justification for each project so that these chapters may serve as the basis for the purpose and need section of any environmental document.

   2) Planners and environmental specialists should identify the potential key environmental impacts of each development project as part of the master plan alternatives analysis. Categories of potential impacts are defined in FAA Order 1050.1, *Environmental Impacts: Policies and Procedures* and FAA Order 5050.4, FAA Airports guidance for complying with NEPA. A matrix showing each alternative and its potential environmental impacts may be useful for subsequent environmental processing.

   3) For some airports, only a few of the environmental impact categories will need to be discussed in the alternatives analysis (such as noise, wetlands, and social impacts), based on location-specific environmental issues identified in the environmental overview. Planners do not need to list each specific impact category mentioned in FAA Order 5050.4, but only those resources the alternatives would likely affect. In many cases, a simple environmental screening will be sufficient to identify those impacts. Detailed impact analyses will be conducted in any Environmental Assessment or Environmental Impact Statement that follow the master plan.

d. Permits that may be needed for each proposed project should be identified in the alternatives analysis. Although such requirements can vary greatly from state to state and within each locality, some of the permits that are usually necessary include:

   - Clean Water Act, Section 404 Dredge and Fill Permit
   - Air Quality Permit for on-site batch plants or other construction-related activities
   - Local government construction permits
   - Growth Management Permits
   - United States Fish and Wildlife Service, National Marine Fisheries Service opinions, or State Wildlife and Game Commission Permits, if protected and endangered species could be impacted
   - Clean Water Act, National Pollution Discharge Elimination System Permits

503. FURTHER GUIDANCE ON CONSIDERATION OF ENVIRONMENTAL FACTORS IN AIRPORT MASTER PLANNING

Appendix D, "Consideration of Environmental Factors in Airport Master Planning," contains recommendations on how to evaluate environmental factors for large or complex projects in airport master planning. It contains a discussion of the interaction of the airport planning and environmental processes and recommendations on how to effectively integrate these processes. The appropriate treatment of environmental factors in airport master planning can make subsequent detailed environmental processing more efficient and speed the completion of airport development. Although Appendix D is primarily intended for large and complex projects, many of the techniques in the guide can be applied to all levels of master planning.

504. DOCUMENTATION GUIDELINES

a. The existing conditions chapter should document the airport's environmental setting. The alternatives analysis chapter should document the potential environmental impacts associated with each development project alternative. In addition, the master plan should identify potential Federal, State, and local permits that may be required for each project alternative. Planners, with the help of environmental specialists, should include a matrix in the alternatives analysis chapter of the master plan that lists each development project alternative and its associated potential environmental impacts and required permits. This will be beneficial in subsequent environmental processing.

b. Planners should use appendices for the majority of the technical documentation, such as noise analysis, wetland mapping, and threatened and endangered species reports to improve the readability and organizational flow of the alternatives analysis chapter.

c. The potential environmental impacts of the proposed airport development alternatives should be addressed in a candid manner and written so that the public easily understands them.

Chapter 6 Existing Conditions

601. GENERAL

a. Most data gathering for a master plan study takes place when planners evaluate existing conditions. Typical broad categories of information to be collected include: the history of the airport; physical facilities on the airport; the regional setting of the airport and surrounding land uses; the environmental setting of the airport; socioeconomic and demographic data for the airport service area; historical aviation activity; and airport business affairs.

b. To initiate data collection, planners should carefully review the scope of work and verify the type and quantity of data needed for subsequent analyses. It is easy to collect information that is not really necessary or to fail to gather critical information needed for later analyses. Planners can avoid these mistakes by carefully reviewing the scope of the study.

c. To avoid unnecessary data gathering, planners should use existing data as much as possible. Previous master plans, other recent planning studies, and regional planning agencies can provide useful information that should be reviewed before any data gathering begins. However, planners should ensure the validity of the existing data before using them for the master plan study.

602. BACKGROUND SECTION

a. The background section should provide a brief overview of the history of the airport, describe its aeronautical role in the national aviation system, and identify its role in the community's infrastructure. Many sponsors periodically assemble information about the economic benefits of their airport, such as employment, direct salaries, and air service, which can be summarized in the background section.

b. Major milestone events in the history of the airport, such as ownership changes, construction of significant facilities, and the introduction of air service can be identified. A timeline, like that shown in Figure 6-1, may be used to present this information.

603. INVENTORY AND DESCRIPTION OF EXISTING FACILITIES

a. A significant portion of the inventory will be devoted to identifying the existing physical facilities at the airport. Drawings and other documents in FAA databases and on file with airport management are a good source of data and should be reviewed early in the inventory effort. These data may need to be supplemented with field observations, personal interviews with tenants and users, Internet searches, and surveys of passengers and employees.

Figure 6-1: Timeline of Events

1928 – Original land donation

1934 – Airport officially opened

1937 – First commercial airline flight

1941 – Additional 40 acres donated

1934

1953 – Dedication of new terminal building and ATCT

1960 – VORTAC installed

1975

1970 – Passenger terminal expanded

1975 – New ATCT constructed

1987 – Airport Authority established

1990 – Airport master plan updated

1998 – Terminal expansion began

1998

b. Classifications that are commonly used to organize this information include the following:

1) ***Airfield/Airspace*** – The functional use and geometry of runways, taxiways, and holding aprons; lighting, marking, and signing of runways and taxiways; navigational aids; visual approach aids, and instrument approach procedures. Information on the use of the airspace and how air traffic is managed should also be collected, including operational limitations resulting from traffic interaction with other airports or reserved airspace, obstructions to air navigation, noise abatement procedures, and airfield or navigational aid shortcomings. Planners should also compile historical data on weather conditions, such as prevailing wind direction and speed, as well as the occurrence of critical combinations of ceiling and visibility. The existence of, and the need for, Remain-Overnight-Parking (RON) should also be determined.

2) ***Commercial Passenger Terminal Facilities*** – Inventory of terminal building space by functional use and size: ticket counters, number of gates, lineal feet of gate frontage, aircraft parking apron area, restaurants and other concession space, and passenger security screening procedures. Surveys conducted in hold rooms are often used to gather information about passenger characteristics that can be useful in determining future facility requirements.

3) ***General Aviation Facilities*** – The quantity and type of hangars; transient aircraft parking apron areas, tie-down positions; general aviation terminal facilities; aircraft parking aprons; fixed base operators; flight schools; pilot shops; and the number and mix of based aircraft.

4) ***Cargo Facilities*** – The quantity and area of air cargo buildings and aircraft parking aprons. At airports with significant air cargo activity, freight forwarders and other support functions are often located in areas adjacent to the airport. These should be identified on the airport layout plan.

5) ***Support Facilities*** – The quantity and type of support facilities at an airport that encompass a broad set of functions that ensure smooth and efficient airport operation, include Aircraft Rescue and Fire Fighting stations, airport administrative areas, airport maintenance facilities, airline maintenance hangars, flight kitchens, aircraft fuel storage, heating and cooling systems, FAA facilities. For airport towers, determine their hours of operation.

6) ***Access, Circulation and Parking*** – The quantity and type of ground access systems and commercial areas that serve the airport, or are served by it, such as on-airport access roads, circulation and service roads, parking and curb space, including information on their alignment, condition and capacity. Also include information on public transportation services, such as bus, rail, taxi and limousine, and the split between personal and public transportation. Consultation with state and local transportation agencies responsible for planning and operating surface transportation systems should produce data on proposed highway and transit plans, as well as traffic density statistics relative to surface systems leading to and from the airport. Furthermore, include information on rental car facilities and activity. It may difficult

to obtain information from rental car companies, but rental car facility planning is typically a critical element of planning for the terminal area and parking facilities, even at smaller airports.

7) ***Utilities*** – Description of major elements of the infrastructure that service the airport's utility demands for water, sanitary sewer, communications, heating and cooling, and power. Historical consumption data may be necessary to quantify future utility loads. Storm-water drainage, deicing and industrial waste disposal systems should also be included.

8) ***Other*** – Non-aeronautical uses such as recreational facilities and parks, industrial parks, agricultural or grazing leases, and retail businesses.

c. The inventory of existing facilities need not include all the classifications described above. That list is a general outline that should be modified to conform to the specific circumstances of an individual airport. For example, a general aviation master plan does not need a section on commercial passenger terminal facilities. Similarly, a plan for a large commercial service airport with little general aviation or air cargo activity could include the inventory of those facilities in a subsection describing support facilities.

d. Whatever format is used to describe existing conditions should be followed in subsequent chapters, using a parallel structure, to describe demand/capacity and determination of facility requirements, identification and evaluation of alternatives, presentations of estimated capital costs, and the airport plans chapter.

e. The inventory of existing conditions at an airport is a critical task in a master plan study, so this effort must be closely managed. Data should be collected only when there is a clear understanding of the need for the information to support the demand/capacity analyses and determination of facility requirements.

604. DESCRIBE REGIONAL SETTING AND LAND USE

a. A master plan study should examine the regional setting of an airport and the land use patterns around it. This is a critical task, because the impact of airport planning decisions can extend well beyond the airport property line.

b. Collect information on the political boundaries of the airport and the political entities with jurisdiction over the operation of the airport and adjacent land uses. Identify the airport service area and the presence and role of airports that might compete with the study airport.

c. Collect all applicable documents, such as official maps, the latest area-wide comprehensive land use and transportation plan, applicable municipal zoning ordinances and other land use controls and unusual building code provisions, including height zoning ordinances, noise overlay zones, and airport overlay districts. The development of practical land use strategies requires an understanding of the political context and local preferences regarding land use.

d. Identify the land uses in areas that will be exposed to airport operations. Land use is a continuously changing process, particularly in urban environments, so the land use inventory should collect information on planned and proposed land uses, as well as on existing uses. Note if there are any governmental programs designed to direct land use patterns in the area under review. For example, if the airport sponsor has completed a noise compatibility-planning program, it should contain valuable information on land use.

e. Identify land uses that may affect the safe operation of the airport or influence its expansion. Structures that could obstruct air navigation, or the presence of other airports that may interfere with the study airport, are the principal safety concern. Also identify areas located near the airport that may represent a potential hazard to aircraft, such as flood control areas, stockyards, and sanitary landfills.

f. Use geographic information systems (GIS), aerial photographs, topographical maps, obstruction charts, aeronautical charts, approach plates and other mapping tools to examine and display land use details. Many local governments have comprehensive GIS systems that contain electronic files for land use analysis and zoning.

g. Consider off-airport drainage and flood control issues, which may be affected by airport development.

605. ENVIRONMENTAL OVERVIEW

a. The principal objective of an environmental overview is to document environmental conditions that should be considered in the identification and analysis of airport development alternatives. In the past, master plan studies often focused only on the environmental consequences of the recommended development plan. In those cases, much of the environmental overview would be conducted while other technical analyses were already underway and the environmental data would not be considered in the formulation of alternative development concepts. Current practice is to develop the alternatives with the subsequent environmental processes in mind and to consider environmental data in the evaluation of the alternatives. As a result, the master plan may aid in the formation of the purpose and need statements in subsequent environmental documents.

b. Noise levels and air and water quality are the most common environmental concerns. However, other environmental conditions in and around the airport should also be examined, including: solid waste generation and disposal; toxic material disposal; floodplains and wetlands; endangered and threatened species of flora and fauna; biotic communities; parklands and recreational areas; historic, architectural, archaeological and cultural resources; and prime and unique farmland. Planners should refer to the current version of FAA Order 1050.1, *Environmental Impacts: Policies and Procedures,* for a complete list of environmental impact categories that may need to be examined. In addition to NEPA requirements, planners should consider appropriate state environmental regulations. Past and current uses of airport property should be examined to identify areas that may be contaminated, including fuel farms, chemical or agricultural aerial application refilling stations, and hangar areas used for various industrial processes such as aircraft maintenance and plating.

c. Planners should ask local resource agencies to provide any information they think should be considered in the process of identifying and evaluating alternative development options.

d. Any existing airport noise or environmental programs should be discussed in the environmental overview.

e. When cost effective, data collected in the environmental inventory can be placed in a GIS database for better data visualization, communication, and analysis.

606. DEVELOP SOCIOECONOMIC DATA

a. Socioeconomic data serve two purposes in a master plan study: to ascertain the nature of the community and market the airport serves and to provide specific inputs for the preparation of aviation demand forecasts, particularly econometric demand models.

b. An effective understanding of the community is helpful in ensuring that the planning is responsive to its long-term needs. Planners should focus on those socioeconomic factors that affect the community's need for air transportation. For example, an economy based on tourism would have air transportation needs that would be quite different from those of an agricultural region.

c. A vast array of socioeconomic data are available from many different sources, including a number of commercial vendors; the U.S. Bureau of the Census; metropolitan planning commissions; and state, county, or local agencies. Planners should be careful when using different sources of socioeconomic data to ensure compatibility.

607. ASSEMBLE HISTORICAL AVIATION ACTIVITY

a. The historical data necessary for forecasting aviation demand are generally available in the records maintained by the airport. At airports with control towers, FAA records of operations by commercial service, air taxi, military, and general aviation aircraft and revenue passenger enplanements are available in the Air Traffic Activity Data System (ATADS) on the FAA Policy Office's data system website at http://www.apo.data.faa.gov/. At airports without control towers, airport records, FAA Form 5010, *Airport Master Record*, and airport system plan study are a good source of information.

For commercial service activity, planners should collect data that identify the air carriers; the proportion of operations and enplanements by each; markets served; the number of originating, terminating, and connecting passengers; the proportions of domestic and international passengers; and air cargo activity. It will also be useful to have a breakdown of the fleet mix of aircraft using the airport.

For general aviation activity, planners should collect data that identify the category and class of aircraft, types of fuels those aircraft use, the type of airport services used, and the availability of hangars for tenant and transient aircraft.

b. Master plans for large airports often involve the use of computer simulation models. For an airfield simulation, planners will need a detailed schedule of arrival and departure times for all commercial operations. Records for average or peak days can often be obtained from airport tower records, radar tapes, or noise monitoring systems. Commercial vendors such as the *Official Airline Guide* can also be helpful. For terminal and landside simulations, planners will need the passenger flow volumes in each terminal associated with the aircraft schedules.

608. FINANCIAL DATA

Airport master planners must examine an airport's financial resources, including its basic business model, operating revenues and expenses, and sources and uses of capital funds.

a. **Airport Business Model** – Summarize the airport's basic business model to help planners organize the vast amount of financial data available at most airports. The business model summary should describe the financial operations of the airport, including how its costs and revenues are charged or credited to airport users and how any operational surplus or deficit is handled. In addition, the business model summary should outline how the airport typically funds capital projects (i.e., with AIP and other grants, Passenger Facility Charges, airport revenue bonds, and so forth). If the airport sponsor owns and operates a multi-airport system, the business model summary should discuss how the financials for the study airport are addressed in relation to the whole airport system. For instance, AIP funds may be proportioned among airports, based on funding priorities rather than by the ratios of activity.

b. **Operating Revenues and Expenses** – Summarize broad categories of operating revenues and expenses. The FAA requires all commercial service airports to submit financial information to the FAA annually on FAA Form 127 and these reports may provide a good starting point. Airport managers often divide operating revenues into airline revenues and non-airline revenues. Non-airline revenues are often subdivided into categories such as terminal concessions; rental car; parking; hangar, land, and other rentals; other; and tax revenues. Operating expenses are often divided into broad categories such as personnel, maintenance, utilities and supplies, other, and debt service.

c. **Capital Funding** – Summarize the airport's ongoing capital improvement program and how it funds its capital development program. The capital improvement program can be funded from many sources, including revenues from the airlines, concessionaires, other airport tenants, tax levies (if applicable), passenger facility charges, AIP grants, other federal and state grants-in-aid, and airport revenue bond proceeds.

   The financial feasibility of the capital improvement program will be determined largely by the magnitude and reasonableness of the charges, rents, and taxes paid by airport users, tenants, and others. The information collected in this inventory will be used to prepare a financial plan for the recommended development program.

   Much of the information discussed in the preceding paragraphs relates primarily to the financial data for commercial service airports and larger general aviation airports. Many

smaller general aviation airports will not have such data readily available; however, such information may be part of the financial records of the sponsor.

609. DOCUMENTATION GUIDELINES

a. The documentation of existing airport conditions should make liberal use of drawings, tables, aerial photographs, and exhibits produced from geographic information system databases. Presented in this manner, such information is easy to understand, interpret, and locate for later reference.

b. Planners do not need to include all collected information in the report. Some should simply remain in work files until needed to support the technical analyses.

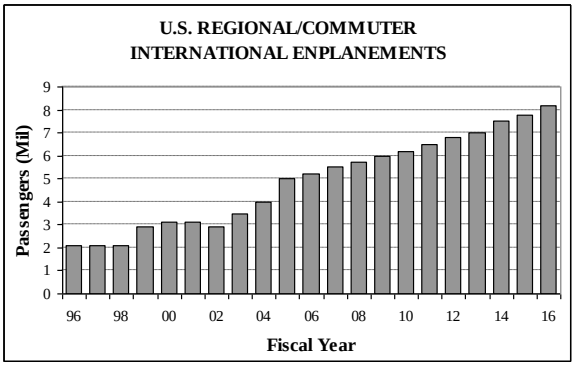
Chapter 7 Aviation Forecasts

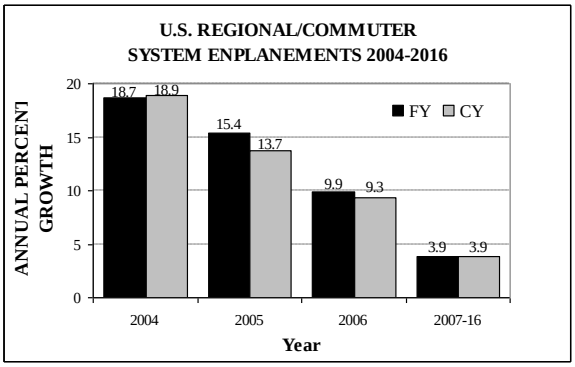
701. GENERAL

a. **Purpose of aviation forecasts** – Forecasts of future levels of aviation activity are the basis for effective decisions in airport planning. These projections are used to determine the need for new or expanded facilities. In general, forecasts should be realistic, based upon the latest available data, be supported by information in the study, and provide an adequate justification for airport planning and development. Any activity that could potentially create a facility need should be included in the forecast.

Planners should prepare a reliable activity baseline, select an appropriate forecast methodology, develop a forecast, compare it to other forecasts for reasonableness, and submit the forecasts to the FAA for approval. The planning agency should use appropriate statistical techniques to estimate activity where actual operations counts are not available.

Figure 7-1: Sample of FAA Forecast Graphs





Source: FAA Aerospace Forecasts, Fiscal Years 2005-2016, U.S. Department of Transportation, Federal Aviation Administration, Office of Aviation Policy & Plans, March 2005

b. **Level of forecast effort** – The level of effort required to produce a planning forecast will vary significantly from airport to airport. Considerable effort, including the use of elaborate forecasting tools and techniques, may be warranted in the case of more complex projects. An existing forecast, on the other hand, may be all that is required for simpler projects. Planners should determine the appropriate level of forecasting effort in the course of pre-planning and scoping the study.

   A number of forecasts are readily available for use in developing and evaluating the master plan forecast. These include the Terminal Area Forecast (TAF), state aviation system plans, and other planning efforts.

c. **Use of the forecasts** – Prior to use in the master plan, the proposed forecasts must be submitted to the FAA for review and approval. Once approved, the forecasts may be used to provide an initial timetable for facility improvements, as a basis for the development of alternatives to meet the projected demand, and as a basis for environmental analyses and economic and financial plans

702. FORECAST ELEMENTS

a. **Types of aviation activity** – To establish the demands likely to be placed on airport facilities, forecasts should include all relevant aviation demand elements, including both the type and level of aviation activity expected at the airport over the planning horizon. The specific activity elements to be forecast will vary depending on the size and category of an airport and the objectives of the master plan study. Planners should note if the forecast projects the introduction of jet aircraft at the study airport, since this will be important to the future environmental review process.

   Aviation demand forecasts typically include aircraft operations and identify the critical aircraft. Forecasts for commercial service airports will also include, at a minimum, passenger enplanements, while forecasts for general aviation airports will include the number and type of based aircraft. The aviation demand elements to be forecast are shown below in Figure 7-2.

Figure 7-2: Aviation Demand Elements

Required	Included Where Appropriate
Operations (annual) Itinerant Air Carrier Air Taxi and Commuter (Regional) General Aviation Military Local General Aviation Military	Domestic vs. International Annual Instrument Approaches IFR vs. VFR Operations Air Cargo Aircraft Operations Touch and Go Operations (Training) Helicopter Operations Average Load Factor Fuel Use
Passengers (annual) Enplanements Air Carrier Commuter Enplanements Originating Connecting	Passenger and Cargo Data Domestic vs. International General Aviation Passengers Helicopter Air Taxi Other Number of Student Pilots Number of Hours Flown
Aircraft Based Aircraft Aircraft Mix Critical Aircraft	Average Seats/Aircraft

b. **Term of aviation forecasts** – Prepare forecasts for short-, medium- and long-term periods and specify the existing and future critical aircraft. Short-term forecasts, for up to five years, are used to justify near-term development and support operational planning and environmental improvement programs. Medium-term forecasts (a 6- to 10-year time frame) are typically used in planning capital improvements and long-term forecasts (beyond 10 years) are helpful in general planning.

c. **Peak period forecasts** – Forecasts of annual aircraft operations or passenger activity may not adequately describe the needs of individual airport facilities. Because they average demand levels over the course of an entire year, annual metrics are only useful when activity tends to be evenly distributed over the hours, days, and months of a particular airport facility's operation. However, most airports have peak periods where demand far surpasses those averages. Stresses arising from activity peaks are critical at commercial service airports serving as hubs or that have substantial international traffic. Master plan forecasts must include appropriately defined peak period activity levels for facilities planning, such as terminal buildings and ground access systems.

703. FACTORS AFFECTING AVIATION ACTIVITY

Planners preparing forecasts of demand or updating existing forecasts should consider socioeconomic data, demographics, disposable income, geographic attributes, and external factors such as fuel costs and local attitudes towards aviation.

a. **Economic Characteristics** – The economic characteristics of a community will affect the demand for air traffic. In addition to national and regional economic activity, these include specific, identifiable, local activities that distinguish the geographic area served by the airport. The type of industry in an airport's service area also will affect aviation demand, with manufacturing and service industries tending to generate more aviation activity than resource industries such as mining.

b. **Demographic Characteristics** – The demographic characteristics of an area's population also affect the demand for aviation services. Demographic characteristics influence the level, composition, and growth of both local traffic and traffic from other areas. Factors such as leisure time and recreational activity are important in estimating activity, but can be difficult to measure. Another important demographic characteristic is the level of disposable income, usually measured on a per capita basis, which is a good indicator of the propensity to travel and general aviation aircraft purchases and use.

c. **Geographic Attributes** – The geographic distances between populations and centers of commerce within the airport's service area may have a direct bearing on the type and level of transportation demand. The existence of populations and centers of commerce beyond an airport's service area may indicate the need for additional airports that serve transportation demand. The physical characteristics of the area and the local climate may also be important, since they may stimulate holiday traffic and tourism. The role of the airport within the airport system and its relationship to other airports may also have an effect on the services that are demanded at the airport.

d. **Aviation-related Factors** – Business activity, changes in the aviation industry, and local aviation actions can markedly affect the demand for airport services. Business developments in the airline industry, such as consolidations, mergers, and new marketing agreements, can affect airline operations at a particular airport, while fractional ownership can affect others. Wider industry trends, such as the introduction of new low-fare service, the introduction of new classes of aircraft, and the growth or curtailment of airline hubbing, may also alter the level and pattern of demand. To the extent that such actions affect all aviation activity in a region or the country, their effects will be captured in the FAA's forecasts. If, however, only the demand at a particular airport is affected, appropriate adjustments should be made in that airport's forecast. Actions taken by local airport authorities, such as changes in user charges, ground access policies or their support services can also stimulate or hinder the demand for airport services. Investment decisions made as a result of the planning process itself can also produce change by removing physical constraints to airport growth, which should be reflected in the forecasts.

e. **Other Factors** – External factors may also influence the demand for airport services. These include economic actions such as fuel price changes, availability of aviation fuels, currency restrictions, and changes in the level and type of aviation taxes. Political developments, including rising international tensions, changes in the regulatory environment, and shifting attitudes toward the environmental impacts of aviation, may also impact future demand and should be considered in developing or updating airport forecasts.

704. STEPS IN THE FORECAST PROCESS

The forecast process for airport master plan studies consists of a series of basic steps that may vary from airport to airport, depending on the issues to be addressed and the level of effort required to develop the forecast. Steps in this process include the identification of parameters and measures to forecast, review of previous forecasts, determination of data needs, identification of data sources, collection of the data, selection of the forecast methods, preparation of the forecasts, and evaluation and documentation of the results.

Planners should refer to a report prepared by the FAA's Office of Aviation Policy and Plans (APO-110), *Forecasting Aviation Activity by Airport*, dated July 2001, to help them determine what approach to use. That report can be accessed at http://www.faa.gov/data_statistics/aviation_data_statistics/. The APO data systems web site, at http://www.apo.data.faa.gov, provides historical traffic counts, forecasts of aviation activity, and delay statistics. The forecast process can be summarized as follows:

a. **Identify Aviation Activity Measures** – The aviation activity measures that planners need to forecast are the level and type of activities that are likely to affect facility needs. For airfield planning, the most important activities are aircraft operations and the fleet mix, since these define the runway and taxiway requirements. As a general rule, plans for general aviation airports require forecasts of aircraft operations and based aircraft. Airports with commercial service require forecasts of aircraft operations, fleet mix, and passenger enplanements. Passenger levels are particularly important, since they determine the size of the terminal building and other important elements of airport infrastructure such as parking facilities and access roads. Planners should forecast instrument operations and instrument approaches, since these data will be needed if they expect to add or upgrade navigational aids and instrument landing systems. For some airports, additional forecast elements may be required, including peak hour operations and peak hour passenger flows.

b. **Review Previous Airport Forecasts** – Planners should review the latest published FAA Terminal Area Forecast for the study airport and any forecasts from an earlier master plan. Contact regional planning bodies and state aviation agencies to determine whether they have conducted airport system planning studies that included forecasts of demand for the study airport.

c. **Gather Data** – Determine what data are required to prepare the forecasts, identify the data sources, and collect historical and forecast data. What data to gather, and for what time period, will depend not only on the parameters to be forecast but also on what data are available from previous airport forecasts. In some cases, it may be necessary to conduct additional activity counts.

d. **Select Forecast Methods** – There are several appropriate methodologies and techniques for forecasting aviation activity at a specific airport. The selection and application of appropriate methodologies and techniques requires professional judgment. A forecast effort may involve a number of different techniques. The FAA report referenced above provides a detailed discussion of several forecasting techniques. The most common techniques include the following:

1) ***Regression analysis*** – A statistical technique that ties aviation demand (dependent variables), such as enplanements, to economic measures (independent variables), such as population and income. Regression analysis should be restricted to relatively simple models with independent variables for which reliable forecasts are available.

2) ***Trend analysis and extrapolation*** – Typically uses the historical pattern of an activity and projects this trend into the future. This approach is useful where unusual local conditions differentiate the study airport from other airports in the region.

3) ***Market share analysis or ratio analysis*** – This technique assumes a top-down relationship between national, regional, and local forecasts. Local forecasts are a market share (percentage) of regional forecasts, which are a market share (percentage) of national forecasts. Historical market shares are calculated and used as a basis for projecting future market shares. This type of forecast is useful when the activity to be forecast has a constant share of a larger aggregate forecast.

4) ***Smoothing*** – A statistical technique applied to historical data, giving greater weight to the latest trend and conditions at the airport; it can be effective in generating short-term forecasts.

e. **Apply Forecast Methods and Evaluate Results** – After the list of activities to forecast has been identified, the appropriate forecast methods have been selected, and necessary data have been assembled, the actual forecasts can be prepared. If several methods are used to project specific aviation activities, they will probably produce different estimates. Therefore, an evaluation of the reasonableness of the results and their consistency with other forecasts should be conducted.

A useful procedure in such an evaluation is to prepare a time line showing both forecast results and historical trends. Similarly, one might compare the history and forecast for the airport with the FAA national history and forecast for the same activity parameter. If the comparison of the growth rates shows a significant difference, the planners must be able to explain it. Forecast results may also be evaluated by comparing them with other forecasts prepared for the airport, such as those contained in state or regional aviation system plans. One might also review the operational factors and events implicit in the forecast to determine if differing assumptions regarding those factors have affected the forecast results. For example, a constraint on operations associated with runway and apron limitations at the airport could affect the results. Therefore, it is useful to evaluate forecasts both with these constraints and with the constraints removed, i.e., a constrained and an unconstrained forecast.

If demand levels are likely to be particularly sensitive to one or more factors, the planner should estimate the impact of reasonable changes in the underlying assumptions about those factors. For example, if expected growth in aircraft operations is highly dependent on the continued operation of a fixed base operator (FBO) and there is a reasonable possibility that the FBO will close, the planner should estimate how much that closing would change the predicted demand. The planner should also examine general aviation hangar activity, including the airport hangar waiting list, and estimate how much increased hangar space would change predicted demand.

If the timing of important demand-generating factors (specific local or national events or activities resulting in an increased demand for aviation services) is uncertain, the forecaster can construct a time line showing the period of uncertainty, during which demand constraints or the diversion of traffic to another airport may be needed. In this respect, the actual number of operations or enplanements in any specific future year is less important than the certainty that a particular threshold will be reached during the planning period. This approach acknowledges that demand is expected to exceed the airport's capacity, but that there is a range of time (with a range of forecast error costs, i.e., costs in terms of delays and reduced service levels as a result of airport capacity not keeping up with aviation demand because of forecast inaccuracy) during which this problem needs to be considered.

When preparing forecasts for airports with declining activity, the forecast should identify the underlying cause for the decline, including a review of national and local trends. A sudden decrease in activity may be temporary, particularly if local income and population are steady or advancing. If the drop in activity takes place more gradually and is sustained, the decline is more likely to continue during the forecast period.

To document an expected upward trend in activity, planners should get letters of support from airlines, fixed base operators, or other users; information from the *Official Airline Guide*, general aviation associations, news articles that document changes at nearby airports, survey data for aircraft activity, and trend data for based aircraft. Such letters should state that the writers plan changes in their operations at the study airport.

Most forecasts should include a sensitivity analysis to measure likely variations in activity if the factors influencing activity change. One method of measuring the uncertainty in the forecast is to use a number of alternative assumptions in preparing it. The use of alternative scenarios should be discussed with FAA staff during master plan study scoping.

It is often useful to provide a range of activity forecasts, that is, to forecast a high level of activity as well as a lower level and to try to determine where within this range the most likely forecast will be found. If a plan uses scenario forecasting and other techniques that develop alternative projections, the airport sponsor can then provide the most likely forecast projections to the FAA for its approval. Having a range of forecast activity allows airport planners to develop flexibility in facilities to accommodate different activity levels.

It may also be useful to develop Planning Activity Levels (PALs) based on the forecast. PALs are selected activity levels that the planner believes may trigger the need for additional airport capacity or other development and may be used for analyzing the benefits of proposed development alternatives. They may also be used to establish thresholds for the implementation of airport development projects. The use of PALs focuses the airport sponsor and the public on the need to plan for aviation activity levels rather than specific timelines.

f. **Compare Forecast Results with the FAA' s Terminal Area Forecasts** – Planners should compare their forecast results with those contained in the most recent Terminal

Area Forecast. To facilitate this comparison, the FAA recommends completing the template in Appendix C of the document titled *Forecasting Aviation Activity by Airport*.

g. **Approval of the Forecasts** – The general requirement for FAA approval of the master plan study's forecasts is that they are supported by an acceptable forecasting analysis and are consistent with the TAF. Master plan forecasts for operations, based aircraft, and enplanements are considered to be consistent with the TAF if they meet the following criteria:

1) Large, Medium, and Small Hub Airports

a) Forecasts differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period, or

b) Forecasts do not affect the timing or scale of an airport project.

2) Other Commercial Service Airports

a) Forecasts differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period, or

b) Forecasts do not affect the timing or scale of an airport project, or

c) Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, *Field Formulation of the National Plan of Integrated Airport Systems*.

3) General Aviation and Reliever Airports

Where the 5- or 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft:

a) Forecasts differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period, or

b) Forecasts do not affect the timing or scale of an airport project, or

c) Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, *Field Formulation of the National Plan of Integrated Airport Systems*.

When the 5- or 10-year forecast is for less than 100,000 total annual operations or 100 based aircraft, the forecast does not need to be reviewed at FAA Headquarters, but the data should be provided to the FAA for the annual update of the TAF.

Further guidance on FAA review and approval of aviation forecasts is defined in a memorandum dated December 23, 2004 that can be found at http://www.faa.gov/airports_airtraffic/airports/planning_capacity/.

Any substantial differences between the master plan forecasts and the TAF must be resolved before moving onto subsequent parts of the master plan. If the planner expects the master plan forecasts to be inconsistent with the TAF for any reason, the FAA's Project Manager should be contacted early in the forecast development process to discuss the implications of the variance.

Locally prepared forecasts may contain a more detailed analysis of local economic conditions or development that is not considered in preparing the TAF. Therefore, airport sponsors should review the FAA's TAF for their airport on a regular basis and notify their FAA Planner/Planning Program Manager when they believe local conditions merit a revision to the TAF. When requesting a change to the TAF, the airport sponsor should provide reliable historical data and letters from individuals with the authority to affect operations, which document planned changes in operations.

705. DOCUMENTATION

Present the results of the forecast process and a description of the process itself as a separate chapter in the master plan report. The forecast chapter should contain extensive documentation. The level of detail provided should be sufficient to enable both the FAA to analyze the results, for planners to use them later in the planning and environmental process, and so the forecast can be adapted for future planning efforts.

The master plan report should summarize each forecast element, explain the forecast methods used, highlight significant assumptions, clearly and concisely present the forecast results, and provide an evaluation of the forecast. Tabulations of historical and forecast data should be included for each forecast element; graphical presentations of key time series and forecasts are usually helpful. FAA recommends completing the template in Appendix B of the report titled *Forecasting Aviation Activity by Airport*. Explanations should be provided if major variances from historic trends are forecast. For complicated forecasts, an appendix to the technical report should provide detailed documentation of the methodology.

706. SOURCE DATA

The following sources may provide assistance for planners in preparing forecasts for master plan studies:

a. **Terminal Area Forecasts** – The FAA's Terminal Area Forecast (TAF) contains historical data for at least the past 10 years and forecast data for the next 15 years. The TAF summary report for each airport includes, as appropriate: aircraft operations (landings and takeoffs, local and itinerant; total operations; and air carrier, commuter/air taxi, general aviation, and military operations), enplanements (total, air carrier and commuter), and total instrument operations. The TAF presumes an unconstrained demand for aviation services.

b. **National Forecasts** – The FAA's Office of Aviation Policy and Plans publishes two other major forecasts, the FAA Aerospace Forecasts and the FAA Long-Range Aerospace Forecasts. The FAA Aerospace Forecasts are estimates of national aviation demand for the next 12 years.

Figure 7-3: Sample Table from Terminal Area Forecast Summary Report

Summary of Enplanements and Airport Operations at FAA Towers and Contract Towers

Enplanements at Towered Airports

	Count	2003	2010	2020	Annual Compound Growth Rate 2003-2010	2010-2020
Large Hubs	33	460,486,763	623,735,048	832,432,922	4.43	2.93
Medium Hubs	35	113,930,143	146,148,406	191,273,310	3.62	2.73
Small Hubs	66	43,914,690	63,050,236	80,139,022	3.69	2.43
Non Hub Towers	351	17,122,217	19,602,930	23,380,002	1.95	1.78
Total	485	635,453,813	852,536,620	1,127,225,256	4.17	2.83

Operations at Towered Airports

	Count	2003	2010	2020	Annual Compound Growth Rate 2003-2010	2010-2020
Large Hubs	33	14,356,535	17,766,287	22,010,896	3.09	2.17
Medium Hubs	35	6,972,068	7,846,402	9,413,334	1.70	1.84
Small Hubs	66	8,217,052	8,788,618	9,838,151	0.97	1.13
Non Hub Towers	351	33,230,486	35,369,207	40,008,626	0.90	1.24
Total	485	62,776,141	69,770,514	81,271,007	1.52	1.54

Source: Terminal Area Forecast Summary Report, Fiscal Years 2004 – 2020, Prepared March 2005, U.S. Department of Transportation, Federal Aviation Administration, FAA-APO-05-1

c. **Historical Data** – The FAA's Air Traffic Activity Data System (ATADS) contains historical aviation operations data for operations at Air Route Traffic Control Centers and FAA- and contract-towered airports. Monthly and annual counts of aircraft operations and instrument operations by user group are available at the facility, state, regional, and national level. These data can also be accessed at the APO website.

d. **Historical Data at Non-towered Airports** – Estimating current activity at non-towered airports can be difficult. The traditional method of using operations data from a similar towered airport to estimate the activity at a non-towered airport has been found to be unreliable. Records of fuel sales at the non-towered airport may be a more reliable indicator. However, the most reliable method has been found to be using a relatively inexpensive acoustical aircraft activity counter to obtain a series of cluster samples systematically drawn throughout the year and estimating the annual activity from these samples. The samples not only provide information on total annual operations, but also on the seasonal variability and peaking characteristics of the activity. For further information on this subject, see Transportation Research Record 958: "Ford-Shirack Study," *Estimating Aircraft Activity at Non-towered Airports: Results of the Aircraft Activity Counter Demonstration Project*.

The characteristics of operations at a non-towered airport, such as whether the operations are local or itinerant and what type of aircraft are using the airport, are as important as the number of operations. Visual surveys to determine these and other observable

characteristics can be expensive. A statistical sample can greatly reduce the cost. In 1987, the Oregon Department of Transportation published the results of a study in which the characteristics of operations at non-towered airports were determined through statistical sampling. See *Statistical Sampling and Estimating Procedure for Aircraft Activity Characteristics*, Oregon Aeronautics Division, Oregon Department of Transportation, April 1987.

e. **State and Regional Airport System Planning Data** – State and regional airport system plans can provide information, direction, and policy guidance for airport master planners. An airport system plan (at least for all NPIAS airports) provides forecasts and describes the roles of the various airports in the area and the distribution of traffic among them.

f. **Socioeconomic Data** – Planners should use recognized sources of socioeconomic data available from local, regional, state, and federal planning organizations. Key data elements include population, employment, income, and other measures. If possible, data should be presented on an historical basis and projected into the future.

g. **Other Data Sources** – Additional sources of data that should be reviewed are the *Official Airline Guide (OAG)*, FAA Form 5010, Airport Master Record, and other existing studies or reports.

The local FAA Airports office can provide additional guidance on using forecasting tools, techniques, and methods. Whether the aviation forecasts are being prepared by the airport planning staff or by consultants, early consultation and periodic discussion with FAA airports and forecasting staff are encouraged. Such discussions are particularly important when planners are considering using significantly different forecast assumptions and methods in developing the basis for a specific airport master plan or where there are differences between existing forecasts. These early discussions will be especially useful when the forecasts indicate that federal grants for airport improvements at the study airport would be justified sooner than called for in the existing TAF.

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Chapter 8 Facility Requirements

801. GENERAL

a. Planners should determine what, if any, additional facilities will be required to accommodate forecast activity. This task begins with an assessment of the ability of existing facilities to meet current and future demand. If they cannot, planners must determine what additional facilities will be needed to accommodate the unmet demand.

   In some cases, the airport sponsor may decide that it is in the community's best interest for the airport not to continue to grow to accommodate forecast activity, or to accommodate forecast activity only up to a point. In these cases, the master plan should document this decision and indicate the probable consequences of the decision (e.g., demand will be capped, the demand will go unmet, or the demand will be diverted to another airport).

   This analysis needs to clearly define the aviation problems and why the airport needs to resolve them. Findings supporting a problem, and the potential solutions to that problem, must be clearly documented. Planners should ensure that this needs analysis provides information sufficient to provide a basis for describing the purpose and need for proposed Federal actions. Care should be taken that the facility requirements are not so narrowly defined that they point to a single solution.

b. Although this AC provides guidance on the facilities commonly found at airports of all sizes, planners should limit their efforts to those elements that are applicable to the study airport. Preparation of an appropriate scope of work in the pre-planning process will ensure that both the airport sponsor and the planners understand what elements should be studied.

c. The requirements for new or expanded facilities reflect the unique circumstances of each airport, such as, but not limited to the following:

   1) Capacity shortfalls, which are commonly driven by growing demand.

   2) Enhanced security requirements mandated by the Transportation Security Administration, including the flexibility to respond to changes in threat levels.

   3) Updated standards developed and adopted by the FAA or other regulatory agencies, to correct existing non-standard conditions and eliminate existing modifications to standards. If there are approved modifications to standards, planners should review the reasoning that led to those adjustments. The facility requirements chapter should indicate if those deviations will continue or will be eliminated in the new master plan.

   4) The airport sponsor's strategic vision for the airport. Such needs are typically associated with a sponsor's strategic business plan, mission statement, or similar plans that will require modification of the airport.

5) The outdated condition, arrangement, or functionality of existing facilities.

d. At some airports, planners can use simulation models to help determine facility requirements. For large airports, simulations can model major components of an airport, including the airfield system, airspace environment, passenger and baggage flows in the terminal, and ground access networks. For smaller airports, simulations can model usage projections, passenger flows, and other support requirements including fixed base operator, maintenance, flight school, and fuel support requirements.

e. Many of the significant improvements needed at an airport are actually driven by the demand level, not a time frame or a specific year. Therefore, planners should identify what demand levels will trigger the need for the expansion or improvement of a specific facility. In this way, the sponsor can monitor growth trends and expand the airport as demand warrants. (For a discussion of the use of Planning Activity Levels, see Section 704.e.)

f. The findings of the capacity analyses and facility requirement determinations form the foundation for the identification of development alternatives and the selection of the alternatives that can best meet future demand. Since critical investment decisions will be based on these analyses, the planner, airport sponsor, and FAA should consider the cost of inadequate analysis in determining the level of effort and sophistication of the capacity and delay analyses. If the analyses are not sophisticated enough, development funds could be wasted on alternatives that do not meet future demand. On the other hand, planning funds can be wasted by capacity and delay analyses that are more sophisticated than they need to be. Future facility needs are to be based on these analyses and it is critical that these analyses be adequate, supportable, and defendable. Therefore, this is a critical issue to discuss during master plan scope of work development.

802. EMERGING TRENDS

a. The aviation industry is changing rapidly and the changes may have a significant impact on the size, quantity, and type of facilities needed to accommodate future demand. For example, airfield and airspace capacity may be affected by the implementation of free flight, the use of global positioning systems for navigation, the continued use of regional jets, the introduction of new aircraft types (large commercial and very light jets), and changes in air traffic procedures. Airline mergers, the introduction of self-serve kiosks, advances in information technology, and new security procedures will affect terminal facility requirements. Cargo facility needs have been changed by the improved logistics of the distribution industry.

b. The rapid pace of change in the aviation industry is expected to continue for years to come. All master planning efforts should examine industry trends and identify those that will influence their capacity needs. An important consideration in airport planning is to encourage flexible concepts that can be adapted to the rapidly changing environment.

803. DESIGN HOUR DEMAND

a. For many master plan studies, estimates of annual demand for air passengers, aircraft operations, cargo, or vehicle trips will be sufficient to identify future facility needs. Planners should be aware, however, that such general estimates can mask substantial seasonal and time-of-day variations in demand; failing to consider these can result in high congestion and low levels of service during peak hours.

b. In the U.S., the evaluation of peak hour demand is often based on the peak hour of the average day of the peak month. This approach provides sufficient facility capacity for most days of the year, but recognizes there will be some very busy days that experience congestion, queues, and delays and that it is important that facilities are neither under- nor overbuilt. However, for some critical airport systems, the peak hour of the average day of the peak month can substantially understate the demand at peak times, resulting in unacceptable levels of service or overloading of systems to a point that may approach gridlock. Some components of the passenger terminal complex, such as baggage handling systems and security checkpoints, are particularly sensitive to this issue.

c. To address these problems, planners may wish to consider alternate methodologies for determining peak hour demand, such as the percentile of busy hours throughout the year (for example, 90th or 95th percentile). A facility sized to meet such demands should have sufficient capacity and service levels during 90 percent or 95 percent of the hours throughout the year. The specific percentile will depend on the facility being evaluated, the desired level of service, and the unique demand characteristics of the study airport.

804. SECURITY CONSIDERATIONS

Security requirements have become very important in planning airport facilities. Planning for security early in the development process can produce designs that accommodate security requirements in a more efficient, less costly, and less intrusive manner. However, specific measures for implementing security requirements will vary in response to shifting threats, evolving technology, and the physical and operational circumstances of individual airports. Planners should meet with representatives of the Transportation Security Administration (TSA) early in the process and be familiar with the current versions of applicable documents, including TSA's *Recommended Security Guidelines for Airport Planning, Design, and Construction* and relevant sections of the Transportation Security Regulations (TSRs). Appendix B, Useful Reference Materials, has a list of applicable TSRs and other security-related publications.

Security requirements will vary depending on the role and service provided at the airport. The information contained in 49 CFR Part 1542, *Airport Security*, describes the security rules and requirements for commercial service airports. Operators of general aviation airports are encouraged to use the recommended guidelines in appropriate TSA publications discussing security at general aviation airports to enhance the security of their facilities. Both commercial service and general aviation airports are extremely diverse and appropriate security measures can only be determined only after careful examination of an individual airport.

Terminal facilities also have extensive security requirements, particularly with regard to the location of passenger and baggage screening. Ground access facilities, such as roadways and parking structures, may be subject to security-based siting considerations, including terminal proximity limitations. Security requirements are also becoming an increasingly important element in planning air cargo and general aviation facilities.

805. AIRFIELD AND AIRSPACE REQUIREMENTS

The determination of airfield and airspace requirements includes an assessment of the airports' ability to handle forecast activity levels, analysis of its compliance with design and safety standards, and a determination of design standards for new facilities or the improvement of existing facilities.

FAA Advisory Circular 150/5300-13, *Airport Design*, is a key resource for the planner in virtually all analyses to determine airfield requirements and is frequently referenced in this chapter.

a. **Airfield Capacity Analysis** – Airfield capacity is expressed in terms of the number of aircraft operations that can be conducted in a given period of time. Capacity is most often expressed as annual capacity (or annual service volume) and hourly capacity (or throughput capacity) for a particular runway and taxiway configuration.

   At low activity airports, airfield capacity often exceeds the anticipated level of demand and only a minimal analysis is necessary. For airports with higher activity levels, several techniques for determining airfield capacity are available to airport planners. The methodology in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, commonly referred to as the "handbook methods," yields hourly capacities and annual service volumes (ASV) and permits the estimation of aircraft delay levels as demand approaches and exceeds the throughput capacity of each airfield configuration. The handbook methods are typically used for long range planning and the results should be discussed with FAA representatives.

   Although the handbook methodology is adequate for many master plans, congested airports may incur higher levels of delay than are typically used in the ASV definitions. ASVs may not be appropriate to use at airports with a 24-hour operation, such as late night cargo operations. For such airports, computer simulation modeling may be necessary to provide the depth of analysis necessary to support major airfield investment decisions. There is no universally adopted simulation tool that must be used in airfield capacity analyses. The FAA's Technical Center supports the simulation engine for the most current version of the FAA Airport and Airspace Simulation Model, which is available to the public free of charge. Both public domain software and proprietary software developed by the private sector are also available for modeling. If simulation modeling is employed, planners must be careful to explain modeling capabilities and limitations, and review key assumptions, inputs, operating configurations and results with appropriate representatives of the FAA.

   Aircraft operational delay costs or savings are often used as the measure for comparing various airfield development alternatives. Delay is typically expressed in minutes per

aircraft operation, which can be translated into hours of annual delay and easily converted into dollar estimates to be used as a basis for comparison. Traditionally, four to six minutes of average delay per aircraft operation is used in ASV calculation. This can be considered as an acceptable level of delay. When the average annual delays per aircraft operation reaches four to six minutes, the airport is approaching its practical capacity and is generally considered congested.

The selection of a particular airfield capacity analysis technique should be made in the pre-planning phase of the master plan study. The selected technique should be clearly defined in the negotiated scope of work. At the conclusion of the airfield capacity analysis, planners will have a sense of whether an additional runway or taxiway should be included in the alternatives analysis.

b. **Runway Requirements** – Existing and future runways should be examined with respect to dimensional criteria, orientation, length, width, and pavement design strength:

1) ***Dimensional Criteria*** – FAA guidance on dimensional standards is based on a coding system known as the Airport Reference Code (ARC). This system is used to relate airport design criteria to the operational and physical characteristics of the aircraft that will operate at the airport. Existing and future ARC classifications are determined from a review of the aviation demand forecasts and an understanding of the airport's existing and future role in the air transportation system. While an ARC classification is assigned to the overall airport, it is sometimes advisable to apply a less demanding ARC to particular areas of the airport that will not be used by the primary critical aircraft. See FAA AC 150/5300-13, *Airport Design*, for more information on appropriate ARC codes and dimensional criteria requirements.

2) ***Orientation*** – Runway orientation is primarily a function of wind coverage requirements for the existing and projected aircraft fleet mix. Historical wind and weather data can be obtained from the National Oceanic and Atmospheric Administration (NOAA). This analysis is used to determine if additional runways are needed to provide the necessary wind coverage. See FAA AC 150/5300 13, *Airport Design*, for guidance on wind coverage analysis techniques.

   Planners should also review runway designation. Periodic changes in magnetic declination may necessitate renumbering the runways. A declination calculator can be found at http://www.ngdc.noaa.gov/seg/geomag/jsp/Declination.jsp. The existence of obstructions and environmental and physical features, either man-made or natural, in approach and departure routes should also be considered in determining runway orientation.

3) ***Length*** – The length of a runway is a function of many factors, the most notable of which are the selection of an appropriate design aircraft and the longest nonstop distance to be flown by the design aircraft from the airport. Aircraft-specific runway length requirements are a function of aircraft physical characteristics at time of flight, weather conditions, and runway conditions. See FAA AC 150/5325-4, *Runway Length Requirements for Airport Design*, for guidance on this analysis. Other common resources for runway length assessments are the aircraft characteristics

information published by aircraft manufacturers, consultation with aircraft operators at the airport, and the FAA document, *Best Practices: Planning Airports for Business Jets*. Aircraft manufacturers may be able to provide airport-specific runway length requirements for their aircraft, especially at airports with severe conditions such as high temperatures or high airport elevations.

4) ***Width*** – The required width of a runway is a function of the approach minimums, airplane approach category, and airplane design group for the design aircraft using the runway and is discussed in FAA AC 150/5300-13, *Airport Design*.

5) ***Pavement Design Strength*** – What aircraft types and the critical aircraft expected to use the airport should be used to determine the required pavement design strength, or weight bearing capacity, of airfield surfaces. The required pavement design strength is an estimate based on average levels of activity, and is expressed in terms of aircraft landing gear type and geometry (i.e., load distribution). The pavement design strength is not the maximum allowable weight. Limited operations by heavier aircraft than the critical aircraft may be permissible. Pavement design and load distribution assumptions can be found in FAA AC 150/5320-6, *Airport Pavement Design and Evaluation*.

c. **Taxiway Requirements** – The taxiway system must provide safe and efficient aircraft movement to and from the runways and the aprons that serve passenger terminals, cargo, and general aviation facilities. The ARC designations from the runway requirements also apply to appropriate dimensional criteria for taxiways. As traffic increases, the taxiway system can become the limiting operational factor, especially if the airfield configuration results in frequent runway crossings by taxiing aircraft, or does not provide sufficient access or bypass capability. The location of taxiway exits may also reduce runway occupancy time, thereby increasing capacity. Planners should examine the location and type of runway exit taxiways as well as the location of parallel taxiways, crossover taxiways, bypass taxiways, perimeter taxiways, and holding pads. At congested airports, computer simulation can aid this analysis.

d. **Electronic, Visual, and Satellite Aids to Navigation** – Aids to navigation provide pilots with information to assist them in locating the airport and to provide horizontal and/or vertical guidance during landing. Navigational aids also permit access to the airport during poor weather conditions. The need for new or additional navigational aids is a function of the fleet mix, the percentage of time that poor weather conditions are present, and the cost to users of not being able to use the airport when it is not accessible. Important navigational aids include instrument landing systems (ILS), approach lighting systems (ALS), Precision Approach Path Indicators (PAPI) or other visual approach slope indicators, and global positioning systems (GPS), such as the Wide Area Augmentation System (WAAS). Airport users can assist planners in identifying the need for navigational aids and the development of WAAS approaches. The installation of new navigational aids may require airspace coordination.

e. Air traffic control facilities include air surveillance radars, airport surface detection equipment, remote transmitters and receivers, wind shear detectors, weather observing equipment, and others. The general siting of future air traffic control facilities should take place during the master plan process so that adequate space is reserved for them and their critical areas are protected from development that would interfere with their operation.

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f. **Airspace Requirements** – For complex master plans, particularly for a commercial service airport located near another commercial service airport, determining airspace requirements may require a detailed investigation, often using computer simulations. Such efforts need to be carefully coordinated with FAA air traffic representatives so as to reach agreement regarding key modeling assumptions. In addition, if the airfield capacity analyses call for new runways or major airfield reconfigurations, significant airspace changes or redesign may be required and FAA air traffic representatives should participate in the discussions.

In most master plan studies, however, the focus will be on reviewing the airport's existing airspace classifications and determining if growth at the study airport or at neighboring airports could require an upgrade to a higher airspace classification.

At non-towered airports, the master plan should determine if the growth in aircraft operations will exceed threshold values for the establishment of an airport traffic control tower. For towered airports, line of sight investigations may reveal that the airport traffic control tower should be relocated. See FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*, for help in making such a determination.

Planners should identify penetrations of imaginary surfaces (as defined in 14 CFR Part 77, *Objects Affecting Navigable Airspace)* to determine their disposition. Obstacle clearance surfaces associated with *United States Standard for Terminal Instrument Procedures (TERPS)*, and obstacle clearance requirements found in FAA AC 150/5300-13, *Airport Design*, should be evaluated as appropriate. In some cases, the TERPS surface may be the controlling airspace surface.

806. COMMERCIAL SERVICE PASSENGER TERMINAL COMPLEX

a. The commercial service passenger terminal complex extends from the aircraft parking positions on the airside interface to the vehicle curbfront on the landside interface.

1) ***Gates and Apron Frontage*** – Planners should establish requirements that identify the number of aircraft parking positions that will be needed to handle future activity. The mix of aircraft expected during the design hour will determine the lineal feet of apron frontage and the dimensions of the required gates. The parking and storage of ground servicing equipment should also be considered in determining apron frontage requirements.

2) ***Passenger Terminal Building*** – Within the terminal building itself, requirements are commonly expressed in terms of square feet for major functional elements such as ticket counter area, security checkpoints, departure lounges, concessions, airline

operations, baggage claim, baggage makeup, circulation and public space, mechanical space, and the Federal Inspection Services (FIS). Understanding the space requirements of these elements will help planners in designing the configuration of the terminal complex. Planners should prepare estimates of the number of processing units needed for ticket counters, baggage claims, and security checkpoints. In some master plans, where terminal building expansion is projected for the long-term, it may be appropriate for the master plan to provide only a general location and footprint of the future terminal building, rather than specific functional area requirements.

3) ***Curbfronts*** – The length of curbfront required is a function of the modal splits of arriving and departing passengers, dwell time assumptions for the vehicles at the curbfront, and the assignment of different types of vehicles to the curbfront (management of the curbfront). The availability of convenient and inexpensive short-term parking, public transit, and door-to-door shuttles will reduce the amount of curbfront required.). To facilitate the flow of traffic in front of the terminal, an assessment of the number of lanes should be conducted.

The role of the study airport in the air transportation system will of course determine what passenger terminal facilities it needs. A major connecting hub, for example, will need terminals that are different from those of an origin and destination airport. Similarly, airports serving major tourist destinations will have special needs. The terminal building area requirements may be too specific for a master plan and it may be appropriate to provide only the general location and footprint of a future terminal complex. Figure 8-1 shows a typical passenger terminal at a large commercial airport.

Figure 8-1: Commercial Service Terminal Complex

Source: Philadelphia International Airport, Terminal F (opened in 2001), www.phl.org (Photo by Richard McMullin, Philadelphia Airport System)

b. **Methodologies** – Information on methodologies that can be used to determine passenger terminal facility requirements is available from several sources, including:

1) FAA Advisory Circulars 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities,* and 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-Hub Locations*

2) *Airport Development Reference Manual*, published by the International Air Transport Association

3) *Measuring Airport Landside Capacity*, published by the Transportation Research Board

Proprietary computer simulation modeling tools are also available and can be used to evaluate passenger and baggage flow through airport terminals. .

807. GENERAL AVIATION REQUIREMENTS

a. General Aviation (GA) includes a variety of users and activities, such as corporate flight departments, cargo operators, recreational users, business flying, flight training, agricultural applications, law enforcement, and fixed base operators. These users need aircraft storage facilities, transient parking aprons, terminal facilities, auto parking, and vehicle access from adjacent roads.

1) ***Aircraft Storage Facilities*** – GA users' physical requirements vary from unpaved tie-down aprons to large conventional hangars with major maintenance services and aircraft aprons. Conventional hangars and T-hangars provide aircraft with protection from the weather and security against vandalism or theft. In general, aircraft owners prefer hangars. The demand for hangars is understandably higher in northern climates with severe winter weather conditions.

2) ***Transient Aircraft Parking Aprons*** – Temporary parking for visiting aircraft may be provided on a transient apron adjacent to the general aviation terminal building, or on aprons managed or leased by an FBO.

3) ***Terminal Facilities*** – General aviation terminal buildings range from very modest structures with little more than a waiting room and a telephone to multi-story buildings with extensive amenities such as pilot briefing rooms, restaurants, gift shops, pilot's lounges, conference and training rooms, and rental car counters. At general aviation airports, the terminal building may also house administrative offices. At commercial service airports, general aviation terminal facilities are often provided by one or more FBO. In such cases, the facilities are provided principally for customers of the FBO and access for the general public is limited.

b. The planner should identify future requirements for general aviation facilities, which will be primarily a function of the forecasts of aircraft to be based at the airport and of transient aircraft operations. The role of the airport in the region's transportation network will also influence facility requirements, as will the airport sponsor's vision of the strategic and economic value of the airport.

c. Planners should also be aware of factors that may influence the existing demand for these facilities. For example, if the facilities are in disrepair compared to facilities at neighboring airports with overlapping service areas, demand may shift away from the study airport. The airport sponsor's pricing policies may also affect the demand. A useful barometer of facility needs, particularly short-term needs, is the existence of waiting lists for hangars, T-hangars, or aircraft tie-down positions.

d. The number of business jets is increasing at a more rapid rate than other general aviation aircraft. This growth will become more pronounced with the introduction of the very light jets (VLJ) or micro jets. No matter their size, business jets have notable impacts on the facilities and services of a general aviation airport.

808. AIR CARGO REQUIREMENTS

a. For commercial service airports and larger general aviation airports, air cargo activity includes a diverse collection of companies with differing business strategies and market roles, including the following:

1) ***Integrated Carriers*** transport freight from door-to-door using their own fleet of trucks and aircraft.

2) ***Freight Forwarders*** act as brokers that link shippers with freight carriers; they coordinate the shipment of freight but do not transport it.

3) ***All Cargo Operators*** sell space to freight forwarders or individual companies and ship the air cargo on their aircraft.

4) ***Combination Carriers*** carry both passengers and freight on a single aircraft, typically with a reconfigured cabin.

5) ***Belly Freight Carriers*** carry cargo in the baggage compartment or belly of a passenger aircraft.

Airport planners should assess the capacity of existing cargo processing facilities and determine future requirements for buildings, aircraft parking aprons, and ground access facilities. Each type of cargo operation has somewhat different site requirements, so a range of spaces will need to be provided for cargo development. In planning for future air cargo facilities, planners should consider: (1) the type of cargo companies expected to expand or initiate operation; (2) annual air cargo operations projected for all operators; (3) the number of existing apron parking spaces; (4) projected growth in annual enplaned tonnage; (5) the availability of ground access for the heavy commercial trucks associated with cargo activity; and (6) any security needs and requirements. Planners should consider providing a means of separating cargo trucks from other airport traffic for security purposes.

b. For most general aviation airports, air cargo facilities are included in the broad category of general aviation facilities. Air cargo-related activities are accommodated in the hangar, apron, and ground access facilities of the general aviation tenants and operators. In those cases, an independent analysis of air cargo needs is unnecessary.

809. SUPPORT FACILITIES

a. Support facilities at an airport provide a broad set of functions that ensure the smooth, efficient, and safe operation of the airport. As applicable, the future requirements of the following support facilities should be examined:

1) ***Aircraft Rescue and Firefighting*** – For airports that require Part 139 certification, planners should review the forecast of aircraft operations to determine if the airport's Aircraft Rescue and Firefighting (ARFF) index will change during the planning period. If Part 139 certification is not currently provided at the study airport, but will be required at some time during the planning period, the applicable ARFF building and equipment requirements should be defined in the master plan. See 14 CFR Part 139 *Certification of Airports*, particularly sections 139.315 to 139.319, for ARFF Index definitions; and FAA AC 150/5210-15, *Airport Rescue and Firefighting Station Building Design*, for standards and guidance in planning an ARFF station. Planners should also consider if multiple ARFF stations will be required to meet response time requirements as defined in Part 139. For airports that do not require Part 139 certification, planners should identify any existing agreements with local authorities for emergency response services, or the lack thereof.

2) ***Airport Maintenance*** – The airport provides a wide variety of services to ensure that airport tenants and users have a safe, efficient, and reliable environment. The facilities needed to support these services include administrative offices; buildings for storage and maintenance of airport equipment; shop space; and buildings for supply storage. Northern airports, of course, need equipment for snow removal operations, see also AC 150/5220-18 *Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*.

3) ***Fuel Storage*** – FBOs often provide fuel storage and supply at general aviation airports. At some airports, unattended self-serve facilities may be provided when activity levels do not warrant full-time attendants. For commercial service needs, fuel storage facilities ensure that jet fuel is available if supply services through pipelines or tanker trucks are interrupted. To support general aviation, planners should address the types of approved aviation fuels needed to meet current and future public demand, since new engine technologies permit the use of auto fuel and diesel in today's aircraft.

4) ***Aircraft Maintenance*** – For the general aviation community, aircraft maintenance is typically provided by an FBO. The types of services provided include, but are not limited to, airframe and power plant repair by an FAA-certified repair station. The facilities required to sustain these services include: (1) an aircraft maintenance hangar with sufficient work space for any aircraft upon which maintenance is being performed; (2) suitable storage and shop space for equipment and tools; (3) office space, customer lounge, restrooms, and telephone; (4) apron area with pavement type and strength adequate to support the expected aircraft; (5) auto parking and ground access to provide customers with adequate vehicle parking; and (6) proximity to the engine run-up area to limit taxi times and fuel cost. At larger airports, a tenant airline may have established a maintenance base for the periodic inspection and maintenance

of their aircraft. To determine the space requirements for such a maintenance facility, planners should ask airline representatives what types of aircraft they plan to service at the airport and their expected facility needs.

5) ***De-Icing*** **-** Airports with exposure to winter weather conditions that can cause accumulation of frost, snow, slush, or ice on aircraft surfaces must have aircraft deicing facilities. These airports should provide de-icing pads to maintain departure flow rates and avoid unacceptable delays. Any new aircraft deicing facility must have runoff mitigating structures to collect fluid runoff. See FAA AC 150/5300-14, *Design Of Aircraft Deicing Facilities*, for standards and guidance in planning deicing facilities.

Guidance for assessing the future needs of aviation support facilities is available from the referenced ACs. In many cases, the planner should rely on interviews with tenants and users, in combination with observation of the methods and procedures used at existing airport facilities.

810. GROUND ACCESS, CIRCULATION, AND PARKING REQUIREMENTS

One of the keys in choosing a mode of travel is the total trip time between points of origin and destination. If total trip time is under three hours, travelers are particularly sensitive to the duration of the ground access portion of an air travel trip. The regional roadway network, on-airport circulation roadways, and parking facilities are the principal components of the ground access system. The capacity and reliability of this system will determine the level of service provided to air travelers on the ground access segment of their trip.

a. **Regional Transportation Network** – With the exception of the busier commercial service airports where access is often a capacity constraint, airport access planning by local transportation agencies has historically been effective and probably will not emerge as a critical constraint of airport capacity expansion. Coordination with local transportation planning authorities during the review of existing conditions should produce enough information to allow an assessment of surface access capability, and to confirm whether the existing and planned network can accommodate projected aviation demand.

   At airports where ground access may be an issue, detailed discussions with local transportation planners may be needed to quantify the shortfalls in the capacity of the regional roads. A variety of analytical computer models and simulation models can be used by airport planners to assist with those determinations. As a general rule, large airports try to develop strategies that reduce the number of single-person private vehicle trips and to encourage greater use of high-occupancy vehicles. In major urban areas, the Metropolitan Planning Organization (MPO) may be able provide assistance to airport planners. Light rail systems, intermodal stations, or other alternate modes of transportation are often examined in these efforts.

b. **On-Airport Circulation Roadways** – This access system is shared by a wide range of users having different trip purposes, which include:

1) ***Originating and terminating air travelers*** most often arrive at the airport in a private vehicle, but may also use a taxi, limousine, courtesy bus, mass transit, charter bus, door-to-door van, or rental car.

2) ***Employees*** travel to and from the airport each day using private vehicles or public transportation.

3) ***Delivery vehicles*** supply the goods and materials consumed or purchased at the airport.

4) ***Other vehicles*** may require access to air cargo facilities, general aviation facilities, support facilities, and other activity centers.

Each user group has a different pattern of arrival and departure times for their airport trips. Analytical methods and computer models may be used to evaluate roadway capacities and the levels of service they provide. Such an analysis should also identify possible capacity increases in the form of additional lanes or operational modifications. Security provisions for vehicle screening may need to be provided. Other users of the roadway facilities that should be evaluated may include:

1) ***Taxi/Limo/Courtesy Van Staging Areas*** – Locations where vehicles can be parked and dispatched as needed to pick up passengers at the terminal curbfronts. A staging area is a critical resource at busy airports where terminal curbfront is scarce.

2) ***Rental Car Facilities*** – At smaller airports, the ready and return parking spaces for rental cars are often located in lots immediately adjacent to the terminal building or in the public parking garage. At larger airports, ready and return spaces may be provided in a consolidated rental car facility or at remote locations that are reached via courtesy vans or buses. Rental car operations also require space for cleaning, fueling, maintenance and vehicle storage.

3) ***Courtesy Vans and Buses*** – Courtesy buses and vans serving on- and off-airport rental cars, hotels, and parking facilities are major users of on-airport roadways. At the larger commercial airports, these are often provided with dedicated curbfront to pick up and drop off passengers.

4) ***Charter Bus Operations*** – Airports that are major tourist destinations must accommodate significant charter bus operations. Cruise ships, for example, impose extraordinary surges on facilities used by charter buses to transfer passengers between the air terminal and the marine port.

Planners should also pay attention to airport signing. Poor signing can reduce the level of service provided to the airport's patrons and cause increased traffic volumes because of recirculation. See AC 150/5360-12 *Airport Signing and Graphics* for instructions on obtaining the industry reference manual, *Guidelines for Airport Signing and Graphics*, which was jointly developed by the American Association of Airport Executives (AAAE), the Airports Council International-North America (ACI-NA), the Air Transport Association of America (ATA), and the Airport Consultants Council (ACC). Also see

Report No. DOT/FAA/PP/96-3, *Intermodal Ground Access to Airports: A Planning Guide.*

b. **Public Parking Facilities** – Public parking facilities at general aviation airports are generally small surface lots located next to the terminal building, while parking facilities at commercial service airports range from free surface lots next to the passenger terminal to a complex combination of garages and surface lots. Close-in parking may include separate areas for hourly and daily parking. At larger airports, remote parking lots with shuttle buses may need to be considered. The development of "cell phone lots" is gaining popularity at many commercial service airports.

c. **Employee Parking** – For most airports, employee parking is provided within individual tenant leasehold areas and is not a critical concern for planners. At small commercial service airports, parking for employees whose worksite is inside the commercial passenger terminal building can usually be accommodated in small surface lots near the terminal. At larger airports, however, public parking in surface lots or garages usually displace terminal area employee parking. In these cases, the planner should include an evaluation of terminal area employee parking and remote area employee parking in the future facility requirements.

811. UTILITIES

The master plan study should also address future need for utilities such as water, sanitary sewer, drainage and deicing, industrial waste, communications, and power supply. Existing systems should be evaluated and their capacity verified at the airport boundary. Historical ratios of utility demand to the level of enplanements or aircraft operations can form the basis for projecting future demand. Since an airport can be a large consumer of utility services, planners should discuss their projections with local utility providers to ensure that the airport's needs are included in their long-term service plans.

812. OTHER REQUIREMENTS

Many airports have significant acreage devoted to non-aeronautical uses, such as industrial parks, recreational uses, agricultural or grazing leases, or retail businesses. Some uses are considered temporary, to remain only until a higher aviation use materializes, while others are expected to remain as surplus to anticipated aviation needs. In either case, the revenue from these activities provides supplemental revenue to the airport and improve the airport's overall financial position. The planner should review the infrastructure needs of such activities and identify improvements that preserve the revenue-generating performance of a valuable asset.

813. DOCUMENTATION GUIDELINES

a. A stand-alone chapter of the technical report should describe the analyses and techniques used to determine future facility requirements. A summary at the beginning or end of the chapter and in the report's executive summary should highlight findings for key components.

b. Planners should use appendices to improve the readability and organizational flow of the documentation. However, they should avoid making the appendices a depository for unnecessary information, which can result in massive reports that may confuse and discourage the reader.

c. It is not necessary for the chapter documentation to mirror the outline of major sections provided in this chapter of the AC. However, it should follow the structure of the chapter of the technical report that describes existing conditions.

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Chapter 9 Alternatives Development and Evaluation

901. GENERAL

a. This chapter brings together many different elements of the planning process to identify and evaluate alternatives for meeting the needs of airport users as well as the strategic vision of the airport sponsor. Airports have a wide variety of development options, so an organized approach to identifying and evaluating alternative development options is essential for effective planning. The key elements of this process are:

   1) Identification of alternative ways to address previously identified facility requirements.

   2) Evaluation of the alternatives, individually and collectively, so that planners gain a thorough understanding of the strengths, weaknesses, and other implications of each.

   3) Selection of the recommended alternative.

   Planners should carefully organize the analysis because it is easy to consider alternatives that do not meet the airport's needs, or fail to consider certain long-term development options, particularly if one highly visible issue seems to overshadow other planning elements. Both of those outcomes can be avoided by the careful review of the scope of work, and by verifying that the facility requirements (including timing) are complete; that other considerations, such as the sponsor's strategic development objectives, unusual site or environmental consideration and other factors are documented and understood; and that there has been sufficient stakeholder participation.

b. Planners should also review the scope of work to ensure that the alternatives process conforms to the overall study design. In simple master plans, alternatives development may be limited. In these instances, facility improvements are simply an extension of existing land use patterns and can be best addressed in the Airport Layout Plan.

c. Planners should meet the airport's development needs in order to improve the airport as a system, while remaining responsive to environmental, fiscal, and other objectives. To do so, the planner must balance competing needs among the airport's various functional elements. Although the process varies by airport, planners typically consider the airside first; terminal, general aviation, and cargo facilities next; and then airport access. Since a master plan covers a 20-year time frame, planners should recognize that the recommended alternative should be functional through various stages of the plan. For example, it would not be a good idea to develop a new location for general aviation operations early on if the airside improvements needed to support it would not be provided until a later phase. A 20-year plan should also have the flexibility to meet unforeseen future conditions.

   In some cases where it is appropriate to identify major development alternatives, such as a new runway, that meet demand beyond a 20-year time frame. For example, if an airport is experiencing urban encroachment that would lead to land use incompatibility,

planners should assess alternatives that would help protect aviation assets from that encroachment, or to plan for long-term land acquisition. However, planning beyond the 20-year period should be general in nature and in much less detail than that for the short- or even mid-term development. For example, if planning for a future runway, the master plan might only indicate the general location and potential length of the runway. The alternatives analysis would only consider key evaluation criteria and would be at a low level of detail.

d. Effective facility planning must consider environmental issues in the alternatives identification, evaluation, and selection effort. The early consideration of the potential environmental impacts of alternatives can avoid later problems. Some master planning efforts will produce short-term recommendations that will require an Environmental Assessment or Environmental Impact Statement. In these situations, the master plan must provide a good technical foundation for the subsequent environmental process. In some complex situations, it may be helpful to include an environmental consultant or FAA Airports Environmental Specialist as an advisor to the master plan. However, the planner should carefully review the master plan scope of work to avoid undertaking tasks better suited for the follow-on environmental analysis, such as wetland delineation or cultural resources surveys. To better understand how a master plan alternatives analysis fits within the overall development process, planners should concurrently review the following FAA guidance:

1) FAA Order 5050.4, FAA Airports guidance for complying with NEPA,

2) FAA Order 1050.1, *Environmental Impacts: Policies and Procedures*

3) AC 150/5300-13, *Airport Design*

4) Chapter 5 of this AC, *Consideration of Environmental Factors in Airport Master Planning*

Master plans that address controversial undertakings, such as capacity projects at larger airports, should pay particular attention to environmental factors and the National Environmental Policy Act (NEPA) process during alternatives identification, analysis, and selection. The plan's environmental evaluation is intended to support the NEPA process. The planning and environmental review will be less likely to experience delays if the master plan supports the subsequent NEPA analysis.

Although master planning is not part of the NEPA process, the master plan alternatives development and evaluation can provide an important component of an efficient NEPA process. In complex cases, the careful scope of work preparation (with assistance from an environmental consultant or FAA Airports Environmental Specialist) can ensure that the master plan provides information useful to subsequent environmental analyses under NEPA. Items of particular interest during planning include the types of reasonable alternatives that the sponsor and FAA can implement. The analysis of these alternatives must be consistent and well documented.

e. The alternatives effort should also consider fiscal issues. Planners must be aware of the practical fiscal limitations imposed on the airport by the availability of FAA funding, passenger facility charges (PFCs), user fees and other sources of development dollars and their development options should reflect the fiscal capabilities of the airport. Cost should not be a factor in rejecting an alternative it makes the alternative infeasible. A plan that is not realistic in terms of what can be funded will not provide much benefit to the sponsor or airport users. Note, however, that under NEPA, cost alone is not necessarily a valid reason for rejecting an alternative.

f. The alternatives identification, evaluation, and selection process should be the most collaborative portion of the master plan study as part of an effective public involvement program. The foundation for a successful effort in the alternatives analysis process is careful consideration of this task in the pre-planning activities. The level of detail to be undertaken in this task will greatly affect the cost of the master plan study.

902. ALTERNATIVES ANALYSIS PROCESS IN AIRPORT MASTER PLANNING

a. A general process of identifying, analyzing, and recommending alternatives is illustrated in Figure 9-1. The steps shown are an example of a comprehensive process that can be used on large and complex projects. For many airport planning projects, some of the steps may not be applicable. The process should be adapted to the needs of the study airport and the level of detail may vary considerably from study to study. The alternatives analysis process may be adapted in several ways, but variations should be clearly described in the study's scope of work; they may include changes such as:

   1) What airport elements are included in the process

   2) How the elements are ranked in the planning hierarchy

   3) What type and level of analysis will be used to differentiate among the alternatives

b. Where a particular functional element does not exist, it can be eliminated from the alternatives analysis process; for example, planners need not consider an airline passenger terminal at general aviation airports. In addition, if there are no facility needs associated with a functional element, it is not appropriate to consider alternatives for that element. Thus, it is possible, if there are no facility improvements for primary elements and those for secondary elements are simply extensions of existing land use patterns, that the alternatives analysis process can be materially reduced or even skipped altogether.

c. The alternatives analysis process planning hierarchy that addresses the primary analysis first examines recommended alternatives for those elements that require large land areas and must be considered as a functional whole. For most airports, this will include the airside. For larger airports, airline passenger terminal and ground access elements may be included. For smaller airports, general aviation facilities may be included in the primary analysis.

   The secondary analysis addresses elements that have greater planning flexibility, however, not all airport planning will have secondary analysis. For example, the support

facilities at some airports will include an Aircraft Rescue and Fire Fighting (ARFF) building. While an ARFF building will have specific size, location, and functional requirements, these requirements are significantly easier to satisfy than those for a new runway or passenger terminal.

The order of the elements in the planning hierarchy may vary by airport. For example, at an airport with particularly complex airside, airline passenger terminal, and cargo situations, but a very simple ground access element, the alternatives analysis process would be adapted to make the ground access element a secondary analysis element while making the cargo element a primary analysis element.

d. Planners may also adapt the analysis to the unique circumstances of the study airport. For example, an airport may have ample airfield capacity, but significant terminal and ground access congestion. In such a case, planners might conduct a relatively simple airfield capacity analysis, or none at all, while the airline passenger terminal and ground access elements would get a more intensive analysis, including computer simulation.

e. The alternatives analysis process is an iterative process, intended to be flexible enough to permit creative thinking about the future of the airport, but sufficiently structured to ensure consideration of all pertinent factors. The planner, in following this process, should focus on issues that shape how the airport will function as a system, as well as on narrower technical analyses.

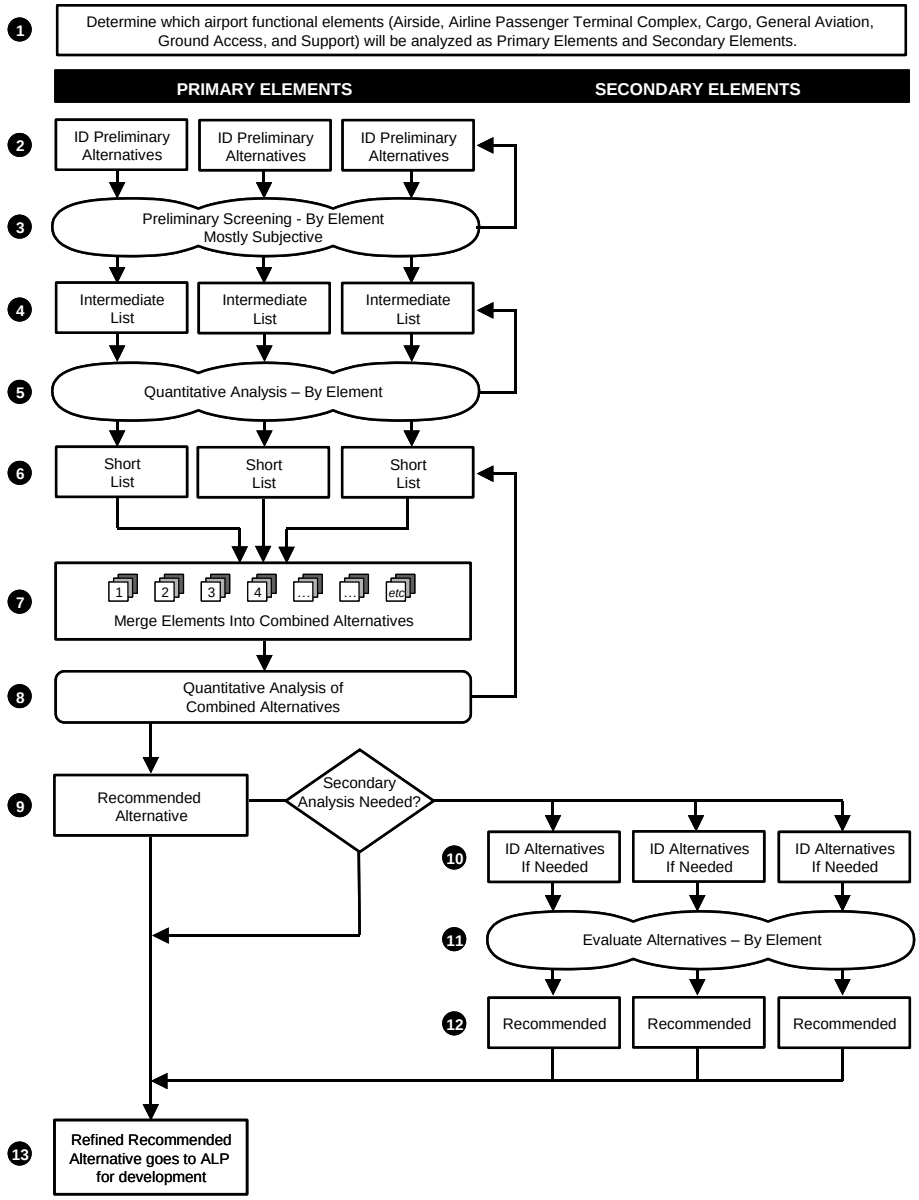
f. The alternatives analysis process should incorporate the public involvement program. Although the appropriate level of public involvement will vary, a meaningful involvement program is important and will provide a number of important benefits.

g. As shown in Figure 9-1, the alternatives analysis process should start with a broad group of alternatives for the primary elements and progressively screen them to produce reasonable alternatives that meet the planning need. The sponsor may identify a recommended single alternative.

1) ***Determine Primary and Secondary Elements (Step 1)*** – Determine which functional elements (airside, airline passenger terminal complex, cargo, general aviation, ground access, and support) should be considered in the primary analysis and which ones can be in the secondary analysis. Primary elements require large, contiguous land areas. Secondary elements have greater planning flexibility, can often be subdivided, and fill-in around the primary elements.

2) ***Identify Preliminary Primary Element Alternatives (Step 2)*** – After the principal elements for primary and secondary analysis are identified, select preliminary alternatives for the primary elements.

Figure 9-1: Alternatives Analysis Process Example



3) ***Screen Alternatives for Intermediate List of Primary Element Alternatives (Steps 3 and 4)*** – Screen the preliminary alternatives, using a mostly subjective, qualitative analysis, to make an intermediate list of alternatives. This screening will eliminate some alternatives for each of the primary elements, and may introduce others. Any subsequent environmental analysis will be aided by clear documentation of this screening, focusing on why alternatives were eliminated.

4) ***Quantitative Analysis for Short List of Primary Element Alternatives (Steps 5 and 6)*** – As appropriate, subject the selected alternatives to a more rigorous, and often quantitative, analysis to get a short list of alternatives by element. Again, clear documentation of this analysis will help in any subsequent environmental analysis.

5) ***Combine and Analyze Primary Element Alternatives (Steps 7 and 8)*** – Identify combined alternatives, consisting of the logical matching of the individual primary element alternatives, and subject them to a further analysis, based on previous work.

6) ***Select Preferred Primary Element Alternative (Step 9)*** – Select and document the recommended alternative for the primary elements. Note that subsequent environmental processing will materially benefit from clear documentation of this selection with a focus on why alternatives were eliminated.

7) ***Identify Alternatives for the Secondary Elements (Step 10)*** – Identify alternatives or options for the secondary elements. In some cases, the simplicity of the situation may eliminate the need for some or all of the secondary component alternatives.

8) ***Evaluate and Select Recommended Alternatives for Secondary Elements (Steps 11 and 12)*** – As appropriate, evaluate secondary elements alternatives, typically using a mix of qualitative and quantitative analysis, and select and document reasonable alternatives or options. Note that subsequent environmental processing will materially benefit from clear documentation of this analysis. It provides a focus on why some alternatives were eliminated and why reasonable alternatives were retained for consideration and environmental analyses.

9) ***Prepare Refined Recommended Alternative (Step 13)*** – The final step in the process is the combination of the recommended alternatives for the primary and secondary elements.

h. During the alternatives analysis process, planners will get new information and input that will help refine the alternatives or result in the introduction of new alternatives. Therefore, planners should view the alternatives analysis process as an iterative one.

903. IDENTIFICATION OF ALTERNATIVES

a. The alternatives identification (steps 2 and 10 in Figure 9-1) should consider only those alternatives meeting the sponsor's planning need and that the FAA or the airport sponsor will be able to implement. Planners should examine each identified alternative's technical feasibility, economic and fiscal soundness, and aeronautical utility (i.e., build and operated safely). Alternatives not meeting those criteria should be dismissed, while

providing reasons for their respective dismissals. The master plan should include reasons why planners rejected any alternative that would avoid environmentally sensitive resources or that would require extensive mitigation. This planning information is critically important to efficient project development. It is also critical to streamlining the subsequent NEPA process, since that process must consider the above master plan alternatives and those outside the FAA's or sponsor's jurisdiction.

b. To avoid an unnecessarily complex alternatives analysis process, the planner should carefully select different ways of addressing the identified need that are not simply variations on the same basic approach. Alternatives should have discrete, measurable, and materially different impacts on the established alternative evaluation criteria. Early work should consider a number of ideas, but these should be reduced to a manageable number of true alternative approaches through the initial steps of the process, taking care to adequately document what concepts were examined and why certain ones were dismissed. The need to work with a manageable number of alternatives in the master plan must be balanced with NEPA requirements to consider all reasonable planning alternatives to avoid or minimize impacts to environmental resources.

   Planners should understand the condition of the airport, the business relationships between the airport and tenants, the future vision of the airport sponsor, the environmentally sensitive features of the airport, and other factors that make each airport unique.

c. There should be a direct link between the facility requirements and the development alternatives. Not all facility requirements are related to capacity shortfalls, as some will improve operations, comply with standards, or meet the sponsor's strategic objectives. However, the basis for all facility requirements should be clearly documented.

d. The alternatives should address those airport elements that are the focus of the particular master plan (airside, airline passenger terminal, or ground access) and de-emphasize functional elements that are less important to the airport's overall function.

e. The process of identifying alternatives should be iterative. It should begin with the identification of a broad range of possibilities, often generated by using a collaborative brainstorming approach. The focus should be on the primary elements. The elements should be reviewed to ensure that necessary interrelationships are considered (i.e., make sure there is a ground access option and airside option that supports each terminal option). The elements may conflict (i.e., a terminal option may conflict with an airside option). Initial screening should narrow the range of possibilities to those reasonable alternatives that meet the planning need for each element, which will then undergo more intensive development and evaluation.

f. As the alternatives are evaluated, planners may need to apply more specialized skills. In some cases, they may need to conduct airspace reviews to determine an alternative's aeronautical utility. In very complex cases, they may need to conduct preliminary engineering studies and prepare cost estimates.

g. In many cases, the secondary element may not require the formulation and analysis of alternatives, but may be integrated directly into the recommended primary element alternative. This is particularly true when the secondary element can follow an extension of an existing land use pattern and no environmental resources are affected.

904. EVALUATION OF ALTERNATIVES

The evaluation of alternatives (steps 3, 5, 8 and 11 in Figure 9-1) should be adapted to each airport's unique situation. Sophisticated and expensive analyses should be done only when deemed necessary to differentiate among alternatives. In all cases, the analysis should follow generally accepted planning practices, be replicable, consistently applied, and well documented.

The alternatives analysis process uses increasing levels of detail as the evaluation of alternatives proceeds. The initial rounds of evaluation should be qualitative and more subjective, based on a combination of good planning judgment, relatively simple-to-use models and simplified calculations. However, subsequent rounds of analysis should be more rigorous.

Evaluation criteria should be determined in advance, but may be adjusted based on information uncovered as part of the alternatives analysis process. Since the selection of appropriate evaluation criteria involves a significant degree of subjectivity, planners must be careful to achieve a balanced evaluation, while still being responsive to the various study participants' points of view. The planner must carefully consider factors of particular importance at the study airport, but make sure that the evaluation addresses all aspects of the alternatives. Therefore, the planner should include a broad range of evaluation criteria to ensure the adequate consideration of all aspects of the alternatives.

Evaluation criteria are divided into four broad categories: operational performance, best planning tenets and other factors, environmental factors, and fiscal factors. For most airports with relatively straightforward planning issues, a simple analysis across a broad range of evaluation categories will be sufficient. The following evaluation criteria should be adapted for each airport to achieve a balance between the need for a thorough evaluation and the inefficiency of over-analysis:

a. **Operational Performance** – How well the airport functions as a system can be evaluated from several perspectives, including capacity, capability, and efficiency.

   1) ***Capacity*** – Test for the capability of accommodating future activity levels. Various capacity techniques can be applied to the airside, terminal, and ground access elements. Consistent application of the technique to each alternative will permit the planner to compare them.

   2) ***Capability*** – Test for the capability of meeting specific functional objectives, such as accommodating the design aircraft, providing the required number of aircraft parking positions or gates, or allowing space for the runway length requirement.

   3) ***Efficiency*** – Test how well the alternatives work as a system by examining combined alternative elements. For example, airfield taxiing efficiency can be evaluated by

combining terminal and airside alternatives to measure which combination yields the lowest weighted average aircraft taxiing time and the fewest runway crossings.

Several FAA offices have a role in assessing the aeronautical utility of various alternatives. These include the FAA's Air Traffic Organization (generally the terminal, technical operations, and planning units), Flight Procedures, and Flight Standards. Questions to be addressed may include the feasibility of approach procedures, navigational aid siting, and airspace interaction.

b. **Best Planning Tenets and Other Factors** – Planners should determine the relative strengths and weaknesses of the alternatives. The following best planning tenets will apply to the evaluation of alternatives at most airports, but others may be applicable at a specific airport:

1) Conforms to best practices for safety and security

2) Conforms to the intent of applicable FAA design standards and other appropriate planning guidelines

3) Provides for the highest and best on- and off-airport land use

4) Allows for forecast growth throughout the planning period

5) Provides for growth beyond the planning horizon, as applicable

6) Provides balance (typically capacity) between elements

7) Provides the flexibility to adjust to unforeseen changes

8) Conforms to the airport sponsor's strategic vision

9) Conforms to appropriate local, regional, and state transportation plans and other applicable plans

10) Technically feasible (limited site constraints)

11) Socially and politically feasible

12) Satisfies user needs

c. **Environmental Factors** – The potential environmental effects of the alternatives are an important consideration. The impact categories defined in FAA Order 1050.1, *Environmental Impacts: Policies and Procedures* and FAA Order 5050.4, FAA Airports guidance for complying with NEPA, offer significant insight about the likely impacts of various alternatives. At some airports, only a few of the items will be applicable, such as noise, wetlands, or social impacts and a simple approach will be sufficient to differentiate among the alternatives. Where an Environmental Assessment or Environmental Impact Statement is likely to be prepared, a more detailed evaluation of environmental factors will be useful. An environmental consultant may provide significant insight in such cases.

Early consideration of the environmental effects of the alternatives can help ensure that they remain responsive to the overall environmental objectives of the airport sponsor. If early examination indicates that the principal alternatives are likely to have extensive environmental effects, it may be appropriate to develop additional alternatives. If there are no additional alternatives, the decision to move forward with the existing alternatives should be made only after careful consideration by the airport sponsor.

d. **Fiscal Factors** – Preparing rough cost estimates is a very effective way to compare alternatives and should be done in all alternatives analyses. Cost estimates should account for any special differences among alternatives. For example, in comparing a green-field site versus the redevelopment of an existing site, the evaluation should consider the respective cost advantages and disadvantages. A green-field site might have cost premiums associated with site work, installation of support infrastructure, and access roadways. At the same time, redevelopment might have cost premiums associated with demolition, phasing, and relocations.

Early fiscal analysis may also be necessary to determine if the alternatives are responsive to the fiscal constraints of the study airport. The identification of likely funding sources and their funding potential are important factors in determining the feasibility of the alternatives. If early estimates indicate that the principal alternatives are beyond the realistic fiscal capability of the airport, planners should include that information in the master plan and develop more fiscally responsible alternatives.

Planners may also prepare a preliminary benefit-cost analysis, following the current benefit/cost analysis guidance from the FAA Office of Airports. However, for most alternatives reviews, a summary analysis using reasonable estimates and judgment will be sufficient. Planners should conduct any required benefit-cost analyses in accordance with FAA guidelines when the development and financing plans are sufficiently refined to allow a more accurate estimate of the costs, benefits, and other factors.

905. SELECTION OF A RECOMMENDED ALTERNATIVE

a. The selection of an airport sponsor's recommended alternative (steps 9 and 12 in Figure 9-1) will usually be based on a combination of efforts, including: summation of the alternative evaluation criteria, supplemental analyses and evaluations, stakeholder input through the public involvement process, and sponsor preferences. The level of complexity of the selection process typically reflects the complexity of the airport's situation. However, in all cases the reasons for the selection of the recommended alternative should be clearly documented.

b. Summation of the alternative evaluation criteria can take many forms. Because this effort typically relies heavily on the judgment of the planning team, particular care must be taken to ensure that the summation process is clear and understood by the airport sponsor and study participants. In simple situations with relatively few evaluation criteria, a recommended alternative can often be selected with little or no summation of the evaluation criteria. In more complex settings, a matrix of findings can be effective in selecting a recommended alternative. In addition, a matrix of findings can document

matters of judgment; facilitate the sponsor's, FAA's, and others' participation in the decision making process; and build consensus regarding the recommended alternative.

In master plans that are controversial or will lead to an Environmental Assessment or that may require an Environmental Impact Statement, the planner should ensure that the process used to select a recommended alternative is comprehensive, logical, well documented, and has meaningful public participation. The public involvement process during a master plan serves an important function, but it does not replace the public involvement process required by NEPA and described in FAA Order 1050.1, *Environmental Impacts: Policies and Procedures* and FAA Order 5050.4, FAA Airports guidance for complying with NEPA. If the master plan contains short-term development projects that are known to require additional environmental processing, the airport sponsor should consider beginning the environmental processing prior to selecting a recommended alternative. Selecting a recommended alternative prior to beginning the environmental processing may complicate the NEPA process because the various agencies and public involved may perceive that the NEPA analysis is biased.

906. AIRPORT SITE SELECTION

The emphasis in airport planning is normally on the expansion and improvement of existing airports. Sometimes, however, an existing airport cannot be expanded to meet the future demand and a new or supplemental airport is required. In these cases, a new airport site may be selected as part of the airport planning process. The process of identifying, evaluating, and selecting a potential site for a new airport is similar to the process of identifying, evaluating, and selecting alternatives for individual airport projects. Appendix E contains guidance on the airport site selection process. If planners want to use Federal financial assistance under the AIP for follow-on planning or site acquisition and development, the FAA must approve the selected site before any additional planning work is started.

907. DOCUMENTATION GUIDELINES

a. The documentation of the alternatives identification, evaluation, and selection process should be a separate chapter in the master plan technical report. The planner should provide a summary at the beginning of the chapter that describes the recommended alternative and its principal benefits.

b. Planners should move technical information to appendices to improve the readability and organizational flow of the documentation.

c. Since this documentation may be heavily relied upon in a subsequent Environmental Assessment or Environmental Impact Statement, the planner should ensure that the documentation is logical and thorough. It should make clear what alternatives were considered, why particular alternatives were discarded, and why the recommended alternative was selected.

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Chapter 10 Airport Layout Plans

1001. GENERAL

a. This chapter provides guidance in the preparation of the drawings that make up the Airport Layout Plan (ALP) drawing set. The ALP depicts existing airport facilities and proposed developments as determined from the planners' review of the aviation activity forecasts, facility requirements, and alternatives analysis. The process outlined in this chapter also applies to ALPs that are prepared without a master plan.

b. FAA Order 5100.38, *Airport Improvement Program Handbook*, provides supplemental guidance for the preparation of an ALP. United States Code (USC) 47107(a) requires, in part, a current ALP approved by both the sponsor and FAA prior to the approval of an airport development project. USC 47107(a)(16) requires that the airport sponsor maintain an ALP that ensures the safety, utility and efficiency of the airport. Grant assurance number 29 requires that the sponsor keep the ALP up to date at all times. As stated in Order 5100.38, an ALP remains current for a five-year period, or longer, unless major changes at the airport are made or planned.

c. The minimum elements of the ALP drawing set are defined in Appendix F, *Airport Layout Plan*, of this AC. This chapter complements the ALP drawing set requirements in Appendix F.

d. The ALP preparer must work closely with the airport sponsor, the responsible FAA office, and if appropriate, the applicable state agency, to define the requirements, standards, and criteria to be employed. To ensure that the ALP is comprehensive, all parties must agree to its content and standards.

e. The ALP graphically depicts current and future airport facilities. The remaining drawings included in the ALP drawing set are considered appended to the ALP and are a part of it.

f. The five primary functions of the ALP that define its purpose are:

1) An approved plan is necessary for the airport to receive financial assistance under the terms of the Airport and Airway Improvement Act of 1982 (AIP), as amended, and to be able to receive specific Passenger Facility Charge funding. An airport must keep its ALP current and follow that plan, since those are grant assurance requirements of the AIP and previous airport development programs, including the 1970 Airport Development Aid Program (ADAP) and Federal Aid Airports Program (FAAP) of 1946, as amended. While ALPs are not required for airports other than those developed with assistance under the aforementioned Federal programs, the same guidance can be applied to all airports.

2) An ALP creates a blueprint for airport development by depicting proposed facility improvements. The ALP provides a guideline by which the airport sponsor can

ensure that development maintains airport design standards and safety requirements, and is consistent with airport and community land use plans.

3) The ALP is a public document that serves as a record of aeronautical requirements, both present and future, and as a reference for community deliberations on land use proposals and budget resource planning.

4) The approved ALP enables the airport sponsor and the FAA to plan for facility improvements at the airport. It also allows the FAA to anticipate budgetary and procedural needs. The approved ALP will also allow the FAA to protect the airspace required for facility or approach procedure improvements.

5) The ALP can be a working tool for the airport sponsor, including its development and maintenance staff.

g. The ALP drawing set is a set of planning drawings and is not intended to provide design engineering accuracy. Individual items such as runway coordinates, obstruction survey data, and application of airport design standards must comply with Federal survey standards. The ALP preparer will need to define accuracy requirements for specific elements of the ALP in cooperation with the airport sponsor and approving agencies.

h. Airport Layout Plans are prepared either as first time ALPs, formal revisions based on changes to the airport, or informal revisions based on minor improvements to the airport. Informal revisions, often referred to as pen-and-ink revisions, can be made to individual sheets of the ALP drawing set, although the responsibility for review and approval must still be coordinated with the FAA. These and other requirements are discussed in FAA Order 5100.38, *Airport Improvement Program Handbook*.

1002. AIRPORT LAYOUT PLAN DRAWING SET

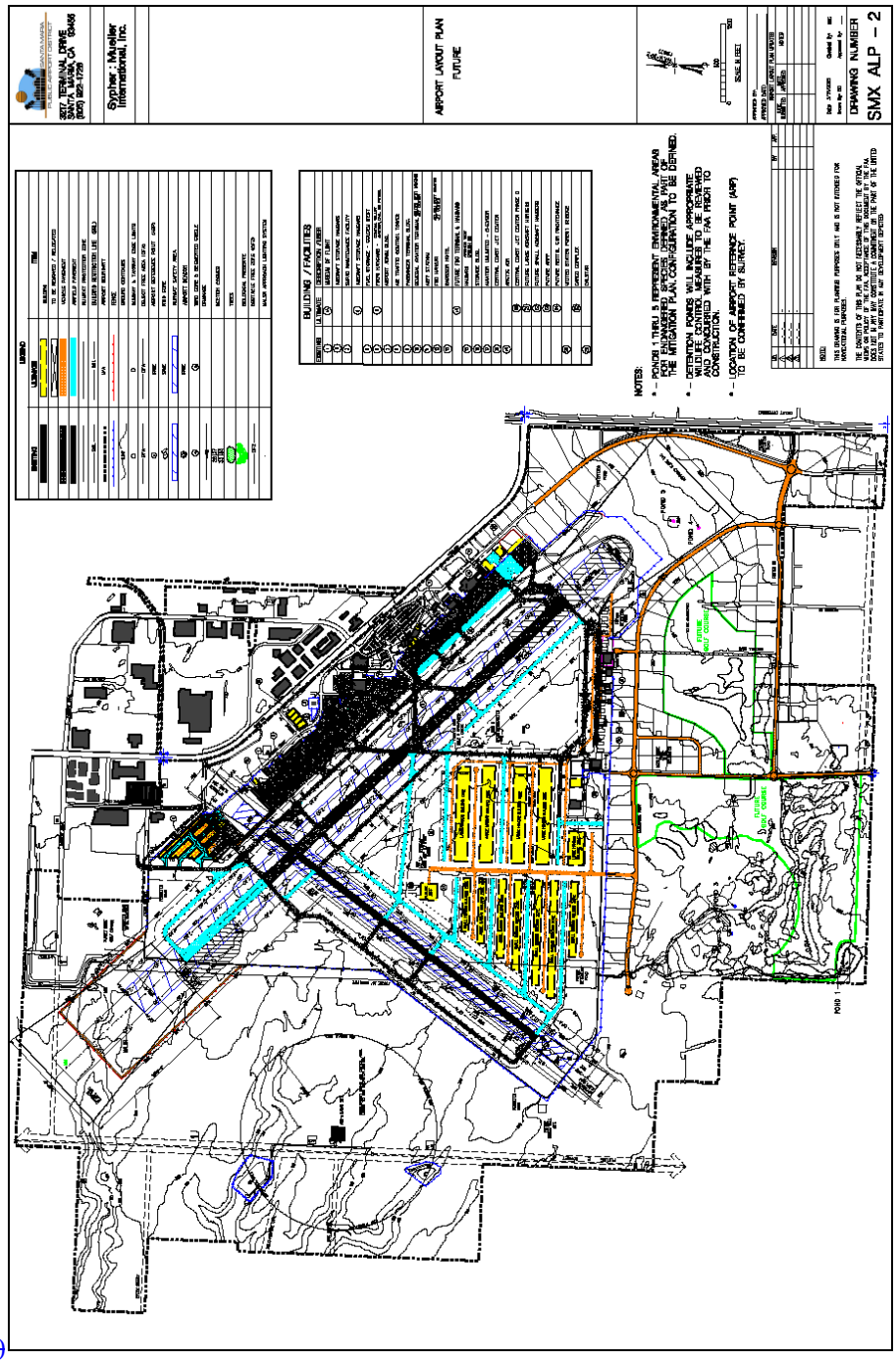
a. The individual sheets that comprise the Airport Layout Plan drawing set will vary with each planning effort. The ALP preparer, airport sponsor, FAA and any other approving agency must determine which sheets are necessary during the project scoping activities.

b. The required content of individual sheets is defined in Appendix F, *Airport Layout Plan*. Many state aviation agencies also have specific ALP requirements. Drawings that might be included in the Airport Layout Plan drawing set are described below and those that are required as minimum ALP drawings are identified as such:

1) ***Cover Sheet*** – A separate cover sheet, with approval signature blocks, airport location maps, and other pertinent information as required by the local FAA Airports office.

2) ***Airport Layout Plan*** – (Required) A drawing depicting the existing and future airport facilities. The drawing should include required facility identifications, description labels, imaginary surfaces, Runway Protection Zones, Runway Safety Areas and basic airport and runway data tables. It may be necessary to include the data tables on a separate sheet. Figure 10-1 is an example of an ALP drawing.

Figure 10-1: Airport Layout Plan Drawing



Source: Santa Maria Airport (SMX), prepared by Sypher:Mueller.

Note: This is a draft airport layout plan and has not yet been reviewed or approved by FAA.

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3) ***Data Sheet*** – A separate sheet containing basic airport and runway data tables.

4) ***Facilities Layout Plan*** – A drawing that depicts existing and future facilities, and only critical, non-overlapping clearance criteria, with minimal text. It is essentially a simplified ALP.

5) ***Terminal Area Plan(s)*** – This plan consists of one or more drawings that present a large-scale depiction of areas with significant terminal facility development. Such a drawing is typically an enlargement of a portion of the ALP. At a commercial service airport, the drawing would include the passenger terminal area, but might also include general aviation facilities and cargo facilities.

6) ***Airport Airspace Drawing*** – (Required) 14 CFR Part 77, *Objects Affecting Navigable Airspace*, defines this as a drawing depicting obstacle identification surfaces for the full extent of all airport development. It should also depict airspace obstructions for the portions of the surfaces excluded from the Inner Portion of the Approach Surface Drawing.

7) ***Inner Portion of the Approach Surface Drawing*** – (Required) Drawings containing the plan and profile view of the inner portion of the approach surface to the runway and a tabular listing of all surface penetrations. The drawing will depict the obstacle identification approach surfaces contained in 14 CFR Part 77, *Objects Affecting Navigable Airspace*. The drawing may also depict other approach surfaces, including the threshold-siting surface, those surfaces associated with United States Standards for Instrument Procedures (TERPS), or those required by the local FAA office or state agency. The extent of the approach surface and the number of airspace obstructions shown may restrict each sheet to only one runway end or approach.

8) ***On-Airport Land Use Drawing*** – A drawing depicting the land uses within the airport property boundary.

9) ***Off-Airport Land Use Drawing*** – A drawing depicting land uses and zoning in the area around the airport. At a minimum, the drawing must contain land within the 65 DNL noise contour. For general aviation airports or low activity commercial service airports, where noise issues are less important, on-airport land use and off-airport land use drawings may be combined.

10) ***Airport Property Map*** – A drawing depicting the airport property boundary, the various tracts of land that were acquired to develop the airport, and the method of acquisition. This drawing is only required for those airports that have acquired land with Federal funds or through an FAA-administered land transfer program; however, it may be useful to all airport sponsors. If any obligations were incurred as a result of obtaining property, or an interest therein, they should be noted. Obligations that stem from Federal grant or an FAA-administered land transfer program, such as surplus property programs, should also be noted. The drawing should also depict easements beyond the airport boundary. An airport property map is not a substitute for an Exhibit A unless it is prepared in accordance with AC 150/5100-17, *Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects.*

11) ***Runway Departure Surface Drawing*** – This drawing depicts the applicable departure surfaces as defined in Appendix 2 of FAA AC 150/5300-13. The surfaces are shown for runway end(s) designated primarily for instrument departures. The one-engine inoperative (OEI) obstacle identification surface (OIS) should be shown for departure runway end(s) supporting air carrier operations.

12) ***Utility Drawing*** – This drawing depicts the location and capacity of major utilities on the airport and in the surrounding area.

13) ***Airport Access Plans*** – If access to the airport is a significant issue, a separate airport access drawing should be created, depicting the major routes of various modes of transportation that serve the airport. Such a drawing could also include proposed improvements to the system.

14) ***Other Plan(s)*** – Drawings that address a specific, unique need at the airport. The sponsor, FAA and other approving agencies must discuss and agree to include them.

1003. COMPUTER-AIDED DESIGN STANDARDS

a. ALP drawings may be produced electronically using design software. The sponsor and responsible reviewing agency will select what program to use. Design standards should be established and may include defined line types, line weight/thickness, lettering styles, symbols, and file-naming conventions. The sponsor, FAA and/or state agency must determine which standards must be followed in development of the Airport Layout Plan drawing set.

b. Following computer design standards will facilitate the review and approval of the drawings by the responsible agency, reduce the chance of someone misunderstanding the drawings, produce drawings that are useful for the reviewing agency and the airport sponsor, and produce drawings that may be used in subsequent planning and design efforts.

1004. GEOGRAPHIC INFORMATION SYSTEMS APPLICATIONS

a. Geographic Information Systems (GIS) are computer-based software that links geographic features on a map with various databases. GIS may be used by the airport sponsor for a number of purposes, including the inventory and maintenance of airport facilities, preparation for emergency services, planning for airport improvements, the inventory of airport property, and the inventory of sensitive environmental areas.

b. The ALP may be linked to an existing GIS or the airport sponsor may implement a new GIS incorporating the ALP. The ALP preparer should understand the intended use of the GIS and the associated ALP standards and requirements. The ALP standards may include specific computer aided design standards for GIS compatibility and ALP requirements may include specific facility and data needed for GIS applications. For example, a GIS database including the airfield lighting and signing will define a portion of the inventory and mapping effort. Similarly, a GIS used for emergency services or analysis of airport access may require mapping of the local road network.

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1005. BASE MAPPING AND DATA SOURCES

Base mapping and data source issues should be discussed as part of the master plan scoping, since they may affect not only the ALP drawings, but also subsequent environmental matters. These issues might include the following:

a. **Base Mapping** – The level of detail required for the base mapping of the ALP must be determined by the airport sponsor, FAA, state agency, and the ALP preparer. Although some sponsors may already have the necessary data, new base mapping will often be required. Base mapping is typically done at the outset of the planning effort and is used in the facility requirements determination and alternatives analysis and selection. Since these processes ultimately establish the total area that will be depicted on the drawings, the preparer should establish the area that must be mapped by considering the following:

- Potential airport expansion beyond the existing boundaries
- The extent of noise contours
- Location of other potential environmental impact areas
- The area required to address ground access issues
- The area to be depicted on the Approach Surface Drawing
- Implications of the use of GIS

The ALP preparer will need to determine, based on topography, budget, and future uses of the base mapping, what intervals of topographical contours to use on the maps. Topographic issues may be important in the alternatives analysis, which may require that reduced contour intervals be used. The ALP preparer should also consider how to analyze airspace obstructions and violations. If aerial photogrammetry is used for the obstruction analysis, mapping can be paired with it, but parameters for both products must be established.

b. **Airspace Obstruction Identification and Analysis** – An assessment of airspace obstructions near the airport should be included on the Approach and Departure Surfaces Drawings and the Airspace Drawing. The ALP preparer and reviewing agency must establish data sources and parameters for this assessment. Obstruction data sources include airport obstruction removal programs, previous obstruction survey data, the airport's Obstruction Chart, and the FAA Digital Obstacle File. Numerous methods may be used for inventorying new obstructions or for verification of identified obstructions, including a physical site survey using traditional methods, aerial photogrammetry; and laser mapping. Obstruction analysis parameters include the extent of the approach surfaces to be surveyed and analyzed, and the survey of areas off the sides of the runways. Existing obstruction clearing and maintenance programs at the airport may minimize the need for extensive obstruction surveying. Conversely, development of a new airport, construction of new runways, and the extension, reclassification, or approach procedure revisions to existing runways may require additional surveying. Surveys should be done in accordance with FAA Advisory Circulars 150/5300-16, 17, and 18.

c. **Off-Airport Property** – The airport property map will identify the parcels that were acquired to develop the airport. The airport alternatives analysis may benefit from an inventory of parcels surrounding the airport boundary, particularly in areas of anticipated

airport development. Being able to identify these parcels by size and use may also benefit potential subsequent environmental studies. The ALP preparer, the responsible agency, and airport sponsor should determine if expanding the property map to include these areas is necessary.

1006. CHECKLISTS

a. The primary guideline for development of the ALP and drawing set is the FAA checklist in Appendix F, *Airport Layout Plan*.

b. Checklists from FAA Regional and District Offices and state aviation offices may supplement the FAA checklist. The ALP preparer should identify applicable checklists at the outset of the project.

c. For airports not included in the National Plan of Integrated Airports System (NPIAS), the FAA's checklist may not apply; states may have separate requirements.

d. Planners must verify that checklists are current, since they are continually revised to reflect changing Federal and state standards.

e. Once the applicable checklists have been identified, the ALP preparer should consult with the reviewing agencies to define the specific items on the checklists that are applicable to the project. Checklists are comprehensive and not all items are applicable to a specific project.

1007. APPROVALS

a. The ALP drawing set approval process will vary, depending on the requirements of the local FAA Region and District office and those of the state aviation agency. The airport sponsor, FAA, state, and ALP preparer need to identify which approval process will be used at the outset of ALP preparation.

b. FAA Order 5100.38, *Airport Improvement Program Handbook*, states that FAA review and coordination of the ALP will cover Federal interests and must consider any required coordination that was not completed at the local or state level.

c. The review of the Airport Layout Plan drawing set will typically be completed through multiple submittals. Milestones must be determined by the reviewing agency, but typically include:

1) ***Preliminary ALP submittal*** – The drawing set should be submitted to the sponsor for review and comment to ensure that the graphic depictions correctly present the sponsor's goals.

2) ***Draft ALP Submittal*** – The drawing set and support documentation should be submitted to the FAA and state aviation agencies for review and comment. Supporting documentation might include ALP checklists and must be predetermined with reviewing agencies. Review comments may be addressed prior to submittal of the Draft ALP drawing set for airspace review.

3) ***Draft ALP Airspace submittal*** – The Draft ALP drawing set should be submitted to the reviewing agency for distribution to various FAA offices for airspace review. As noted above, in some cases the FAA or state may require that the Draft ALP drawing set be submitted for review and comment and then resubmitted for airspace review after their comments have been addressed. In other cases, the FAA may conduct the airspace review at the same time as its general review of the Draft ALP drawing set.

4) ***Final ALP submittal*** – The ALP drawing set should be revised, as needed, based on the airspace determination and review comments if these were not addressed prior to submitting the Draft ALP drawing set for airspace review. The final ALP drawing set and accompanying narrative (Master Plan Report or ALP Narrative Report) should be sent to the reviewing agency for distribution.

d. Conditional Approval – The FAA may approve the Airport Layout Plan drawing set conditionally, based on specific components that will be subject to further review and approvals prior to funding and implementation. See Chapter 5 for additional information regarding master plan environmental review and ALP approval.

e. Unconditional Approval – The FAA may unconditionally approve the Airport Layout Plan drawing set when all proposed development projects are either categorically excluded from additional environmental processing, have received a Finding of No Significant Impact resulting from an Environmental Assessment, or have received a Record of Decision resulting from an Environmental Impact Statement.

1008. DOCUMENTATION GUIDELINES

a. The requirements for documentation of the Airport Layout Plan drawing set must be determined with the airport sponsor and the reviewing agency or State agency. Documentation will typically include a complete reduced-size set of the Airport Layout Plan drawing set and the accompanying text. The master plan will provide the narrative if the ALP is prepared as part of a master plan. If the ALP is prepared separately as an ALP Update, an ALP narrative is required. The narrative will typically describe ALP development criteria and the rationale for the development shown on the ALP. Examples of these include airport reference code-related design criteria unique to specific areas of the airfield, or known or proposed modifications to FAA design standards. (See Section 202.c of this AC for further guidance on the ALP Narrative Report.)

b. The quantity and form of ALP drawing sets must also be defined by the airport sponsor, FAA and state agencies. A reproducible, signed original copy and multiple paper copies of the drawings set may be required. Distribution requirements should be established during the project scoping.

c. Electronic files of the Airport Layout Plan drawing set may be prepared. These files are typically provided to the reviewing agency and may also be provided to the sponsor.

d. Once approved by the sponsor and approving agency, the ALP becomes a legal document and the sponsor should consider placing security controls on the ALP drawing set to prevent unauthorized changes to the drawings.

Chapter 11 Facilities Implementation Plan

1101. GENERAL

a. The facilities implementation plan provides guidance on how to implement the findings and recommendations of the planning effort. Facility implementation plans will vary considerably, depending on the complexity of the projects and the airport sponsor's preferences. In some cases, a simple schedule, listing of key projects, project descriptions, timing of key activities, estimated development cost, interrelated projects, and any special considerations will be sufficient. Other situations may warrant a detailed implementation plan that includes a comprehensive master schedule for the implementation of the major projects, a detailed coordination plan outlining key activities and responsibilities, and detailed project descriptions in the form of project data sheets or project booklets for each major project. In all cases, an implementation plan should provide the airport sponsor and FAA with the information they will need to integrate the master plan's recommendations with the daily activities of the airport.

The airport sponsor, FAA, and other involved parties may use similar terms to describe somewhat different components of the facility implementation plan, particularly in regard to what makes up a Capital Improvement Plan (CIP). Airport sponsors maintain a "capital improvement program" or a "capital improvement plan" that includes all of their airport planning and development projects, both eligible and ineligible for AIP funding. The FAA places AIP eligible projects from the airport capital improvement plan into the planning module of the FAA's System of Airport Reporting (SOAR) (formerly known as the NPIAS) for the airport. The FAA then develops an Airports Capital Improvement Plan (ACIP) in SOAR by applying a priority system and expected funding levels to these projects and selecting those that it expects to be able to fund.

Regardless of the terms used, the facilities implementation plan must address all of the airport's planned capital projects (even those projects that are not associated with the recommendations of the master plan) to ensure that adequate fiscal, staff, scheduling, and other resources are available. In addition, all documentation should be prepared so that it will be clearly understood by all parties.

The facilities implementation plan must balance funding constraints; project sequencing limitations; environmental processing requirements; agency and tenant approvals and coordination processes; business issues, such as leases and property acquisition; and sponsor preferences. The plan must also be coordinated with the master plan ALP and the airport's financial plan.

The facilities implementation plan may change from year to year in response to changing conditions. Therefore, the facility implementation plan should be prepared so that it is easy to update after the master plan is completed. For example, future aviation activity may grow more quickly than the initial facilities implementation plan anticipated, requiring modification of the plan to allow earlier implementation of projects. It should be more detailed in its early years than in the later years to reflect the imprecise nature of long-range facility planning.

1102. FORMULATION OF THE CAPITAL IMPROVEMENT PLAN

a. A new or revised Capital Improvement Plan (CIP) is a key element of the facility implementation plan. The projects illustrated on the ALP should be more precisely described in the sponsor's CIP. While the ALP illustrates facility improvements for broad time periods, (5, 10, and 20 years), those descriptions must be refined into specific projects for the CIP. The airport sponsor will then be able to integrate the master plan projects into its overall program of facility improvement projects, repair projects and maintenance projects. In some cases, planners may need to significantly revise the sponsor's existing CIP if it includes projects that are no longer relevant to the airport's development as a result of changes in the master plan. At large airports, where there may be many ongoing development projects, it can be difficult to integrate the projects identified in the master plan into the sponsor's existing CIP. The planner should work with the sponsor to define ongoing projects with regard to schedule, scope, and sources and uses of funds in order to integrate the master plan projects into a realistic CIP.

b. Given the wide variability in project descriptions and CIP processes, the planner needs to understand the requirements of the sponsor, FAA, and other applicable agencies before undertaking this task. Effective coordination among the planner, FAA, and the sponsor is essential. The airport's CIP contains all projects including those that may not be reflected in the FAA's planning module of SOAR. The level of detail in the sponsor's CIP may also vary considerably, depending on the complexity of the study airport and sponsor preference.

   Specific projects, based on the ALP, should be divided into smaller projects that reflect how projects are approved, designed, and constructed. Planners should maintain an appropriate project scope in designing individual projects. For example, if the master plan recommends the extension of a runway, the project would include extending the runway, as well as associated projects such as extending the parallel taxiway and adding associated navigational aids, electrical systems, and service roadways. However, if the master plan recommends the relocation of a passenger terminal, the subsequent projects associated with that could be extensive in themselves, including projects to address access roadway modifications, terminal area parking, terminal curb and roadway, terminal building and concourse, terminal apron, access taxiways, and miscellaneous support infrastructure. In all cases, however, the standard descriptions outlined in the SOAR planning module should be used for projects submitted to the FAA for funding consideration. Each component of an overall project should be described. For example, the land acquisition that is part of a runway extension should be described as "Extend Runway – Land Acquisition, Phase 1."

   Specific projects can be described as project listings on a master table, on individual project data sheets, or in projects booklets. The approach used will vary with the level of detail needed to support the sponsor's needs. Project descriptions may include the following types of information:

   - Project identification (name and project number)
   - Project scope (detailed project description and illustrations)
   - Concise project purpose or objective (why the project is needed)

- Project schedule (begin/end dates for pre-design, design, construction, close out, and start-up)
- Prerequisites, dependent, and interrelated projects
- Project budget (construction cost estimate, including quantities and unit costs, soft costs, and contingencies)
- Environmental processing required
- Funding information (AIP grant and PFC estimates, other funding source),
- Special considerations (lease considerations, property acquisition requirements, known environmental mitigation requirements, and site constraints)
- Identification of responsibilities (key activities and when they must be completed, by agency, organization, position, or person)
- Benefit/cost information (see Chapter 12 for a discussion of the FAA's *Airport Benefit Cost Analysis Guidance*)

1103. PROJECT SEQUENCING AND THE COMPREHENSIVE MASTER SCHEDULE

a. Airport projects may be complex, so the implementation plan should consider the interrelationships among the projects in the sponsor's existing and revised CIP. Planners should examine all projects to establish interrelationships, determine a sequence to minimize conflicts, and establish a master schedule to ensure the sequence is maintained throughout the implementation plan.

The facility implementation plan should cover the same years as the forecasts in the planning effort. Typically, detailed information should be provided for the five-year horizon, with less detail provided for the longer planning periods.

In addition to the technical aspects of designing and constructing the projects, the project sequencing plan or master schedule should reflect the sponsor's overall financial, environmental, and strategic plans. Developing the project-sequencing plan is an iterative process and may result in the reformulation of projects or revisions to the airport's financial, environmental, and strategic plans.

Since activity rarely grows exactly as forecast in the master plan, establishing triggers for key improvements, such as an aircraft apron expansion, additional aircraft storage hangars, or additional runway capacity, is recommended to allow a sponsor to respond to actual activity levels as they occur. The project-sequencing plan should document these triggers along with the year in which planners expect them to be reached. Such an approach will be particularly useful for the longer-range part of the implementation plan.

Preparation of the project-sequencing plan should be undertaken with a full understanding of how the airport sponsor will use the implementation plan. Given the high levels of complexity associated with such an effort, planners should ensure that planning resources are efficiently used to meet the sponsor's needs. In many cases, a plan that simply highlights the order of the projects and key activity triggers will be sufficient. In more complex situations, an implementation plan should include the preparation of an actual master schedule that incorporates project sequencing, key activities, and the identification of the responsible parties.

1104. KEY ACTIVITIES AND RESPONSIBILITIES

a. The implementation plan should provide information regarding key activities and responsibilities. Because the lead-time associated with many projects is significant, the early identification of key activities and responsibilities can help ensure that essential preparatory activities are completed on a timely basis. As with other elements of the implementation plan, the level of detail regarding key activities and responsibilities will vary, depending on the sponsor's needs and the complexity of the program.

The key activities and responsibilities will vary from airport to airport, but will include many of the following:

1. ***Sponsor-specific project approval activities***, such as airport board, council, or other administrative body approvals; various budgetary approvals and funding appropriations; and similar sponsor-specific items
2. ***Airline and other tenant approvals*** and lease modifications
3. ***Project funding activities***, such as FAA and other agency grant applications, PFC application, and long-term debt financing.
4. ***Environmental processing activities***, as appropriate, under current versions of FAA Order 1050.1, Environmental Impacts: Policies and Procedures and FAA Order 5050.4, FAA Airports guidance for complying with NEPA.
5. ***Land acquisition activities***
6. ***Sponsor-specific project implementation process activities*** associated with designing and constructing the projects
7. ***Agency coordination activities***, including the FAA, local metropolitan planning organization or its equivalent, Transportation Security Administration, Department of Defense, and other agencies that may have direct involvement with the airport
8. ***Public Coordination activities*** that carry the public involvement process into the project implementation phase

At a minimum, the listing of key activities and responsibilities should include what activities should be undertaken, by what party, and when. In more complex situations, it may be useful to provide a schedule of activities or to incorporate the key activities and responsibilities into the overall sponsor's CIP master schedule.

1105. DOCUMENTATION GUIDELINES

a. The documentation of the facilities implementation plan will vary, depending on the complexity of the study airport and sponsor objectives. Because the implementation plan may be read as a stand-alone document, planners should provide enough source documentation so the plan can be independent of the master plan. Planners should use appendices to improve the readability and organizational flow of the documentation, particularly if project data sheets, project booklets, or benefit/cost analyses are included. The documentation should include any electronic spreadsheets and files so as to facilitate the modification of the facilities implementation plan as needed. Prior coordination with the local FAA Airports office will facilitate the integration of the sponsor's CIP into the planning module of SOAR.

b. The documentation of the facilities implementation plan should normally include a new or revised CIP for at least the short-term airport development projects. Planners should address major developments in sufficient detail so the sponsor will know how to fund each project in the CIP. The plan should clearly indicate other agencies that are anticipated to provide grants-in-aid so they can determine the appropriate level of their involvement.

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Chapter 12 Financial Feasibility Analysis

1201. GENERAL

a. This chapter provides guidance on what will be required to demonstrate the airport sponsor's ability to fund the projects in the master plan. Planners should emphasize the projects that they expect to implement over the near-term, as presented in the capital improvement plan (CIP). A more general discussion of the funding of the medium- and long-term projects is more appropriate because of the uncertainty of future funding and - possible shifts in the importance of those projects.

b. The sponsor's ability to fund the recommended projects should be a major consideration in preparing the CIP and facilities implementation plans. The financial feasibility analysis should take place concurrently with the development of the CIP and the facilities implementation plan.

c. The level of effort necessary to conduct a financial feasibility analysis will vary considerably, based on the size of the airport. In general, items to consider are: the funding sources for the CIP, a projection of revenues and expenses (pro forma cash flow analysis) for each year of the CIP, and methods to enhance airport revenues.

d. During the scoping process for the master plan, planners may determine that the financial feasibility analysis need not be a stand-alone chapter. The CIP and facilities implementation plan should provide adequate information on how the projects in the CIP will be funded.

1202. SOURCES OF FUNDING

a. Airport development can be financed from several sources, including Federal and state grants-in-aid, private financing or third party development, passenger facility charges, customer facility charges, a variety of bonds, and local funds.

Federal Funding – Some airport projects are eligible for FAA funding through the Airport Improvement Program (AIP), which provides entitlement funds for primary and all-cargo airports based upon their annual enplaned passengers and pounds of landed cargo weight. Other distributions of AIP funds include states, general aviation airports, and non-primary commercial service airports. Some AIP funds are distributed directly to states that are in the block grant program. The states then allocate the funds to individual airport projects. Additional AIP funds, designated as discretionary, may also be used for eligible projects, based on the FAA's national priority system.

Although the AIP has been reauthorized several times and the funding formulas have been periodically revised to reflect changing national priorities, the program has remained essentially the same. Public use airports that serve civil aviation may receive AIP funding for eligible projects, as described in FAA Order 5100.38, *Airport Improvement Program Handbook*. The airport sponsor must fund the remaining project cost, using a combination of the funding sources discussed in this section.

State Funding – Many states have programs to assist in airport capital development. The administration of these funds depends on the mechanisms established in each state. The most common source is a state aeronautics commission or department. State funds are often used to provide some part of the non-Federal share of projects supported by the FAA and for other projects that have been included in the state airport or aviation system plan. Most states have established a priority system for the allocation of state funds. Some states also provide limited funding to airports to support local economic development.

Third Party Development – Third party financing may be appropriate in a case where an airport sponsor uses a third party developer or a tenant to finance a construction project. Only projects with a strong positive cash flow can support this type of financing. Generally, the third party would lease the structure for a period of years to the tenant paying the airport ground rents. According to the terms of the agreement, the airport sponsor receives ownership of the asset upon expiration of the lease. This method of financing preserves the airport sponsor's cash to fund higher priority projects. Examples of projects that are funded in this manner include the development of passenger terminals, general aviation hangars, corporate hangars, and cargo facilities.

Passenger Facility Charge – The Aviation Safety and Capacity Expansion Act of 1990 authorized the Secretary of Transportation to grant public agencies the authority to impose a Passenger Facility Charge (PFC) to fund eligible airport projects. PFC revenue may be used on a "pay-as-you-go" basis or leveraged to pay debt service on bonds or other debt used to pay for PFC-eligible projects. Although the FAA is required to approve the collection and use of PFCs, the program permits local collection of PFC revenue through the airlines operating at an airport and provides more flexibility to airport sponsors than AIP funds.

To be eligible for PFC funding, a project must preserve, enhance, or make a significant contribution to the safety, security, or capacity of the national air transportation system; reduce noise or mitigate noise impacts resulting from an airport; improve local air quality in accordance with the Voluntary Airport Low Emission program; or furnish opportunities for enhanced competition between or among air carriers; reduce current or anticipated congestion; or other qualification that may be added to the program over time. Allowable project costs include only those incurred on or after November 5, 1990. Regulations associated with the imposition of a PFC are described in 14 CFR Part 158, as implemented through FAA Order 5500.1, *Passenger Facility Charge*.

Customer Facility Charge – A customer facility charge (CFC) is a fee paid by airport customers for the use of some non-aeronautical service at the airport. These charges are commonly collected from on-airport rental car agencies. The funds are collected by the rental car agency from their customers and then paid to the airport for use in paying the debt service on, for example, a consolidated rental car facility. The airport constructs the facilities on behalf of the agency, allowing them to finance major projects, but keeping the debt off their balance sheets.

Bonds – A variety of bonds can be issued to support airport development projects.

1) ***General obligation bonds*** are backed by the creditworthiness and taxing power of the municipality operating the airport. They usually bear low interest rates because of their high degree of security. However, state laws may limit a municipality's overall debt, and competition from other community financing requirements may preclude their use for an airport project. Some states have an exemption from the debt limitation rule for general obligation bonds because they are used for a revenue producing enterprise.

2) ***Revenue bonds*** pledge the revenues of an airport sponsor to the repayment of debt service. These are the most common source of funding at larger commercial service airports. Revenue bonds are popular because they do not burden the taxpayer or affect the bonding capacity of the municipality. However, their use is limited to airports with a sufficient operating surplus to cover the debt service. Projected Net Revenues must exceed debt service requirements by at least 1.25 times and up to 2.0 times, depending on the strength of the bond issuer and the underlying assumptions with respect to the market risk for the bonds. Interest rates are dependent on the coverage ratio, but in any case will be higher than for general obligation bonds. Other factors that may affect the interest rates on revenue bonds are the strength of the local passenger market and the financial condition of the airlines serving the market.

3) ***Special facility revenue bonds*** are normally issued by the airport sponsor for the construction of a facility for a third party and backed by the revenues generated from that facility. This method of funding can be used for such facilities as maintenance hangars, airline reservation centers, terminal buildings, and air cargo terminals.

4) ***Industrial development bonds*** can be issued by states, local government, or an airport authority to fund the construction of an airport industrial park or other facilities that may attract business and increase non-aeronautical leasing revenues at the airport.

Local Funds – The remaining portion of project costs must be funded from local sources. The local share of project costs can come from the annual cash flow at the airport or with unrestricted cash balances available to the airport sponsor. The local municipality may provide the local share from its annual cash flow or available cash reserves.

1203. FINANCIAL FEASIBILITY

a. **Prepare CIP Funding Plan** – The CIP and development-phasing plan for the CIP prepared in the facilities implementation plan should be summarized, with the potential funding sources clearly identified for each year of the financial plan. The planner should use realistic assumptions about the amount of external funding available so an accurate plan of finance can be carried forward in the financial feasibility analysis.

If the airport sponsor needs to issue debt for projects included in the CIP, it should identify the financing assumptions for the amount of bond proceeds needed to cover the local share and annual debt service requirements.

b. **Review Airport's Financial Structure** – Planners should analyze the financial structure of the airport to determine the composition of the airport's management, relevant airport leases, and other operating issues that will affect future cash flow at the airport.

1) Airports are typically operated under the jurisdiction of city or county government, with airport or aviation departments or public authorities dedicated either to airports or aviation, or with a department responsible for aviation or airports. The ability of the airport to finance capital improvement projects depends upon the political, management, and financial structure under which these entities operate. The airport's ability to support development is based on the likelihood of obtaining Federal and state aid, its ability and willingness to issue a financial instrument to fund a portion of the costs, and the amount of revenue from airport operations.

2) Revenue-producing areas, or direct cost centers, for a high activity commercial service airport typically include the landing area (airfield), aircraft aprons, terminal, (both space rental and concessions), parking and ground transportation, cargo buildings, aircraft maintenance facilities, fixed base operator facilities, and other leased areas. Many of these revenue-producing facilities will not exist at smaller airports.

   Airports commonly use two mechanisms for the recovery of airport operating costs from airlines and other tenants in the airport terminal: the compensatory cost method and the residual cost method. The compensatory approach allocates all airport costs to cost centers and the rates and charges are assigned to airport tenants based upon recovering these costs in proportion to the tenant's use of these facilities and services. A residual methodology has one or more signatory airlines agree to pay the net costs of operating the airport not recovered from other tenants or other sources of airport revenue. One of the basic differences in these two funding mechanisms is the assignment of risk. In the compensatory cost method, the airport sponsor assumes the financial risk, whereas in the residual cost method the signatory airlines assume the risk. These two methodologies represent either end of the airline rate-setting methodology spectrum. Many "hybrid" allocation methodologies are used at commercial service airports.

3) Planners should examine the budgeting process used by the airport to establish the financial management plan for operating revenue, operating and maintenance (O&M) expenses, and capital expenditures.

4) At larger airports where the complexity of the financial analysis increases, the planner should recognize that constraints may occur because of the various legal documents relating to the airport, including any bond ordinance, airline use and lease agreements, and other operating agreements at the airport, such as:

   a) ***A Bond Ordinance or Trust Indenture*** limits the amount of additional debt that an airport sponsor can issue to fund capital projects and may include the application of revenue, rate covenant, and additional bonds test. The application of revenue refers to the priority of the flow of funds of the airport's gross revenues. A rate covenant requires the airport sponsor to set rates, fees, and

charges at the airport at a level that will produce net revenues that will satisfy the debt service coverage requirement. An additional bonds test is the documentation the airport sponsor must produce to prove that the airport can generate the necessary coverage before it can issue additional bonds.

b) ***The Airline Use and Lease Agreement (AULA)*** is the contractual relationship between the airport and the airlines serving the airport. Normally this agreement would specify the airfield facilities available to each airline, the terminal space leased by each airline, and the rates and charges for use of the various facilities, landing fees, apron fees and any other charges. In a residual cost center arrangement, the airlines often have majority-in-interest (MII) approval, which is a weighted "vote" to construct capital projects that are included in the airline rate base. This allows an airport sponsor to include the net cost of a capital project in the airlines' rate base if a majority of the airlines approves that project, based on the terms of the AULA.

c) ***Lease documents*** are established between the airport and aeronautical and non-aeronautical tenants, such as fixed based operators, concessionaires, and airport service providers. Normally these lease agreements specify the term of the lease, the specific assignment of space for these business enterprises, the rental rate or fees for use of the facilities, and a concession fee.

d) ***Analyze Historical Cash Flow*** – The planner should examine both the airport revenues and O&M expenses by cost center, where applicable, for the prior three-to-five years and a historical cash flow profile for the airport that describes financial operating trends. The planner may decide to exclude non-cash expenditures such as depreciation and amortization. The historical cash flow will be useful in projecting future revenues and O&M expenses.

e) ***Prepare Pro Forma Cash Flow Analysis*** – The planner should prepare a pro forma cash flow analysis that projects airport revenues, O&M expenses, existing and new debt service requirements, and other non operating revenues and expenses for each year of the CIP. The general test of financial feasibility applied throughout the planning process is the ability of the airport sponsor to cover the local cost of the CIP through airport cash flow.

(1) Planners for low activity airports should recognize their dependence on Federal and state aid for improvements, but should not rely on the availability of such funds. Instead, they should consider alternative strategies for financing in an effort to become more self-sufficient, in accordance with AIP grant assurances. The master plan should discuss the investment requirements and the benefits of the proposed development, so the airport sponsor can make practical decisions predicated on availability of funds and public investment priorities.

(2) High activity commercial service airports usually generate sufficient revenue to support revenue bond financing for capital improvements. Such airports' need to supplement bond financing with Federal aid will vary in degree,

usually depending on activity levels. High activity commercial service airports are usually self-sufficient and produce adequate cash flow from setting rates, fees, and charges at the airport in accordance with the Bond Ordinance, airline use and lease agreements, and other operating agreements.

(3) In conducting the pro-forma cash flow analysis, the planner should focus on the three to five year time frame that coincides with the CIP. The planner should also emphasize the first 10 years of development, since the CIP is generally better defined during that period. Discuss development during the 10 to 20 year horizon in a broader manner, because projects during this period are often demand driven and will have a neutral effect on the airport's cash flow. In addition, over the longer-term, priorities for airport capital projects may change and a new master plan or update may be completed.

(4) In analyzing the financial feasibility of an airport's CIP, the planner may choose to value construction expenses, operating revenues, and O&M expenses in current year dollars.

(5) The planner may decide to increase the capital cost from current year dollars to the year in which construction is expected. If the planner conducts the analysis in this manner, inflationary impacts must be included in the projection of revenues and O&M expenses, along with increases because of operational factors.

f) ***Conduct Sensitivity Analysis*** – In some cases, a sensitivity test may be warranted to assess financial risk. For example, the planner may want to test different rates of passenger growth to determine how sensitive the financial plan is to this, particularly where PFCs or revenue bonds are being heavily relied upon in the CIP.

1204. REVENUE ENHANCEMENT

a. Airports are often under pressure to improve their financial condition to keep user costs at reasonable levels. In preparing the pro forma cash flow analysis, the planner should compare the financial performance of the study airport to that of comparable airports to identify ways to increase concession, airline, and non-aeronautical revenues.

b. Increases in concession revenues will be subject to the terms of existing operating agreements. Certain concessions may not be subject to operating agreement constraints, including automobile parking rates, future land rental rates, fuel flowage fees, and aircraft tie down fees, but may be subject to others constraints.

c. The existing AULA may not allow the airport sponsor to recover the cost of operating the airport from the airlines, or the terms of the existing airline agreement may no longer meet the needs of the airport sponsor. Alternatively, the airport sponsor may have sufficient unrestricted funds and wish to reduce airline-operating costs. In either case, the master planning process is a good time for the airport sponsor to examine its AULA and

make appropriate revisions, to the extent it is able, particularly if there are projects in the CIP that will require funding from the airlines.

d. Non-aeronautical revenues provide the best opportunity for an airport sponsor to establish new types of lease revenue, based on the use of existing land parcels at the airport. An example of such an arrangement is a short-term lease of land to grow hay, grass or to graze cattle, which would allow the airport sponsor to increase revenues while maintaining control of the future use of the land. The airport sponsor should be aware of the restrictions placed on these activities by 14 CFR Part 139, wildlife hazard concerns, and grant assurances.

1205. BENEFIT COST ANALYSIS

a. The FAA *Airports Benefit Cost Analysis (BCA)*, December 1999, states that when possible, airport sponsors should conduct a BCA as part of the development of the master plan. A formal BCA is required only for projects that enhance capacity at an airport and will receive $5 million or more in AIP discretionary funds or are named in a Letter of Intent.

b. If the airport sponsor decides to submit a complete BCA to the FAA, more detailed cost estimates for a project(s) will be required than those prepared for the facilities implementation plan.

1206. DOCUMENTATION GUIDELINES

a. The documentation of this chapter in the master plan should clearly show the financial feasibility of the CIP.

b. The financial planning chapter of a master plan for a large commercial service airport will be more complex than one for a low activity general aviation airport. In this chapter, planners should consider the funding plan for the CIP, historical cash flow, existing and future debt service requirements, airline rates and charges, airline cost per enplanement, concession revenues per enplanement, and pro forma cash flow analysis.

c. If a BCA has been prepared during the master plan process, it should be included as an Appendix to the master plan report.

d. Documentation provided to the airport should include any electronic spreadsheets and files to facilitate planners in modifying the financial plan on an as-needed basis.

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Appendix A Glossary

Advisory Circular – External publications issued by the FAA consisting of non-regulatory material providing for the recommendations relative to a policy, and guidance and information relative to a specific aviation subject.

Aircraft Approach Category – An alphabetic classification of aircraft based upon 1.3 times the stall speed in a landing configuration at their maximum certified landing weight.

Aircraft Operation – The landing, takeoff or touch-and-go procedure by an aircraft on a runway at an airport.

Aircraft Rescue and Fire Fighting – A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

Airfield – The portion of an airport that contains the facilities necessary for the operation of aircraft.

Airplane Design Group – A Roman numerical classification of aircraft based upon wingspan.

Airport Authority – A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

Airport Capital Improvement Plan – The planning program used by the Federal Aviation Administration to identify, prioritize and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

Airport Improvement Program – A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

Airport Layout Plan – A scaled drawing of the existing and planned land and facilities necessary for the operation and development of an airport.

Airport Master Plan – The planner's concept of the long-term development of an airport.

Airport Obstruction Chart – A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

Airport Reference Code – A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to use the airport. It is a two character code consisting of the aircraft approach category and the airplane design group.

Airport Reference Point – The latitude and longitude of the geometric center of the runway system at an airport.

Airport Sponsor – The entity that is legally responsible for the management and operation of an airport including the fulfillment of the requirements of laws and regulations related thereto.

Airside – The portion of an airport that contains the facilities necessary for the operation of aircraft.

Air Taxi – An aircraft operated under an air taxi operating certificate for the purpose of carrying passengers, mail, or cargo for revenue in accordance with FAR Part 121 and FAR Part 135.

Airport Traffic Control Tower – A facility in the terminal air traffic control system located at an airport which consists of a tower cab structure and an associated instrument flight rules room, if radar equipped, that uses ground-to-air and air-to-ground communications and radar, visual signaling, and other devices to provide for the safe and expeditious movement of terminal area air traffic in the airspace and airports within its jurisdiction.

Annual Service Volume (ASV) – The number of annual operations that can reasonably be expected to occur at the airport based on a given level of delay.

Approach Surface – An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

Apron – A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

Avigation Easement – A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

Based Aircraft – The general aviation aircraft that use a specific airport as a home base.

Benefit Cost Analysis (BCA) – An analysis of the benefit, cost, and uncertainty associated with a project or action. A formal BCA is required for capacity projects of $5 million or more in AIP discretionary funds.

Building Restriction Line – A line defined by specifications and displayed on an airport layout plan beyond which airport buildings must not be located to limit building proximity to aircraft movement areas.

Capital Improvement Plan – The planning program used by the Federal Aviation Administration to identify, prioritize and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

Cargo Service Airport – An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

Citizen's Advisory Committee (CAC) – A group of individuals that weigh recommendations against community goals, values, and needs.

Commercial Service Airport – A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

Computer Aided Design – Software that is commonly used for drafting architectural and engineering drawings.

Conical Service – An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

Critical (Design) Aircraft – The most demanding aircraft with at least 500 annual operations that operates, or is expected to operate, at the airport.

Crosswind – A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

Crosswind Component – The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

Discretionary Funds – Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security or mitigating noise.

Displaced Threshold – An aircraft runway landing area that begins at a point on the runway other than the designated physical end of the runway.

Enplanement – The boarding of a passenger, cargo, freight or mail on an aircraft at an airport.

Entitlement – Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

Environmental Assessment – An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Impact Statement – A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

Federal Aviation Regulations – The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

Finding of No Significant Impact – A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

Fixed Base Operator – A business enterprise located at on airport that provides services to pilots including aircraft rental, training, fueling, maintenance, parking, and the sale of pilot supplies.

General Aviation – The segment of aviation that encompasses all aspects of civil aviation except certified air carriers and other commercial operators such as airfreight carriers.

General Aviation Airport – An airport that provides air service to only general aviation.

Geographic Information System (GIS) – A GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information according to location. It is a technology that manages, analyzes, and disseminates geographic data.

Global Positioning System – A satellite based navigational system that provides signals in the cockpit of aircraft defining aircraft position in terms of latitude, longitude and altitude.

Ground Access – The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

Horizontal Service – An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

Instrument Flight Rules – Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

Instrument Meteorological Conditions – Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

Itinerant Operations – Operations by aircraft that leaves the local airspace.

Landside – The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

Local Operations – Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

Military Operations – Aircraft operations that are preformed in military aircraft.

National Airspace System – The network of air traffic control facilities, air traffic control areas, and navigational facilities throughout the U.S.

National Environmental Policy Act (NEPA) – Federal legislation that establishes environmental policy for the nation. It requires an interdisciplinary framework for federal agencies to evaluate

environmental impacts and contains action-forcing procedures to ensure that federal agency decision makers take environmental factors into account.

National Plan of Integrated Airport Systems – The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

Navigational Aid – A facility used as, available for use as, or designed for use as an aid to air navigation.

Operation – The landing, takeoff or touch-and-go procedure by an aircraft on a runway at an airport.

Passenger Facility Charge (PFC) – The collection of PFC fees for every enplaned passenger at commercial airports controlled by public agencies to be used to fund FAA-approved projects that enhance safety, security, or capacity; reduce noise; or increase air carrier competition.

Peak Hour (PH) – An estimate of the busiest hour in a day. This is also known as the design hour.

Planning Activity Level (PAL) – Selected activity levels that may trigger the need for additional facilities or improvements.

Primary Airport – A commercial service airport that enplanes at least 10,000 annual passengers.

Primary Surface – An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

Record of Decision (ROD) – A public document that reflects the FAA's final decision, rationale behind that decision, and commitments to enforce and monitor mitigation.

Regression Analysis – A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

Reliever Airport – General aviation airports in major metropolitan areas that provide pilots with attractive alternatives to using congested hub airports.

Runway – A defined rectangular area at an airport designated for the landing and taking-off of an aircraft.

Runway Gradient – The ratio of the change in elevation divided by the length of the runway expressed as a percentage.

Scope – The document that identifies and defines the tasks, emphasis and level of effort associated with a project or study.

System Of Airport Reporting (SOAR) – The FAA Office of Airports integrated database that contains airport planning, development, and financial information.

Technical Advisory Committee (TAC) – A group of individuals that provide input on technical issues.

Terminal Area Forecast – The official forecast of aviation activity, both aircraft and enplanements, at FAA facilities. This includes FAA-towered airports, federally contracted towered airports, non-federal towered airports, and many non-towered airports.

Terminal Instrument Procedures – Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

Transient Operations – Operations by aircraft that are not based at a specified airport.

Transitional Surface – An imaginary obstruction-limiting surface defined in FAR Part 77 that extends outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary and approach surface.

Uncontrolled Airport – An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

Visual Flight Rules – Procedures for the conduct of flight in weather conditions above Visual Flight Rules (VFR) weather minimums. The term VFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

Visual Meteorological Conditions – Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

Wide Area Augmentation System – An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Appendix B Useful Reference Materials

1. FAA ADVISORY CIRCULARS

Most of these Advisory Circulars are available for viewing and/or printing on the FAA website at www.faa.gov/regulations/index.cfm.

00-2 Advisory Circular Checklist. Transmits the checklist of current FAA Advisory Circulars and is revised tri-annually. This publication is available on the FAA website at www.faa.gov/aba/html_policies/ac00_2.html.

70/7460-1K Obstruction Marking and Lighting. Describes the FAA standards for marking and lighting structures to promote safety.

70/7460-2K Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace. Provides information to persons proposing to erect or alter an object that may affect the navigable airspace. Explains the need to notify FAA before construction begins and FAA's response to those notices as required by FAR 77.

90-66A Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports without Operating Control Tower. Calls attention to regulatory requirements and recommended procedures for aeronautical operations at airports without operating control towers. It recommends traffic patterns and operational procedures for aircraft, lighter than air, glider, parachute, rotorcraft, and ultra-light vehicle operations where such use is not in conflict with existing procedures in effect at those airports.

90-98 Simultaneous Closely Spaced Parallel Operations at Airports Using Precision Runway Monitor (PRM) Systems. Notify pilots and operators about the establishment of specific air traffic procedures to conduct flight operations into airports identified for simultaneous closely-spaced parallel approaches using PRM systems.

150/5000-12 Announcement of Availability—Passenger Facility Charge (PFC) Application Form 5500-1. Provides guidance for the submission of the PFC application.

150/5020-1 Noise Control and Compatibility Planning for Airports. Provides general guidance for noise control and compatibility planning for airports. Provides specific guidance for preparation of airport noise exposure maps and airport noise compatibility programs by airport sponsors for submission under FAR Part 150 and the Aviation Safety and Noise Abatement Act of 1979.

150/5050-7 Establishment of Airport Action Groups. Provides guidance on the establishment of airport action groups.

150/5060-5 Airport Capacity And Delay. Explains how to compute airport capacity and aircraft delay for airport planning and design.

150/5100-14C Architectural, Engineering, and Planning Consultant Services for Airport Grant Projects. Provides guidance for airport sponsors in the selection and employment of

architectural, engineering, and planning consultants under Federal Aviation Administration airport grant programs.

150/5100-16A Airport Improvement Program Grant Assurance Number One—General Federal Requirements. Describes the Federal requirements contained in Assurance 1 of the Grant Assurances required by the Airport and Airway Improvement Act of 1982, as amended. It is intended for sponsors receiving assistance under the Airport Improvement.

150/5100-17 Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects. Provides guidance to sponsors of airport projects developed under the Airport Improvement Program to meet the requirements of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (PL 91-646, as amended) and the regulations of the Office of the Secretary of Transportation, 49 CFR Part 24.

150/5100-19B Guide for Airport Financial Reports Filed by Airport Sponsor. Provides airport sponsors with guidance for complying with the airport financial reporting requirements required by 49 USC §47107(a)(15).

150/5190-1A Minimum Standards for Commercial Aeronautical Activities on Public Airports. Provides basic information and broad guidance material to assist the owners of public airports in developing and applying minimum standards for commercial aeronautical activities on public airports.

150/5190-4A Model Zoning Ordinance to Limit Height of Objects around Airports. Provides a model zoning ordinance to be used as a guide to control the height of objects around airports.

150/5200-30A Airport Winter Safety and Operations. Provides guidance to assist airport owners/sponsors in the development of an acceptable airport snow and ice control program and to provide guidance on appropriate field condition reporting procedures.

150/5200-31A Airport Emergency Plan. Provides guidance for the preparation of emergency plans at civil airports.

150/5200-33A Hazardous Wildlife Attractants On or Near Airports. Provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports.

150/5200-34 Construction or Establishments of Landfills Near Public Airport. Contains guidance on complying with new Federal statutory requirements regarding the construction of establishment of landfills near public airports.

150/5210-15 Airport Rescue and Firefighting Station Building Design. Provides standards and guidance for planning, designing, and constructing and airport rescue and firefighting station.

150/5220-18 Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials. Provides guidance for site selection, design and construction of buildings used to store and maintain airport snow and ice control equipment and materials.

150/5300-7B FAA Policy on Facility Relocations Occasioned by Airport Improvements or Changes. Reaffirms the aviation community of the FAA policy governing responsibility for funding relocation, replacement and modification to air traffic control and air navigation facilities that are made necessary by improvements or changes to the airport.

150/5300-9A Predesign, Prebid, and Preconstruction Conferences for Airport Grant Projects. Provides guidance for conducting predesign, prebid, and preconstruction conferences for projects funded under the FAA airport grant program.

150/5300-13 Airport Design. Contains the FAA's standards and recommendations for airport design.

150/5300-14 Design of Aircraft Deicing Facilities. Provides standards, specifications, and guidance for designing aircraft deicing facilities.

150/5300-15 Use of Value Engineering for Engineering and Design of Airport Grant Projects. Provides guidance for the use of value engineering in airport projects funded under the FAA's Airport Grant Program. This Advisory Circular should be used by sponsors of airport development projects considering the application of value engineering to projects involving grant funds.

150/5320-5B Airport Drainage. Provides guidance for engineers, airport managers, and the public in the design and maintenance of airport drainage systems.

150/5320-6D Airport Pavement Design and Evaluation. Provides guidance to the public for the design and evaluation of pavement at civil airports.

150/5320-16 Airport Pavement Design for the Boeing 777 Airplane. Provides thickness design standards for pavements intended to serve the Boeing 777 airplane.

150/5325-4A Runway Length Requirements for Airport Design. Provides design standards and guidelines for determining recommended runway lengths.

150/5340-1H Standards for Airport Markings. Contains the FAA standards for markings used on airport runways, taxiways, and aprons.

150/5340-18C Standards for Airport Sign Systems. Contains the FAA standards for the siting and installation of signs on airport runways and taxiways.

150/5360-9 Planning and Design of Airport Terminal Facilities at Non-Hub Locations. Provides guidance material for the planning and design of airport terminal buildings at non-hub locations.

150/5360-12D Airport Signing and Graphics. Provides guidance on airport related signs and graphics.

150/5360-13 Planning and Design Guidelines for Airport Terminal Facilities. Provides guidelines for the planning and design of airport terminal buildings and related access facilities.

150/5390-2A Heliport Design. Provides recommendations and standards for heliport and helistop design.

150/5390-3 Vertiport Design. Provides guidance to planners and communities interested in developing a civil vertiport or vertistop.

150/5395-1 Seaplane Bases. Provides guidance to assist operators in planning, designing, and constructing seaplane base facilities.

2. FAA ORDERS

Virtually all of the following orders are available for viewing and/or printing on the FAA website at www.faa.gov/regulations/index.cfm.

1050.1 Environmental Impacts: Policies and Procedures. Provides policies and procedures to ensure FAA compliance with the provisions of the National Environmental Policy Act. http://www.faa.gov/regulations_policies/orders_notices/

5050.4, FAA Airports guidance for complying with NEPA. Provides instructions and guidance for the preparation and processing of environmental assessments, findings of no significant impact, and environmental impact statements for airport development proposals and other airport activities.

5090.3 (current version) Field Formulation of the National Plan of Integrated Airport Systems. This order contains instructions for FAA Regional offices in the formulation and maintenance of the NPIAS computer database and on the preparation of the Secretary of Transportation's biennial Report to Congress.

5100.37 Passenger Facility Charge. Provides guidance and the processes to be used by FAA personnel in administering the Passenger Facility Charge program.

5100.38 Airport Improvement Program Handbook. Provides guidance and sets forth policies and procedures for the administration of the Airport Improvement Program by the FAA.

5100.39 Airports Capital Improvement Plan. Prescribes the development of the national Airports Capital Improvement Program that serves as the primary planning tool for systematically identifying, prioritizing and assigning funds to critical airport development and associated capital needs for the National Airspace Program.

8260.3 United States Standards for Terminal Instrument Procedures (TERPS) 46. Contains criteria for instrument approach and departure procedures.

3. FEDERAL AVIATION REGULATIONS

Virtually all of the following Federal regulations addressing aviation are available for viewing and/or printing on the FAA website at www.faa.gov/regulations/index.cfm.

14 CFR Part 77 Objects Affecting Navigable Airspace

14 CFR Part 150 Airport Noise Compatibility Planning

14 CFR Part 158 Passenger Facility Charges (PFCs)

4. TRANSPORTATION SECURITY REGULATIONS

The following Transportation Security Regulations (TSRs) are available for viewing and/or printing on the Transportation Security Administration website at www.tsa.gov/public.

TSR Part 1540 Civil Aviation Security: General Rules. Definitions and rules for all aspects of aviation.

TSR Part 1542 Airport Security. Requirements for airport security programs including establishment of secured areas, air operation areas, security identification display areas, and access control systems. Also describes requirements related to Security Directives.

TSR Part 1544 Aircraft Operator Security: Air Carriers and Commuter Operators. Applies primarily to operators holding certificates for scheduled and charter passenger operations. Details the requirements for security program and screening of passengers and property.

TSR Part 1546 Foreign Air Carrier Security. Discusses security and screening requirements.

TSR Part 1548 Indirect Air Carrier Security. Describes requirements for indirect carriers such as freight forwarders.

TSR Part 1550 Aircraft Security Under General Operating and Flight Rules. Applies to operation of all other aircraft such as general aviation aircraft.

5. SECURITY-RELATED PUBLICATIONS

Recommended Security Guidelines for Airport Planning, Design, and Construction. (Formerly DOT/FAA/AR-00-52, June 2001. Updated TSA version in progress.)

Standards for Airport Security Access Control Systems. (RTCA DO-230A, April 2003) Available from RTCA at http://www.rtca.org.

6. FAA REPORTS

Airport Noise Compatibility Planning (ANCP) Toolkit, FAA Office of Environment and Energy (http://www.faa.gov/about/office_org/headquarters_offices/aep/planning_toolkit/).

FAA Airport Benefit-Cost Analysis Guidance, Office of Aviation Policy and Plans (http://www.faa.gov/airports_airtraffic/airports/aip/bc_analysis/).

FAA Guide to the Best Practices for Environmental Impact Statement Management, FAA Office of Airport Planning and Programming (http://www.faa.gov/airports_airtraffic/airports/environmental/).

Forecasting Aviation Activity by Airport, GRA, Inc., Office of Aviation Policy and Plans (APO-110) (http://www.faa.gov/data_statistics/aviation_data_statistics/).

Intermodal Ground Access to Airports: A Planning Guide, Federal Highway Administration, Intermodal Division and Federal Aviation Administration, National Planning Division, Report No. DOT/FAA/PP/96-3. Available from National Technical Information Service as PB97-189484 (www.ntis.gov).

National Plan of Integrated Airport Systems (NPIAS), Office of Airport Planning and Programming, National Planning Division (www.faa.gov/airports_airtraffic/airports/planning_capacity/npias/).

Terminal Area Forecast (TAF), Office of Aviation Policy and Plans (http://www.faa.gov/data_statistics/aviation/).

7. GENERAL AIRPORT PUBLICATIONS

Aerodromes, Annex 14 to the Convention on International Civil Aviation, International Civil Aviation Organization.

Aerodrome Design Manual, Part 1, Runways, International Civil Aviation Organization.

Aerodrome Design Manual, Part 2, Taxiways, Aprons and Holding Bays, International Civil Aviation Organization.

Airport Engineering, Ashford and Wright, John Wiley & Sons, Inc.

Airport Finance, Ashford and Moore, Van Nostrand Reinhold, Inc.

Airport Planning and Management, Smith, Odegard and Shea, Wadsworth Publishing Company.

Airport Planning and Management, Wells and Young, McGraw-Hill Companies, Inc.

Airport Planning Manual, Part 1 – Master Planning, International Civil Aviation Organization.

Airport Planning Manual Part 2 – Land Use and Environmental Control, International Civil Aviation Organization.

Airport Systems Planning, Design, and Management, deNeufville and Odoni, McGraw-Hill Companies, Inc.

Airport Terminals Reference Manual, International Air Transportation Association.

Construction of Visual and Instrument Flight Procedures (PANS-OPS), International Civil Aviation Organization.

Environmental Protection, Annex 16 to the Convention on Civil Aviation, International Civil Aviation Organization.

Planning and Design of Airports, Horonjeff and McKelvey, McGraw-Hill Companies, Inc.

STOL Port Manual, International Civil Aviation Organization.

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Appendix C List of Potential Stakeholders

Users and tenants:

- Commercial service and charter airlines
- Air cargo airlines and operators
- Corporate aircraft owners
- Freight forwarders
- Airline ground handling and catering companies
- Airline maintenance base operators
- Aircraft fueling and storage operators
- General aviation aircraft owners
- General aviation hangar owners and tenants
- Fixed base operators
- Air tour operators
- Air ambulance and rescue operators
- Flight schools
- Flying clubs/Civil Air Patrol
- Military users and tenants of the airport
- Rental car operators
- Parking lot operators
- Concessionaires
- Ground transportation companies (taxi, shuttle bus, limousine operators, and public transportation)

Groups and individuals from within the airport sponsor's organization:

- Airport board or similar executive group
- Airport executive director or manager
- Airport executive management team (operations director, engineering/planning director, maintenance director, finance director, and others.
- Airport senior line operations and line maintenance personnel
- Airport senior fire and safety officer

FAA personnel from these offices:

- Airports District Office
- Air Traffic Organization
- Airport Traffic Control Tower
- Regional Technical Operations
- System Management Office
- Regional Flight Standards
- Runway Safety Office
- Flight Procedures Office
- NAS Implementation Center
- Flight Service Station

Resource agencies and other governmental units with regulatory or review authority:

- Federal Inspection Service agencies
- Federal agencies with responsibility for affected resources
- Transportation Security Administration
- Federal, state, regional, and local air quality, water quality, and wildlife agencies
- Representatives of local political jurisdictions
- State, regional, metropolitan and local planning office
- State, regional, metropolitan and local transportation and land use planning agencies
- State aeronautics office
- State and local environmental regulatory authorities
- Native American and Alaska Native tribes and pueblos
- On-airport law enforcement agency
- Local fire and police departments

Other interested groups:

- Private land owners and developers
- Airport hotel and business associations
- Local tourism board or authorities
- Chamber of Commerce and other economic development groups
- Citizens and others with a strong economic or social tie to the airport
- Non-government organizations
- Neighborhood associations
- Traveling public

Appendix D Consideration of Environmental Factors in Airport Master Planning

1. INTRODUCTION

This appendix presents practices that can be applied to airport master planning to make the planning process and subsequent environmental analysis more efficient. A more integrated and efficient planning and decision making process should reflect environmental values, result in less delay, and avoid conflicts in the completion of needed airport development.

The consideration of environmental factors by Federal agencies is delineated in Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), reference 40 CFR 1500.5(a) and 1501.2. The NEPA statute and CEQ regulations require all Federal agencies to integrate the NEPA process with other planning at the earliest possible time. This is to ensure that planning and decisions reflect environmental values. CEQ regulations require Federal agencies to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment." Doing this early in the planning process helps incorporate environmental factors in project planning and development, avoid delays and second-guessing later in the NEPA process, and can head off potential conflicts.

This guidance is not intended to make master planning a part of the NEPA process. It is to ensure that supportable and consistent planning data and environmental, technical, economic and other planning analyses are provided for use in FAA decision making. Airport planning provides the basis for a project's purpose and need in environmental evaluation and the alternatives that the FAA will carry into its NEPA analysis.

a. Applicability

This guidance is primarily intended for complex and controversial undertakings such as capacity projects at larger airports. It may also be helpful in the planning of projects smaller in scope, and should be reviewed prior to starting an airport master plan that has the potential to impact resources. It is intended for airport development professionals (e.g., planners, environmental specialists, project managers, engineers) employed by airport sponsors, consultants, FAA and state agencies.

b. Clarifications

When this document refers to airport planners it means individuals engaged in airport planning, no matter their specific job title. When the document refers to environmental specialists it means individuals engaged in environmental analysis or review, no matter their specific job title. When the document refers to engineers it means individuals engaged in engineering, no matter their specific job title. The term "project (program) manager" is not used, although it is recognized that many organizations employ "project managers" in airport planning, environmental analysis, and engineering.

2. PRACTICE AND PROCESS

a. Background

This section summarizes the key points of NEPA as it relates to project planning. When the term "agency" is used, it refers to Federal agency.

CEQ regulations require agencies to identify environmental effects and values in adequate detail so they can be compared to economic and technical analyses. Agencies must study, develop and describe appropriate alternatives to recommended courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources. To permit these, environmental analysis must be integrated early in planning along with other planning analyses.

In cases where actions are planned by private applicants or other non-Federal entities before Federal involvement, agencies must ensure that 1) policies or designated staff are available to advise potential applicants of studies or other information likely required for later Federal action; 2) applicants are aware of the Federal agencies need to consult with State and local agencies and Indian tribes and with interested private persons and organizations when its own involvement is reasonably foreseeable; and 3) the Federal agency commences its NEPA process at the earliest possible time after the project proponent or sponsor has completed planning sufficient to allow environmental impact analysis.

b. Timing of Airport Planning and Environmental Analysis

Environmental considerations are integral to the planning process, and should be identified and evaluated at the same time as economic and technical analyses and prior to commencing preparation of an EA or EIS. This will assist in defining those projects that are reasonably foreseeable, and therefore may be subject to the NEPA analysis.

Airport planning should be complete or nearly so when the airport sponsor begins preparing its EA or FAA begins preparing its EIS. If a sponsor selects a recommended alternative and completes its planning process before beginning environmental processing, the FAA is not obligated to select that recommended alternative as its preferred alternative. FAA will select its preferred alternative during the NEPA process. Starting preparation of a NEPA document immediately after the completion of planning may improve the likelihood that aviation forecast and modeling data remain current during the environmental analysis process. In the case of an Environmental Impact Statement, the start of the NEPA process would be considered the issuance of a Notice of Intent to prepare the EIS. For an Environmental Assessment, the start of the NEPA process (for the purpose of this guidance) should be considered the earlier of: the approval of an AIP grant for the EA; or the initiation of the environmental resource agency/community coordination. The airport sponsor and FAA should always complete (and document) the following prior to commencing preparation of an EIS or EA.

- Local aviation forecasts that are current and approved by the FAA

- Justification of the scope and timing of the project's planned facilities based on airport planning, operational requirements, and design standards

- Identification and consideration of all reasonable planning alternatives (within the sponsor's or FAA's jurisdiction), eliminating (and documenting) those not meeting the stated aeronautical need. If an alternative does potentially meet the aeronautical need, but is not considered reasonable, provide sufficient explanation as to why not

- Tentative identification of studies or other information likely required for later Federal action, as well as appropriate State and local agencies, Indian tribes, private persons and organizations likely to have an interest in the project.

Also, it is important that only those alternatives that have aeronautical utility (i.e., can be built and operated safely) are forwarded for analysis under NEPA. Sometimes it may be necessary to conduct airspace reviews (during planning) of various planning alternatives to determine their aeronautical utility and safety.

Additional discussion on forecasts, project requirements and alternative analysis is included below.

c. Local Governmental and Community Involvement in Airport Planning

Establishing long-term cooperative consultation between the airport sponsor and local, regional, and state governments and planning organizations with land use, zoning, and surface access responsibilities can improve consistency between community and airport planning. This consultation makes it easier to gain local agreement on individual airport projects. Such consultation enables the airport sponsor to voice its interests in future land compatibility, obstruction control, and surface transportation access. Local planners benefit by learning airport needs for the promotion of community access and the local economy. Information on the future airport expansion and improvement contained in an airport master plan should be incorporated into the development of comprehensive land use plans to ensure land use compatibility around airports.

History shows that successful projects involve the community early in airport master planning. This involvement educates and informs local citizens, and allows them to provide constructive input to guide the airport sponsor and FAA decision-making. Community involvement during master planning should include information on the airport's proposed project, its aviation need (problem) and possible alternative ways to address the need. Input should be solicited and questions from the community should be encouraged. Input received should be considered and timely responses to questions raised should be provided. The community includes the public and local government in the vicinity of the airport, including Native American Tribal Organizations, metropolitan and regional planning organizations, and airport businesses and tenants.

Community involvement in the planning process, as described above, should ensure community awareness of proposed action prior to commencing preparation of an EA or EIS. The NEPA process should not be the first time that the community hears about the proposal. Community involvement during planning is a natural part of good planning

and is separate and distinct from public comment under NEPA. In developing a community involvement process, the airport sponsor should strike a balance between soliciting meaningful participation and keeping the master plan process on track. Depending on the scope of the project and the degree of anticipated controversy, community involvement specialists may need to become involved. Early involvement is critical to getting a sense of perspective about where and how the airport fits within the community and what concerns the community has and why. Such involvement may be needed to develop local agreement, which is often necessary to secure support from local officials for the project. A public consultation plan should be prepared identifying the type, number, and timing of public forums and identifying the public sector(s) having concerns about the proposal. It is essential that the community be advised as to its role throughout the planning process.

AIP grant assurances require that airport sponsors take appropriate action, to the extent reasonable, to restrict the use of land adjacent to airports to activities consistent with normal airport operations. Zoning authorities should be strongly encouraged to put height limits in place to protect current and planned aircraft approaches. The airport sponsor should also emphasize to local officials the importance of zoning for airport-compatible land use, including noise sensitive areas and airport design surfaces, so that the airport may remain a transportation asset to the community. In addition, frequent coordination with local, regional, and state organizations responsible for surface transportation planning helps ensure that improvements in airport capacity are matched with commensurate improvements in surface access.

The "FAA Community Involvement Manual", document FAA-EE-90-03, should be consulted to help develop a community involvement program. This manual can be accessed in the "Communications Tools" section of the Airport Noise Compatibility Planning Toolkit at http://www.faa.gov/about/office_org/headquarters_offices/aep/planning_toolkit/. There are a number of State DOTs that have similar guidance. Additional discussion on community involvement can be found under the "Community Consultation" section of the FAA document "Best Practices Guide-Initiative 6 to May 2001 Report to Congress on Streamlining the Environmental Process," which is available at http://www.faa.gov/airports_airtraffic/airports/environmental/.

d. FAA Role in Airport Master Planning

The primary responsible party for airport master planning is the airport sponsor. However, early coordination with FAA is essential to efficient project management. FAA is involved in airport planning to ensure that proposed airport development is safe, has utility, and meets airport design standards, and identifies obvious issues that could become environmental concerns. Additionally, if Airport Improvement Program (AIP) money is needed, FAA ensures that the scope and timing of the proposed development is appropriate for Federal financial participation. FAA carries out these requirements through the following actions:

- Review and approval of local aviation forecasts and design aircraft
- Review and approval of site selection studies
- Review and approval of airport layout plans, including completion of airspace studies*
- Review the adequacy of the planning alternative analysis for incorporation into the subsequent NEPA Analysis
- Review of capital improvement planning

**Refer to the FAA "Community and Environmental Needs Division" memorandum of November 18, 2003 for guidance on how to treat airport layout plans that show proposed development that is undergoing NEPA analysis and review.*

When AIP funds are involved, FAA ensures that the scope of a project's planned facilities is justified.

Finally, FAA reviews master plan work scopes where the airport sponsor is seeking AIP or Passenger Facility Charge (PFC) funds to help finance preparation of the master plan.

e. EIS Conceptual Engineering

For complex projects, it is often necessary to conduct some engineering analysis to enable the airport sponsor and/or the FAA to make planning and environmental decisions. To avoid prejudging alternatives, the engineering should be limited to that necessary to:

- Define alternatives within FAA or sponsor's jurisdiction for environmental analysis
- Assess aeronautical safety and utility of these alternatives
- Comparatively analyze environmental impacts
- Inform the public and environmental resource agencies
- Identify potential environmental mitigation during the environmental analysis, and
- Determine the order of magnitude of project costs

Early in the planning process, airport planners, environmental specialists and engineers should agree to the appropriate extent of conceptual engineering effort, the responsible parties for the effort, and the schedule for accomplishing such engineering.

f. Facility Requirements/Purpose and Need

"Facility requirements" is a term used in airport planning to describe the development required to address documented airport needs. The analysis and documentation supporting the facility requirements are normally contained in an airport master plan. This analysis needs clearly to define the aviation problem(s) and why the airport needs to solve it (them). Care should be taken that the facility requirements are not so narrowly defined so that they unreasonably point to a single solution.

"Purpose and Need" is a NEPA term that refers to a section of an environmental document, which describes the purpose of, and need for, the proposed Federal action. The problem to be addressed is identified (need), the requested Federal action is noted as a possible solution to the problem (purpose), and information that supports that a problem exists is presented (or referenced).

FAA planners should ensure that the "Facility Requirements" analysis provides information sufficient to provide a basis for describing the "Purpose and Need" for proposed Federal actions. FAA environmental professionals can be helpful in determining the adequacy of "Facility Requirements" documentation for use in defining purpose and need under NEPA.

As always, projects that are seeking AIP or PFC funding need to be justified on aeronautical grounds. Economic development should not be a basis for justifying AIP or PFC assistance.

g. Alternative Analysis

The master plan is not intended to establish a single project alternative for NEPA evaluation, but to identify alternatives that meet the airport's aeronautical needs. It may establish the sponsor's recommended alternative. It should consider all reasonable alternatives normally within the jurisdiction of the airport sponsor and the FAA, including operational alternatives. Those alternatives that do not meet the planning need (i.e., facility requirements), or are not feasible or prudent, should be dismissed, with the reasons for dismissal appropriately documented in the master plan. This should include reasons why planning did not consider alternatives that avoided or minimized environmental areas or conditions contributing to extensive mitigation. The master plan should also document the justification for any sponsor recommended alternative, as well as the reasons for not recommending others. An airspace review (i.e., NRA case) of alternatives may be necessary to determine if alternatives can be built and are operationally feasible before their environmental impacts are evaluated in a NEPA document. A preliminary cost estimate, similar in detail to cost estimates normally prepared in master plans and depicted in capital improvement plans, should be developed for all alternatives to be analyzed in a NEPA document.

Unlike the master plan, a NEPA document may consider alternatives that are not within the jurisdiction of the airport sponsor or the FAA, such as the development of alternative airports or the use of other transportation modes. As stated previously, NEPA requires Federal agencies to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making which may have an impact on man's environment." In preparing NEPA documents, FAA typically considers environmental impact, cost and other factors in its alternative analysis. It is possible that during the NEPA process, FAA will identify alternatives not previously considered during the planning process. Airport planners should be called on to advise the environmental specialists on whether additional alternatives developed during the NEPA process meet planning needs and can be constructed and operated safely and efficiently.

h. Currency of Aviation Forecasts

A master plan uses locally generated aviation forecasts as the basis for identifying the need and timing of airport development. FAA reviews the local forecasts and forecast methodology to ensure that they are appropriate and that they provide an adequate justification for the scope, and timing of proposed airport development. Local forecasts developed in a master plan can be adopted for use in an environmental impact analysis provided that the FAA has approved them. FAA field offices can approve local forecasts if the forecast methodology is reasonable and the forecast is consistent with the FAA's Terminal Area Forecast (TAF) or differences with the TAF have been resolved by the FAA. Consistency with the TAF is discussed in separate planning guidance provided by the FAA, which also has special provisions for FAA approval of forecasts at lower activity general aviation airports. It is important that the local forecasts of aircraft activity and enplanements used in NEPA analysis were recently approved by the FAA and, in the process of approving these forecasts, the most recent published TAF was used for comparison.

It is also important that the same forecasts be used throughout project formulation including project justification, airfield modeling, environmental analysis, and benefit cost analysis. Where updated forecasts are approved, or separate forecasting used, the new information should be clearly distinguished from a prior forecast.

3. TOOLS

a. Planning Team

Airport planners, environmental specialists, and engineers should work together throughout the project formulation and development processes. This includes from the beginning of the master plan, through the preparation of an EA or EIS and subsequent decision document, as well as through design and construction to ensure that mitigation measures are properly accomplished. The team should first meet with the airport sponsor during pre-planning to insure that important issues are identified early. The extent of planner, environmental specialist and engineer involvement would depend on project complexity and controversy.

When preparation of an EA or EIS is anticipated, environmental specialists should take an active role in determining the adequacy of the master plan's alternative analysis. This ensures that the master plan and the EA or EIS are consistent in data and in rationale on the reasonable alternatives. In addition, the environmental specialist may assist the airport planner in reviewing the scope of work for the master plan relative to the scope of environmental work to be performed, provide guidance on developing the overview of sensitive environmental features, assist in developing and conducting the public consultation and help in deciding that project justification is sufficient to develop a strong and clear purpose and need statement in the EA or EIS. The airport sponsor's planning consultant should include, as part of their team, a specialist familiar with NEPA and environmental analysis requirements for airport projects.

The airport planner's role in the NEPA process is to: review the planning aspects of the NEPA document for accuracy and consistency with airport planning, design standards, operational requirements and land use compatibility considerations; review the adequacy of discussions of technological solutions that address the purpose and need; and review the consistency of the local aviation forecasts with the TAF and with the aviation forecasts used in other project documents.

During the planning and environmental analysis, engineers should provide conceptual engineering, if required, provide "planning-level" project cost estimates, and if required determine the constructability of various alternatives, including construction sequencing and timing.

b. Overview of Environmental Features

A recommended practice for the airport sponsor/consultant is to prepare an "overview of environmentally sensitive features of an airport" as part of the airport master plan. Such an overview can help an airport sponsor judge if the airport's environmental features affect day-to-day decisions as well as longer-term development strategies. The level of detail would be airport specific as determined by the sponsor and its consultant after consultation with the local FAA Airports office. The overview should include readily available information including:

- Items known from prior environmental and planning documents, and from the expertise of environmental professionals, community planners, and resource agencies
- Items that can be easily seen during a walking survey of the airport or off-airport area.
- Information from various types of available environmental resource maps of the airport area.

The findings from the literature search and airport walking survey should be documented.

This overview is not intended to substitute for the "Affected Environment" section of an EA or EIS. It is intended to provide information on, or an overview of obvious environmental resources, which could affect the planning of the proposed development. Therefore, it is not necessary to carry out substantial investigations such as cultural resource studies or wetland delineations in order to define all environmental factors needed for master planning. If an airport sponsor wishes to conduct such detailed studies under a master plan, the local FAA Airports office should be consulted. If concurrence is provided the FAA should work with the sponsor to ensure that the selected consultant is, or selected consultants are, experienced in the discipline(s) being investigated.

The overview should also include easily seen and/or readily documented environmental features and resources beyond the airport property line. The area of consideration beyond the property line will vary depending on the environmental resource. For noise, it may be set at the DNL 65 dB contour, while for coastal zones it may stretch well beyond the airport boundaries. A text of the environmental overview should be included in the master plan report together with appropriate graphics. Sensitive features may also be

shown on a separate ALP drawing. Attachment 3 to this appendix lists suggested features that may be included as parts of the overview. Information on land uses or features that surround the airport and whether or not such uses are zoned compatibly with aviation uses should also be included. If not zoned compatible, the reasons should be investigated and the sponsor should provide information on its efforts to promote aviation-compatible land uses near the airport.

The master plan report and/or ALP should note the source (i.e., May 2004 walking survey, NWI maps, 2003 regional land use plan, etc.) of flood plain, wetland, or cultural resource information that is presented. This will ensure that resource data that is approximate, such as wetland locations based on a recent walk-through or older NWI maps, is identified as approximate data. For example, a possible ALP note for wetlands is: "Wetland areas bounded by dashed lines are based on an April 2003 NWI map and March 19, 2004 walk-through of the area. The walk-through suggests wetland presence due to standing water and certain vegetation. The NEPA analysis will include a wetland delineation of that area, if alternatives under consideration are located in this area."

This information will alert planning and environmental reviewers of the possible presence of sensitive resources. As a result, further investigation of these areas during the NEPA process may be necessary. Project layout or design could change based on further information obtained during preparation of a NEPA document. The master plan report and/or ALP should clearly note if the environmental overview uses data more than five years old or of questionable quality.

An environmental overview may provide the information necessary to: 1) determine if additional alternatives are needed to avoid or minimize the impact of the project to sensitive environmental features; 2) define future environmental coordination and analysis work to develop more thorough work scope for an EA or EIS and; 3) properly understand the anticipated costs of preliminary/final design as well as how best to estimate the cost of and schedule for the NEPA process.

c. Electronic Data Information Systems

Airport sponsors typically have a great deal of spatial information to support infrastructure development. Although electronic data sources such as Computer Aided Design (CAD), Geographic Information Systems (GIS), and other spatial data formats are common, there is often redundancy due to a lack of knowledge about existing data sets and differing standards. A common data source is more efficient in the identification of environmentally sensitive features such as residential areas, parks, and hazardous waste sites and in quantifying the potential impact of various proposed development. Therefore, airport sponsors should consider developing an electronic spatial data standard for all planning, environmental, and engineering documents. Although GIS is typically used to implement such a standard, also consider other options that may offer more ready access and basic skill requirements should be considered.

Notwithstanding the above, hard copies of ALP drawings and master plan reports shall be provided for FAA retention and use.

If AIP or PFC funds are to be used for the development of a GIS or similar format, the scope of the GIS development should be discussed with the FAA to ensure that eligibility is established. See FAA Order 5100.38, *Airport Improvement Program Handbook*. The GIS should be in a standard format that is consistent with the data formats used by the surrounding units of government.

d. If AIP or PFC funds are to be used for the development of a GIS or similar format, the scope of the GIS development should be discussed with the FAA to ensure that eligibility is established. See FAA Order 5100.38, *Airport Improvement Program Handbook*. The GIS should be in a standard format that is consistent with the data formats used by the surrounding units of government.

4. NEPA DOCUMENTS OF OTHER FEDERAL AGENCIES

An airport development proposal may require that a Federal agency other than the FAA is the lead agency for NEPA purposes. Although this usually involves development by a military entity, such as the Air National Guard, it may involve such actions as a roadway funded by the Federal Highway Administration, an apron/hangar for the U.S. Forest Service, or a recreational area by the Army Corps of Engineers. The master plan should recognize such proposed development, ensuring that the proposal is an appropriate use for the airport, and that the FAA's Federal actions associated with the development, such as ALP revisions or approval of land releases, are adequately addressed in the lead agency's NEPA document. The master plan should also describe how the proponent's potential plans would ultimately affect the airport sponsor's proposed airport development. FAA's environmental role will vary from project to project. Normally the FAA will be either a joint lead agency, or at least a cooperating agency during the preparation of an environmental document. The "other" Federal agency should come to FAA early to see what we look for in our environmental documentation and processing. Some laws, such as Section 4(f) of the DOT Act, or policies, such as noise, apply to FAA but not to other agencies, and must be addressed in the NEPA document.

ATTACHMENT D-1
ENVIRONMENTAL OVERVIEW FOR MASTER PLAN PURPOSES

Air Quality Classification	Attainment Area: Non-attainment Area: List Pollutant(s): Maintenance Area: List Pollutant(s):	
Aquatic Concerns	Bay: Creek: Ocean: Pond: Habitat-Endangered/Threatened Species: Drinking Water Reservoir: Pond: River:	Wetlands: Floodplains: Potable Water Aquifer: Sole-Source Aquifer: Streams: Other:
Terrestrial Concerns	Contaminated Areas: Habitat-Endangered/Threatened Species: Farmland, Prime and Unique: Hazardous Material Storage Areas: Landfills:	
Cultural	Historic Properties*: Archeological Resources: Parks: Wildlife Refuges: Residential Areas: Noise Sensitive Areas (church, school, hospital, etc.): Other:	
Land Use Concerns	Traffic: Noise: Lighting: Obstructions: Environmental Justice: Zoning:	

*Historic resources should be identified but the planning consultants should be wary of disclosing some information due to the sensitivity certain parties (i.e., Native Americans, Native Hawaiians) attach to these resources. A discussion should be held with these parties to decide if maps should include the identified resources.

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Appendix E Airport Site Selection

1. GENERAL

a. In some cases, the planner may determine that the existing airport cannot be expanded to meet the future demand and that a new or supplemental airport may be needed. In these cases, it may be necessary to look for a new airport site. The process of identifying, evaluating, and selecting new airport sites is very similar to the process of identifying, evaluating, and selecting alternatives for individual airport projects.

b. A comparison of new airport sites with the alternative of continuing operations at the existing airport may have been completed during the master plan alternatives analysis. In these cases, the site selection process may be a refinement of the preliminary investigation of alternatives for the existing airport. A site selection process may also result from the need for a new airport identified in a regional or state system plan study.

c. Prior to initiating a detailed site selection study, the planner should collect data that justifies the need for the new airport and its viability. Community and user support, along with an airport sponsor's legal and financial capability to build and operate the new airport, should be documented. There should be a consensus among Federal, state and local officials as to the intended role of the new airport, at least to the extent that its requirements and size can be determined. However, this does not rule out changing the role of the new airport as a result of the study findings.

2. SITE SELECTION PROCESS OVERVIEW

a. The scope of the site selection process will vary with the size, complexity, and role of the new airport. The sophistication of the analysis and the complexity of the decision making process can vary greatly.

b. If the planner determines that a new airport is needed, he or she should develop initial criteria that can be used to evaluate different sites and determine if each can function as an airport and meet the needs of the community and users. Such criteria might include that the sites are within a certain radius of the existing airport and are of a minimum size in terms of land area.

c. Once the preliminary sites have been identified, a screening process should be applied to each site. An evaluation of all potential sites that meet the initial criteria should be conducted, screening out those with the most obvious shortcomings. Screening factors might include topography, natural and man-made obstructions, airspace, access, environmental impacts, and development costs. If any sites are eliminated from further consideration, thorough documentation of the reasons for that decision is encouraged and will facilitate the subsequent environmental processing.

d. The remaining potential sites should then undergo a detailed comparison using comprehensive evaluation criteria. While the criteria will vary, the following should be considered:

- Operational Capability – the site should provide the operational capability necessary to serve the defined role of the airport and the needs of its users
- Capacity potential – If the new airport is needed to provide additional capacity, the capability of the site in providing long-term capacity growth is important.
- Ground access – an important factor is the ability of the users to get to and from the airport easily and in a timely manner.
- Development Costs – Simple cost estimates are useful in determining the financial feasibility of building a new airport.
- Environmental Consequences – The potential environmental impacts associated with a new site may be critical to gaining approval.

Consistency with Area-wide Planning – The site should be consistent with regional and local land use and transportation plans.

e. While a weighting of the evaluation criteria and a weighted ranking of the alternative sites may be used in selecting a site, planners should use caution in applying this technique since it introduces an element of subjectivity into the analysis. They should focus on providing decision makers with information on the various sites in a manner that is understandable and unbiased.

f. The site finally selected will be subject to the review of alternatives as required under NEPA. Planners will then make commitments on specific environmental mitigation measures. The selection will probably receive scrutiny through public information sessions, review by policy and advisory committees, and at public hearings.

g. The planner should not assume that the site selection process described here conclusively results in the selection of the best site. Overriding political, jurisdictional, institutional, environmental or financial considerations may influence the decision makers' choice of sites.

3. SITE APPROVAL

a. Once a site is selected, timely site approval by the airport sponsor who will develop and operate the new airport is important. Such action will permit the prompt establishment of the airport while the decision-making apparatus is politically and organizationally intact.

b. If state and regional approval procedures have been followed, an important next step will be Federal approval. FAA approval is necessary if planners intend to seek Federal financial assistance under the AIP for follow-on planning or site acquisition and development. Such approval must be supported by appropriate environmental documentation, public hearings, and evidence that the proposed airport will be reasonable consistent with local planning. The FAA must approve the selected site before any additional planning work is started.

c. Regardless of the applicability of Federal financial assistance in the planning or development of the airport, the FAA will advise on the aeronautical suitability of the site after having studied the site from the standpoint of airspace use as required by 14 CFR Part 157, *Notice of Proposed Construction, Alteration, Activation, and Deactivation of Airports.*

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Appendix F Airport Layout Plan Drawing Set

The following list provides general guidelines in preparing the Airport Layout Plan drawing set. The individual sheets that comprise the Airport Layout Plan drawing set will vary with each planning effort. During the project scoping activities, planners must determine which sheets will be necessary. Checklists from FAA Regional and District Offices and many state aviation offices may supplement the guidance provided in this Appendix. Since these checklists are comprehensive, not all items will be applicable to a specific project.

1. AIRPORT LAYOUT DRAWING

a. Sheet size – Minimum 24” x 36”

b. Scale –Within a range of 1” = 200’ to 1” = 600’

c. North Arrow

1) True and Magnetic North

2) Year of the magnetic declination

3) Orient drawing so that north is to the top or left of the sheet

d. Wind Rose

1) Data source and the time period covered

2) Include individual and combined coverage for:

a) Runways with 10.5 knots crosswind

b) Runways with 13 knots crosswind

c) Runways with 16 knots crosswind

d) Runways with 20 knots crosswind

e. Airport Reference Point (ARP) – Existing and ultimate, with latitude and longitude to the nearest second based on NAD 83

f. Ground contours at intervals of 2’ to 10’, lightly drawn

g. Elevations (Existing and Ultimate to 1/10 of a foot)

1) Runway

2) Displaced thresholds

3) Touchdown zones

4) Intersections

5) Runway high and low points

6) Roadways where they intersect the RPZ edges and extended runway centerlines

7) Structures on Airport--If a terminal area plan is not included, show structure top elevations on this sheet.

h. Building limit lines – Show on both sides of the runways and extend to the airport property line or RPZ.

i. Runway Details (Existing and Ultimate)

1) Dimensions – length and width within the outline of the runway

2) Orientation – Runway end numbers and true bearing to the nearest 0.01 degree

3) Markings

4) Lighting – Threshold lights only

5) Runway Safety Areas--Dimensions may be included in the Runway Data Table

6) End Coordinates – Note near end (existing and ultimate) of each runway end, to nearest 0.01 second

7) Displaced threshold coordinates, to the nearest 0.01 second

8) Declared Distances – For each runway direction if applicable. Identify any clearway/stopway portions in the declared distances

j. Taxiway details (Existing and Ultimate)

1) Taxiway widths and separations from the runway centerlines, parallel taxiway, aircraft parking, and objects

k. RPZ Details (Existing and Ultimate)

1) Dimensions

2) Type of property acquisition (fee or easement)

l. Approach slope ratio (20:1; 34:1; 50:1)

m. Airport Data Table (Existing and Ultimate)

1) Airport elevation (MSL)

2) Airport Reference Point data

3) Mean maximum temperature

4) Airport Reference Code for each runway

5) Design Aircraft for each runway or airfield component

n. Runway Data Table (Existing and Ultimate)

1) Percent effective gradient

2) Percent wind coverage

3) Maximum elevation above MSL

4) Runway length and width

5) Runway surface type

6) Runway strength

7) FAR Part 77 approach category

8) Approach type

9) Approach slope

10) Runway lighting (HIRL, MIRL, LIRL)

11) Runway marking

12) Navigational and visual aids

13) RSA dimensions

o. Title and Revision Blocks

1) Name and location of the airport

2) Name of preparer

3) Date of drawing

4) Drawing title

5) Revision block

6) FAA disclaimer

7) Approval block

p. Other

1) Standard legend

2) Existing and Ultimate airport facility and building list

3) Location map

4) Vicinity map

2. AIRPORT AIRSPACE DRAWING

a. Plan view of all FAR Part 77 surfaces, based on ultimate runway lengths

b. Small scale profile views of existing and ultimate approaches

c. Obstruction data tables, as appropriate

d. Sheet size – same as the airport layout drawing

e. Scale – 1” = 2,000’ for the plan view; 1” = 1,000’ for approach profiles; and 1” = 100’ (vertical) for approach profiles

f. Title and revision blocks - same as the airport layout drawing

g. Approach Plan View Details

1) USGS for base map

2) Show runway end numbers

3) Include 50’ elevation contours on all slopes

4) Show the most demanding surfaces with solid lines and others with dashed lines

5) Identify top elevations of objects that penetrate any of the surfaces. For objects in the inner approach, add note “See inner portion of the approach plan view for close-in obstructions.”

6) For precision instrument runways, show balance of 40,000’ approach on a separate sheet.

h. Approach Profile Details

1) Depict the ground profile along the extended runway centerline representing the composite profile, based on the highest terrain across the width and along the length of the approach surface.

2) Identify all significant objects (roads, rivers, and so forth) and top elevations within the approach surfaces, regardless of whether or not they are obstructions

3) Show existing and ultimate runway ends and FAR Part 77 approach slopes.

3. INNER PORTION OF THE APPROACH SURFACE DRAWING

a. Large scale plan views of inner portions of approaches for each runway, usually limited to the RPZ areas

b. Large scale projected profile views of inner portions of approaches for each runway, usually limited to the RPZ areas

c. Interim stage RPZs when plans for interim runways extensions are firm and construction is expected in the near future

d. Sheet size – Same as Airport Layout drawing

e. Scale – Horizontal 1” = 200’; vertical 1” = 20’

f. Title and revision blocks – Same as for Airport Layout drawing

g. Plan View Details

1) Aerial photos for base maps

2) Numbering system to identify obstructions

3) Depict property line

4) Identify, by numbers, all traverse ways with elevations and computed vertical clearance in the approach

5) Depict the existing and ultimate physical end of the runways. Note runway end number and elevation

6) Show ground contours, lightly drawn

h. Profile View Details

1) Depict terrain and significant items (fences, roadways, and so forth)

2) Identify obstructions with numbers on the plan view

3) Show roads and railroads with dashed lines at edge of the approach

i. Obstruction Table Details

1) Depict terrain and significant items (fences, roadways, and so forth)

2) Identify obstructions with numbers on the plan view

3) Show roads and railroads with dashed lines at edge of the approach

4) Prepare a separate table for each RPZ

5) Include obstruction identification number and description, the amount of the approach surface penetration, and the proposed disposition of the obstructions

4. TERMINAL AREA DRAWING

The need for this drawing will be decided on a case-by-case basis. For small airports, where the Airport Layout drawing is prepared to a fairly large scale, a separate drawing for the terminal area may not be needed.

a. Large scale plan view of the area or areas where aprons, buildings, hangars, and parking lots are located

b. Sheet size – Same as Airport Layout drawing

c. Scale – Range of 1” = 50’ to 1” = 100’

d. Title and revision blocks – Same as for Airport Layout drawing

e. Building Data Table – To list structures and show pertinent information about them. Include space and columns for:

1) A numbering system to identify structures

2) Top elevation of structures

3) Existing and planned obstruction markings

5. LAND USE DRAWING

a. Include all land uses (industrial, residential, and so forth), on and off the airport, to at least the 65 DNL contour

b. Sheet size – Same as Airport Layout drawing

c. Scale – Same as the Airport Layout drawing

d. Title and revision blocks – Same as for Airport Layout drawing

e. Aerial base map

f. Legend (symbols and land use descriptions)

g. Identify public facilities (such as schools, parks, and othes)

h. Drawing details – Normally limited to existing and future airport features (i.e., runways, taxiways, aprons, RPZs, terminal buildings and navigational aids)

6. RUNWAY DEPARTURE SURFACES DRAWING

a. Large scale plan views of departure surfaces for each runway end that is designated primarily for instrument departures. The one-engine inoperative (OEI) obstacle identification surface (OIS) should be shown for any departure runway end supporting air carrier operations.

b. Large scale projected profile views of departure surfaces for each runway that is designated primarily for instrument departures.

c. Sheet size – Same as Airport Layout drawing

d. Scale – Horizontal 1” = 1000’; vertical 1” = 100’ (runway departure surfaces); and Scale – Horizontal 1” = 2000’; vertical 1” = 100’ (OEI obstacle identification surfaces)

e. Title and revision blocks – Same as for Airport Layout drawing

j. Plan View Details

7) Aerial photos for base maps

8) Numbering system to identify obstructions

9) Depict property line, including easements

10) Identify, by numbers, all traverse ways with elevations and computed vertical clearance in the departure surface

11) Depict the existing and ultimate physical end of the runways. Note runway end number and elevation

12) Show ground contours, lightly drawn

k. Profile View Details

4) Depict terrain and significant objects, including fences, roadways, rivers, structures, and buildings.

5) Identify obstructions with numbers on the plan view

6) Show roads and railroads with dashed lines at edge of the departure surface

l. Obstruction Table Details

6) Depict terrain and significant objects, including fences, roadways, rivers, structures and buildings

7) Identify obstructions with numbers on the plan view

8) Show roads and railroads with dashed lines at edge of the approach

9) Prepare a separate table for each departure surface

10) Include obstruction identification number and description, the amount of the departure surface penetration, and the proposed disposition of the obstructions

7. AIRPORT PROPERTY MAP

a. Sheet size – Same as Airport Layout drawing

b. Scale – Same as the Airport Layout drawing

c. Title and revision blocks – Same as for Airport Layout drawing

d. Legend

e. Data Table

1) A numbering or lettering system to identify tracts of land

2) The date the property was acquired

3) The Federal aid project number under which it was acquired

4) Type of ownership (fee, easement, federal surplus, and others)

f. Show existing and future airport features (i.e., runways, RPZs, navigational aids and so forth) that would indicate a future aeronautical need for airport property.