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Practices in Preserving and Developing Public-Use Seaplane Bases

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A Synthesis of Airport Practice

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The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

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FOREWORD

Airport administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the airport industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire airport community, the Airport Cooperative Research Program authorized the Transportation Research Board to undertake a continuing project. This project, ACRP Project 11-03, "Synthesis of Information Related to Airport Practices," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an ACRP report series, *Synthesis of Airport Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

*By Gail R. Staba
Senior Program Officer
Transportation
Research Board*

Public-use seaplane bases throughout the United States may be publicly challenged, yet seaplane operations continue to serve a multitude of transportation and recreational purposes, including promotion of local economies. The objective of this report is to review current practices in developing and preserving public-use seaplane bases throughout the United States, and identify their benefits, challenges, and gaps in practice. The report reviews and presents information on the seaplane base planning process, design considerations, permits, regulatory requirements, and facility and service needs of seaplane bases. For those interested in preserving seaplane bases, effective practices in collecting data and public messaging, comprehensive transportation planning, environmental safeguards, and public outreach possibilities are presented. The report synthesizes available information to present a state-of-affairs report on seaplane bases.

Information used in this study was acquired through a review of the literature, a survey, interviews with seaplane base operators and industry experts, and site visits.

Stephen M. Quilty, SMQ Airport Services, Lutz, Florida, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the web at www.trb.org) retains the color versions.

PRACTICES IN PRESERVING AND DEVELOPING PUBLIC-USE SEAPLANE BASES

SUMMARY Public-use seaplane bases (SPBs) throughout the United States are facing constant challenges and threats to their continuing operations from a number of different sources, yet seaplane operations continue to provide valuable services and serve a multitude of purposes, including promotion of local economies.

Seaplanes operate in highly diverse environments, from congested airspace to unimproved remote locations—the latter being more prevalent. Very similar to many small general aviation airports and backcountry airstrips, many pressures and challenges face seaplane operations and, in particular, the viability of SPBs.

The objective of this report is to review current practices in developing and preserving public-use SPBs throughout the United States, and identify their benefits, challenges, and gaps in practice. Collectively, the information in this study provides an overview of SPB operations to those not familiar with them, is useful for discussing the future direction of SPB operation, and serves as an impetus for future research and educational efforts. It further describes potential gaps in data collection, operational activity, facilities, and similar parameters. The challenges and gaps faced in development and preservation efforts are explored, as they may relate to federal and state planning, funding assistance, regulations, and operating requirements. The report reviews and presents for development consideration, information on the SPB planning process, design considerations, permits, regulatory requirements, and SPB facility and service needs. Presented for preservation consideration are aspects of data collection and messaging, comprehensive transportation planning, environmental safeguards, and public outreach possibilities. The report synthesizes available information on all of the topics mentioned in the previous paragraph, to present a state-of-affairs report on SPBs.

Thirty-one of 35 SPB operators from 11 different states responded to a survey seeking information on their current practices, challenges, threats, and outreach activities. The study found that the term “seaplane base” can have different meanings. A public-use SPB can be solely a registered waterway used for takeoff and landing, or it can be a registered waterway site and include land and support facilities, in which case the land facilities can be either publicly owned, privately owned, or publicly owned with a private operator. This report focuses on public-use SPBs and includes all three scenarios. The majority of public-use SPBs in the United States are similar to privately owned land airports that are open to the public. The SPB landing, takeoff, and docking areas are available as public use, but the land and facilities are privately owned and operated or leased to a private operator, such as a private business marina or individual docking area. Despite the possible confusion, an important distinction is that an official SPB designation on a body of water is not needed for a seaplane to operate. If a boat is permitted to operate on a body of water, then unless seaplane activity is specifically disallowed, a seaplane is permitted to operate as well because both are considered “vessels” under existing laws.

The study also found that SPBs can be grouped into three general categories: (1) those that exist to meet basic community transportation needs and access to the National Airspace

System (NAS) because of their remote location; (2) those that serve a recreational or sporting purpose; and (3) those that serve as an economic focal point for community development and attraction. Alaska and the San Juan County area of Washington State are examples of meeting basic community transportation needs. Where little to no road access connectivity exists, seaplanes provide a lifeline for many communities. The use of SPBs for sporting purposes is seen across the northern U.S. tier, especially in Washington, Minnesota, and Maine, where resorts and sporting lodges prosper. Indiana and Florida are examples of where the recreational use of an SPB is very common. The last category, economic development, recognizes the potential for community growth through the use of SPBs, as an attraction for economic development, commercial activity, and tourism. The towns of Tavares, Florida; Rising Sun, Indiana; and Greenville, Maine, are examples. SPBs in Union Lake, Washington, and Lake Hood, Alaska, provide commercial air service and promote tourism, while SPBs in Louisiana support the oil industry.

The main challenges discovered through the literature search and in the survey are those associated with SPB development, safety, airspace, noise, management, funding, regulation and permitting, environmental regulations, and local compatibility and acceptance. More specifically, the challenges for continued SPB operation are reflected in the competing use of the waterways by other recreational vessels; an unfamiliarity by the general public with SPB facilities, services, and benefits; the different and oftentimes complex nature of regulatory oversight by various governmental agencies; inadequate or weak financial investment, support, and funding of facilities and operation; and a low or dwindling interest in SPB operation and the number of seaplane pilots.

Like any business or recreational activity, an economic value is associated with SPB activities. They employ individuals, they purchase supplies and services from the local community, and they attract commercial and recreational activity to the community. Being included in a state aviation system plan recognizes the value and importance of an SPB and raises awareness of its impact on intergovernmental planning and development reviews.

The high interest and constant monitoring efforts of state aviation agencies and various seaplane pilot associations are the main sources of efforts to preserve many existing public-use SPBs throughout the United States, and to open new ones. SPB interviewees indicate the development of economic and operational tools and public outreach are needed to help sustain existing SPBs and to develop new ones. The study found that there is a need for better operational data collection, better planning and regulatory acceptance of SPBs, better funding opportunities, and better means to convey the value and benefits of SPB operation to the local communities and other users of public waterways.

CHAPTER ONE

INTRODUCTION

Like many other general aviation (GA) activities, seaplane activity at lakes, rivers, and other waterways in the United States is thriving in some places but struggling in others. The growth and continuation of seaplane operations faces many pressures and challenges. This research focuses on existing public-use SPB facilities that are identified in the FAA airport master record database (the 5010 database) (*Airport Data & Contact Information*). Not included in the study are the numerous privately owned SPBs that are not open to the public or not listed in the FAA database, but are well known in the seaplane operating community and available for use with the operator's permission.

Seaplane bases generally can be categorized into those that exist to meet basic transportation access to the NAS and to a community because of its remote location, those that serve a recreational purpose, and those that serve as an economic focal point for the community. The first is a way of life and is evident in Alaska and in the Puget Sound area of Washington State. The second is prevalent throughout the United States and common in its recreational and private purpose. The last is becoming more common as cities like Tavares, Leesburg, and Flagler County, Florida; Greenville, Maine; and Rising Sun, Indiana, seek to become destination cities and attract seaplane-related businesses for economic development purposes.

OBJECTIVE

The objective of this study is to identify current practices in developing and preserving public-use SPBs. It further outlines the challenges discovered in the course of the research related to those same public-use SPBs. Challenges facing SPBs can be the general public's unfamiliarity with the facilities, services, and benefits provided; pressures from environmental and special interest groups; funding constraints; and gaps in published guidance (e.g., design, engineering, and planning guidelines).

Development refers to the establishment of new facilities, the upkeep of older ones, and the means to do both. In this regard, the study looks at SPB operational requirements and site selection to include the benefits, economic impacts, and funding aspects of SPB operation. Development also includes an overview of the planning process, design considerations, permits, regulatory requirements, and facility needs and services. The available information on these topics was synthesized to present a state-of-affairs report.

Preservation refers to the efforts made to manage the pressures and challenges that could reduce opportunities for seaplane operations across the country. How SPB operators publicize the value of an SPB through marketing, advertising, economic studies, planning, community education, and other outreach efforts are synthesized and reported.

In support of the study's objective, practices that currently exist within SPB communities and potential gaps in data collection, activity, facilities, and similar parameters are identified. The challenges and gaps in development and preservation efforts are further explored as they may relate to federal and state planning, funding assistance, regulations, and operating requirements. Collectively, the information in this study provides an overview of SPB operations to those not familiar with it, is useful for discussing the future direction of SPB operation, and can serve as an impetus for future research and educational efforts on the subject matter.

METHODOLOGY

To collect information and data on the development and preservation of SPBs, a literature review was undertaken, a survey was administered (Appendix A), interviews were conducted, and site visits were performed.

The literature search entailed a review of documents available through a variety of general, academic, and meta-search engines. It also entailed visits to the Seaplane Pilots Association (SPA) library and the collection of information and reports from SPB site

visits and interviews. A review of the 2013–14 Aircraft Owners and Pilots Association (AOPA) *Airport Directory* identified 119 public-use SPBs in states other than Alaska, and 128 public-use facilities in Alaska (Haines 2012). The SPB information listed in the directory derived from the FAA *Airport Master Record* database. The AOPA directory was used along with the FAA's 5010 online database, as the latter does not allow for a search inquiry on the category of seaplane bases.

Appendix B highlights the number of public and private SPBs listed in the AOPA directory. An initial inquiry was made to all 247 SPB operators noted in the AOPA directory, inviting each to participate in the survey. Thirty-five SPB operators self-selected to participate in the study and were subsequently sent surveys. Thirty-one operators responded to the survey, representing an 89% response rate of those that self-selected. Appendix C lists those SPB operators that participated in the study. Their general geographic locations are shown in Figure 1.

LITERATURE REVIEW

Numerous books, articles, and publications are devoted to seaplane pilots and history. Less information is available on seaplane bases, which is the focus of this research. One of the first publications to promote the feasibility of SPBs as a means to better use available lakes, rivers, and harbors is a U.S. Department of Commerce publication titled *Seaplane Facilities* (Seaplane Facilities 1949). First published in 1949, its purpose was to answer questions associated with the planning of seaplane bases and to assist local communities or persons interested in solving aviation problems concerning seaplane facilities. In particular, it addressed whether a community needed a seaplane base, where to locate one, and what improvements, either on-shore or off-shore, might be needed in the future.

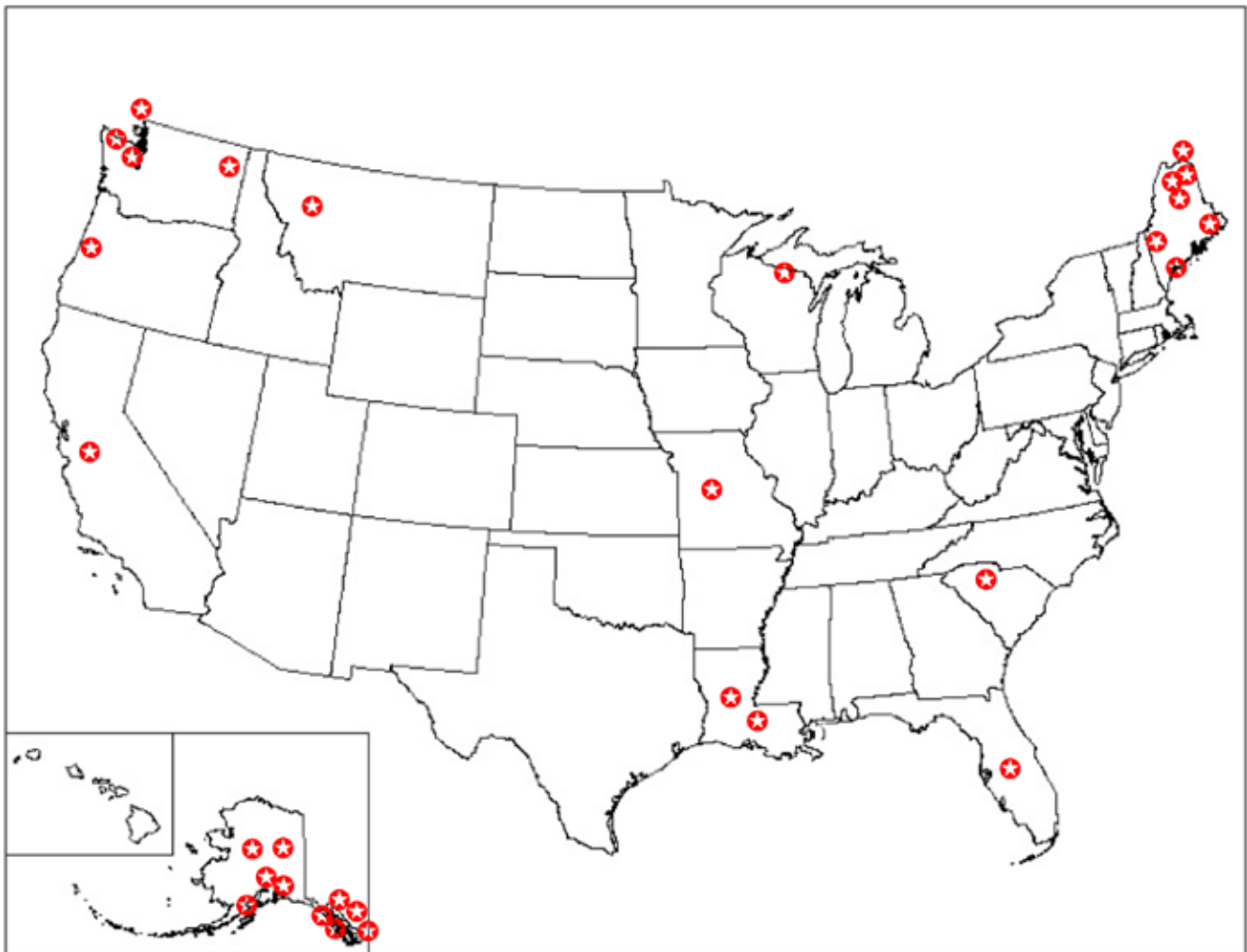


FIGURE 1 Location of seaplane base participants.

The 1949 Department of Commerce publication became the forerunner to today's FAA advisory circular (AC) on SPBs. History shows that advances in aircraft technology and the growing network of roadways and other transportation modes in the United States diminished the perceived importance of seaplanes (Nicolaou 1998). Land airports became the predominant base for commercial use of airplanes. Still, seaplanes proved resilient at what they do best—accessing remote areas of the country or the in-close areas of urban centers that are located adjacent to waterways.

The FAA has published two excellent resources that include information on SPBs: (1) *FAA Handbook H-8083-23, Seaplane, Skiplane, and Float/Ski Equipped Helicopter Operations Handbook (FAA Handbook H-8083-23 2004)* and (2) *Advisory Circular 150/5395-1A—Seaplane Bases (Advisory Circular 150/5395-1A 2013)*. Additional safety information is provided in *Advisory Circular 91-69A, Seaplane Safety for FAR Part 91 Operators (Advisory Circular 91-69A 1999)*.

Within the United States, numerous seaplane-accessible landing areas exist. However, many have not sought to be registered in the FAA's database as a public-use SPB, or to be published in a directory. An example of unlisted facilities is found in New Hampshire, where a comprehensive economic development strategy report states: "More than 100 privately owned airports, heliports and seaplane bases are available for private use in New Hampshire. They are not required to register with the state or with FAA" [*Lake Region Comprehensive Economic Development Strategy (CEDS) 2013 Report 2013*].

In total, only 30 states have public-use seaplane facilities listed. "Public use" refers to an airport available for use by the general public without a requirement for the airport owner or operator's prior approval (FAA Order 5010.4 1981; Advisory Circular 150/5200-35A 2010). Twenty of the 30 states have three or fewer public-use facilities, with 14 of those states having only one listing (see Appendix C).

Information about an SPB can be found using the online 5010 database for searching airport master records and reports ("AirportIQ5010" 2014). As noted, AOPA publishes an annual compilation of the 5010 data in a more usable format. While numerous water landing areas are not registered in the FAA database, SPA publishes a *Water Landing Directory* that provides information on the location and accessibility of water landing areas and SPBs throughout the United States ("Water Landing Directory" 2011). NavCanada produces a navigational and water aerodrome supplement that contains information on SPBs in Canada (*Water Aerodrome Supplement 2014*).

In a meeting on November 19, 2014, SPA Executive Director Steven McCaughey indicated that there are approximately 32,000 seaplane-rated pilots in the United States. The number was obtained from a special data query search by the FAA, as the data are not readily available on the FAA's website or other reports. Also not accurately known is the number of seaplane aircraft in the United States, as the FAA does not make a distinction within its aircraft registry between airplanes on floats, wheels, or skis. Amphibian-type aircraft can be counted in the registry, but into what category would they be placed. . . land or seaplane? The same difficulty in categorization exists for classifying those aircraft that are seasonally switched from wheels to skis to floats.

SPA has published a number of publications that seek to introduce facts about seaplanes and SPB operations. A single-sheet quick reference guide for public policymakers is provided in Appendix D (*Seaplane Operations* n.d.). Another publication is a booklet that discusses the valuable services provided by seaplane operations, addresses issues and concerns about these operations, and provides some background information on the history, utility, and benefit of seaplanes to individuals and communities throughout the country (*Flying America's Waterways 2001*). Another publication is a white paper that serves as a useful reference for resolving conflicts between the seaplane community and those interested in curtailing seaplane operations (*Seaplane Compatibility Issues: A Report about Seaplanes Focusing on Safety, Noise and Jurisdiction 1996*). The handbook provides perspective on three issues related to seaplane activities: safety, jurisdiction, and noise.

A number of reports and documents found in the literature search describe site-specific economic and feasibility impacts, site selection, and planning studies. Those documents are cited in their respective sections throughout this report. One feasibility study in particular provides a comprehensive insight into the economic feasibility of an SPB and its planning process. The study was conducted in August 2008 for the Alaska Department of Transportation and Public Facilities (DOT&PF) (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska 2008*). Owing to high demand and long waiting lists for SPB facilities in the Anchorage area, the report evaluated the financial feasibility of constructing an additional SPB to increase capacity and accommodate future growth. Aspects of the report are referenced elsewhere in this study. Cost data provided in the report may not be applicable to other areas of the country because the Anchorage area has some unique construction and development issues.

On the European front, an initiative to investigate the seaplane transport system throughout the European Union (EU) resulted in a collaborative organization known as Future Seaplane Traffic (FUSETRA) (<http://www.fusetra.eu>). Funded by the European Commission Directorate General, its goal was to demonstrate the needs and quantify the potential for seaplane traffic business development, as well as to propose recommendations for the introduction of a new seaplane/amphibian transportation system. A series of workshops and reports were produced in 2010 that reflected the status of worldwide seaplane/amphibian operations and their effectiveness. The workshops and research also reviewed concepts and requirements for a new European seaplane/amphibian transport system that could be integrated into the sea/air/land transport chain.

As commissioned by the EU, another purpose of FUSETRA was to directly affect the strategy of future regulatory issues in the EU. FUSETRA laid out a road map to address how existing or new rules may be adapted to achieve a goal of interdisciplinary cooperation between sea, land, and air, and between local and EU authorities. As a result of its efforts, four main deficiency areas were described and several improvement concepts were highlighted in the following areas: (1) permission and certification, (2) availability of trained staff, (3) aircraft and infrastructure, and (4) market and profitability. FUSETRA did not receive continued funding beyond its initial study term, and no further studies have been developed.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS

The National Plan of Integrated Airport Systems (NPIAS) is a planning document maintained by the FAA for identifying nearly 3,400 existing and proposed airports that are significant to national air transportation. Airports listed in the NPIAS are eligible to receive federal grants under the Airport Improvement Program (AIP). Based on data from the 2015–2019 *NPIAS Report to Congress*, approximately 610,500 active pilots, 209,000 GA aircraft, and 6,700 air carrier aircraft use 19,360 landing areas in the United States (Foxx 2014). The landing areas include 14,212 private-use (closed to the public) and 5,148 public-use (open to the public) facilities. There are 488 total SPB facilities, of which 272 are private use and 216 are public use. To be included in the NPIAS, a number of criteria must be met. An SPB must have an eligible sponsor, be open to the public, have enough activity (usually at least 10 locally based aircraft), and be located at least 20 miles from the nearest other NPIAS airport, or it must enplane at least 2,500 passengers.

The NPIAS data presented in Table 1 was updated on September 30, 2014. The data were not available at the time this study began; hence, the data differ slightly from the 2012 database used for determining eligible SPBs for this study. Fewer SPBs are listed in the newer database than in the 2012–2013 database. The 2015–2019 NPIAS reports that there are 5,148 public-use airports, of which 3,331 are in the NPIAS. Of those 3,331 public-use airports listed, 514 accommodate airline or commercial service and receive the bulk of federal grant funding. There are 38 SPBs listed in the NPIAS. The majority (34) are located in Alaska. Lake Hood, Alaska, is a primary commercial service airport, while Craig, Metlakatla, and Thorne Bay, Alaska, are nonprimary commercial service SPBs. All others are GA.

TABLE 1
NUMBER OF AIRPORTS IN THE NPIAS AS OF SEPTEMBER 30, 2014

Type of Facility	Total U.S. Facilities	Private-Use Facilities	Public-Use Facilities	Existing NPIAS Facilities
Airport	13,112	8,266	4,857	3,283
Heliport	5,579	5,513	66	10
Seaplane Base	488	272	216	38
Balloon Port	13	12	1	—
Gliderport	35	30	5	—
Ultralight Flightpark	122	119	3	—
TOTAL	19,360	14,212	5,148	3,331

Source: Foxx (2014).

Note: The total number of SPBs (216) differs from the study's 247 SPB list due to an update of NPIAS data during the course of the study. The 2014 data are shown in the table. Dash indicates no data.

Each state has a state airport system plan (SASP) that identifies the development needed to establish a viable system of airports within its state. To be included in a SASP, state requirements may include the same or similar stipulations as for the NPIAS. Airports included in a SASP, but not in the NPIAS, are usually smaller airports that have state or regional significance but are not considered to be of national interest, one of the main requirements for inclusion in the NPIAS.

The 2014 NPIAS report indicates that between 2009 and 2013, the number of aircraft has declined by approximately 7%, the number of public-use landing areas has declined 1%, and the number of pilots has increased 1%. Statistics cited in the Alaska DOT&PF feasibility study for a new SPB in the Anchorage area reveal that the average survey respondent was male, had a household income of \$113,000 per year and a 4-year college education, and was 55 years old in 20. These averages were higher in every category than for that of the general population in the Anchorage area (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008).

REPORT ORGANIZATION

This synthesis report is organized into eight chapters with additional sections for references, acronyms, and appendices. Within the report, references are made to the survey questions by use of the bracketed letter {Q} along with a number that corresponds to the survey question of the same number (e.g., Q1, Q2, Q3)

Chapter one provides an introduction to the synthesis and describes its purpose, the literature review and study methodology, and background information on the NPIAS, which is necessary to better understand the context for how SPBs can be preserved and developed.

Chapter two provides a basic history of SPB development and delves into defining what an SPB is, given that various definitions exist and different regulatory bodies may have oversight of their operation.

Chapter three discusses the economic impact of SPBs and the capital and operational means to help fund their development.

Chapter four focuses on current practices in developing SPBs as derived from the literature and survey responses. An overview of guidance material related to the SPB planning process and factors to address in the design and construction is provided.

Chapter five addresses the collection of operational, safety, and accident data and how the data are used to help preserve existing SPBs. Information is presented on what SPB operators are currently doing in the area of environmental protection and public outreach, promotion, and advocacy.

Chapter six groups into seven sections survey responses on the challenges operators perceive as affecting their continued preservation and development. The challenges are development, safety, airspace, management, funding, environmental, and community acceptance. Gaps in current practice are also addressed.

Chapter seven provides two case examples—one of a community using its SPB to promote economic development and the other of an SPB that supports commercial operation.

Chapter eight provides the conclusions and suggestions for further research.

CHAPTER TWO

WHAT IS A SEAPLANE BASE?

The term used to describe a body of water or private facility that is available to the public is “public use.” As it relates to an airport, public use means it is available for use by the general public without prior approval of the airport owner or operator (FAA Order 5010.4 1981; Advisory Circular 150/5200-35A 2010). “Private use” refers to any airport available for use by the owner only, or by the owner and other persons authorized by the owner (Advisory Circular 150/5200-35A 2010).

For the majority of private SPBs listed in both the FAA database and Appendix B, the ownership is designated as being “privately owned.” In the case of SPBs, the term “privately owned” generally refers to the land facilities and not the waterway, as waterways fall under the control of a federal, state, or local government agency. In contrast, for a private-use land airport, a private owner actually owns the land on which the runways and taxiways are located. If a private owner makes his or her airport available to the public, then it becomes a public-use airport (albeit privately owned). In all but a few cases, the owner of a public-use land airport also owns or operates the facilities located on it. The same ownership of water and land facilities does not hold true for SPBs.

HISTORY

The history of seaplane development, commencing in 1910, is well documented. The history of the development of seaplane bases is not so well documented. In a telephone conversation on September 15, 2014, Rick Leisenring, curator at the Glenn H. Curtiss Museum in Hammondsport, New York, indicated that when Curtiss developed the first pontoons to be used on an aircraft in the United States in 1911, he used an existing dock to place the aircraft into the water. At first, a beach area was all that was needed, though invariably a pilot usually got wet trying to maneuver and position an aircraft. With some exceptions, existing wooden boat docks were easily adapted to seaplane use, as evidenced by Glenn Curtiss’ first efforts.

The first commercial airline operation in the United States began on January 1, 1914, when Tony Jannus, a 24-year-old pilot, formed the Tampa Air Boat Line and piloted a seaplane on scheduled commercial flights between St. Petersburg and Tampa, Florida (Kite-Powell 2014). Though the operation lasted only 4 months, it proved that the concept of commercial aviation was viable. The advent of World War I further promoted the value of seaplanes (Nicolaou 1998).

As seaplane use increased, the construction or need for facilities to specifically accommodate seaplanes naturally followed. The development of seaplanes allowed for travel over large bodies of water and to remote inland rivers or lakes where construction of physical facilities made access impractical or impossible. Pan American Airways (Pan Am) championed the cause of specially constructed SPBs and elaborate terminal buildings for passengers and mail handling located near metropolitan areas (*Age of Adventure* n.d.). Pan Am was the forerunner to today’s international airlines. Its president, Juan Tripp, helped to promote the development of concrete ramps for amphibious use and the use of large floating docks with gangways or piers connecting them to the mainland, which laid the foundation for the future design of seaplane bases.

As aircraft and engine technology progressed with the events of World War II, aircraft were able to travel farther. As a result, land airports gained prominence and more were constructed. In the United States, SPBs used for commercial purposes became secondary to land airports, and fell out of favor in the late 1950s (Nicolaou 1998). Figure 2 illustrates the effects on the international manufacture of new seaplane designs as land airports and wheeled aircraft gained prominence. However, the need and desire for access to remote areas continued for recreational use.

Several of the SPBs included in the survey have been in operation for a long time, as shown in Table 2 {Q1}. Long Lake in Sinclair, Maine, was established in 1915 and Lake Hood in Alaska was established in the 1920s. One SPB (Renton, Washington) started with the Boeing Aircraft Company in 1932 after the manufacturer was selected as one of first air-mail carriers.

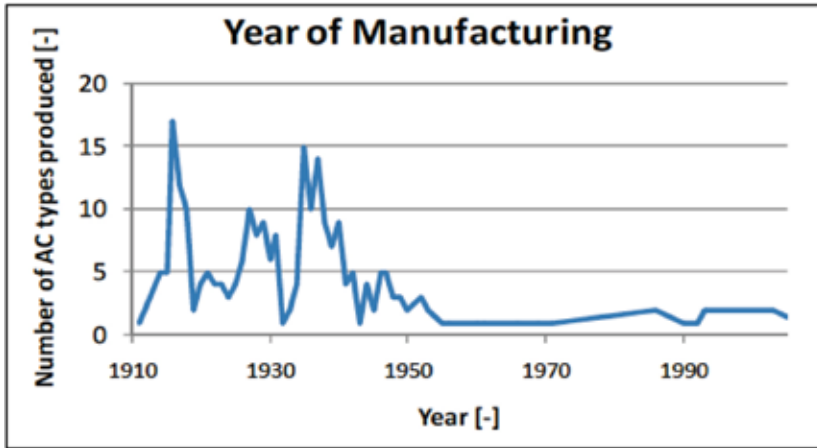
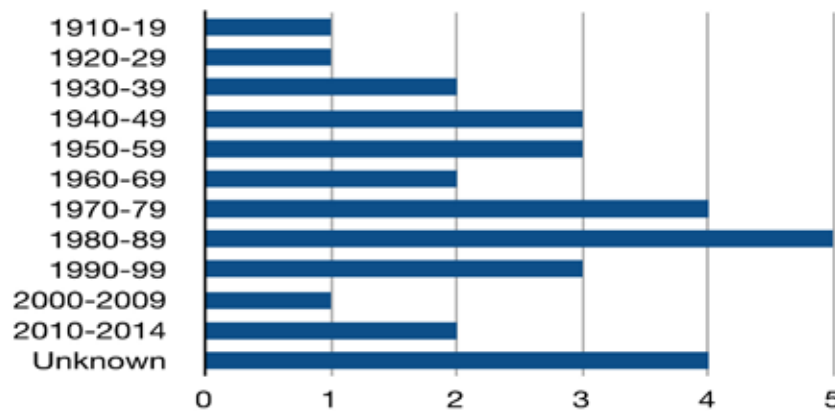


FIGURE 2 Year and number of new seaplane designs produced globally. (Source: FUSETRA Seaplane Database 2010. Used with permission.)

TABLE 2
NUMBER AND TIME PERIOD IN WHICH SURVEYED SEAPLANE BASES WERE ESTABLISHED



Source: SMQ Airport Services {Q1}.
Note: Total number of SPBs is 31.



FIGURE 3 Different types of seaplanes. (Credit: S. Quilty, SMQ Airport Services)

SEAPLANE TYPES

“Seaplane” is the term used to describe any aircraft that is designed to operate on water. Three general types of seaplanes are floatplanes, flying (hull) boats, and amphibians (Figure 3). A floatplane is an aircraft that has pontoons instead of wheels and

is often referred to as a straight floatplane. A flying boat is an aircraft whose fuselage acts as a boat hull with small outrigger pontoons used to help stabilize it. An amphibian seaplane is one that has retractable landing gear, allowing it to operate on land or water. Amphibians can have either pontoons or a hull for operation on the water and are often known as float amphibian or hull amphibian aircraft.

No matter what type of seaplane it is, once it is on the water it becomes a vessel. This conforms to U.S. Coast Guard regulations (United States Coast Guard 2014). In the regulation, the word “vessel” includes every description of watercraft, including nondisplacement craft and seaplanes, used or capable of being used as a means of water transportation. Additional regulatory background is provided later in this chapter. An important note about vessels is that where boats and other watercraft are allowed, so too are seaplanes. Federal aviation regulation Part 91 requires pilots to give way to boaters [14 Code of Federal Regulations (CFR) 91.115].

DEFINING A SEAPLANE BASE

The term “seaplane base” has variable meanings and can lead to confusion when discussing licensing and permitting, capital improvement, governmental financial assistance, maintenance, environmental responsibilities, or its public purpose. As described in the following paragraphs, it is important to note that seaplanes can access many different bodies of water and do not require the designation of an official SPB to operate on water. An official SPB designation provides for depiction on aeronautical charts and possible eligibility for funding assistance.

The FAA’s definition of an airport is “an area of land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any” (14 CFR 1.1). The airport definition includes landing areas developed for conventional fixed-wing aircraft, helicopters, and seaplanes (Foxy 2014). The inclusion of “its buildings and facilities” in the definition creates a challenge for the development and preservation of SPBs, especially in the areas of capital funding and public support, as explained later.

A seaplane base is not defined in 14 CFR Part 1 *Definitions*. There is a definition in AC 150/5395-1A, which is “a dedicated area of water used or intended to be used for the landing and takeoff of seaplanes, water taxiing, anchoring, ramp service, possibly with shoreline, and onshore facilities.” The use of the words “possibly with shoreline, and onshore facilities” implies that a beaching or docking area and related facilities are not necessary for an SPB to exist. It is for this reason that the term “seaplane base” can cause confusion.

The term “water operating area” is used in the same advisory circular to mean a designated area on a body of water deemed suitable to facilitate seaplane operations for landing, takeoffs, and water taxiing. Landside facilities are not inferred. The water operating area can be described by latitude and longitude coordinates, Notice to Airmen, or on a layout plan. Reasons to designate a water operating area include to avoid hazardous or unforeseen water obstacles, or to improve the approach or departure paths for aircraft. As with the ability of boats to traverse bodies of water, the absence of a dedicated or designated area does not restrict or exclude a seaplane from operating on a body of water, nor an SPB from being established.

In FAA Order 7110.65V (*Air Traffic Control* 2014), the definition for a landing area mirrors the International Civil Aeronautics Organization definition: “Any locality either on land, water, or structures, including airports/heliports and intermediate landing fields, which is used, or intended to be used, for the landing and takeoff of aircraft whether or not facilities are provided for the shelter, servicing, or for receiving or discharging passengers or cargo.” Given these definitions, a water landing area can be an SPB, absent any land facilities.

In the same FAA order, a “sea lane” is defined as a designated portion of water outlined by visual surface markers for and intended to be used by aircraft designed to operate on water. In AC 150/5395-1A, a distinction is made between a sea lane and a marked sea lane. The FAA order does not make that distinction. The AC identifies a sea lane as a defined path within a water operating area dedicated for the landing and takeoff run of seaplanes along its length. A marked sea lane is defined as a sea lane that has its four corners identified by visual markers, such as by buoys. Absent the markers, a sea lane can still exist, but obstacle clearance is not assured. In a meeting on November 19, 2014, SPA Executive Director Steven McCaughey noted that seaplane pilots generally prefer to not have a sea lane marked, as it reduces their operating flexibility given winds and aircraft operating requirements.

A sea lane’s visual markers allow for an FAA assessment of approach, departure, and traffic pattern obstacles because there is a defined point for the beginning and end of the landing area. Flight path obstacle evaluation is conducted under 14

CFR Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace*. Under Part 77, an SPB is considered to be an airport “only if its sea lanes are outlined by visual markers” (14 CFR 77.3). If an SPB operator seeks to develop a seaplane base layout plan (SBLP) per AC 150/5395-1A, a diagram depicting a sea lane will allow for the FAA to make an evaluation of Part 77 obstacle surfaces.

Another potential source for the confusion in defining what constitutes a seaplane base is found in AC 150/5200-35A—*Submitting the Airport Master Record in Order to Activate a New Airport*. The instructions for entering data that identifies the owner of a proposed SPB include the following: “If the landing area is a seaplane base, enter the name of the owner of the property on which the shore facility is established” (Advisory Circular 150/5200-35A 2010). According to the instructions, an SPB must have a shore facility. But that is not always the case. This requirement helps to explain why water landing areas may not be registered in the FAA database, or are registered to a private owner located on a public waterway, especially in remote areas. Another reason an SPB may not be listed in the database is because it does not meet the level of activity criteria.

One example to help illustrate the confusion of what may constitute an SPB is Lake Union, Washington, adjacent to the city of Seattle. A review of FAA Form 5010 Airport Master Record data shows both Kenmore Air Harbor and Seattle Seaplanes listed as SPBs—W55 and 0W0. The W55 master record identifies a 5,000-ft water landing area in Lake Union with an SPB listed as Kenmore Air Harbor. A private individual, the chairman of Kenmore Air Harbor, Inc., is listed as the owner. The master record for 0W0 identifies a 9,500-ft water landing area in Lake Union with the airport listed as Seattle Seaplanes and the private owner of Seattle Seaplanes as owner of the SPB.

The issue is that neither of the private operators listed have ownership of the associated water landing area, as they are on a public lake that falls under the purview of the state of Washington, with the city of Seattle having oversight of operational activity. In the example cited, the SPB owners identified on FAA’s Form 5010 refers to ownership of the land facilities and not that of the water landing area. This would be similar to the owner of a private fixed-base operator (FBO) at a city-owned land airport being listed as the owner of the airport. It is easy for the private commercial operators to be misconstrued as the owners of the public waterways because of the master record listing.

Other examples are seen at two different public-use SPBs. One is an Alaskan lake that is open to the public but where the water’s edge is surrounded by private-use landowners. Many seaplane pilots land and take off in the lake, but they are based at individual private-use lake residences. No public seaplane services are available, but the water landing area is listed as a public-use SPB because one of the lake lot landowners registered it with the FAA.

The other example is an SPB whose Form 5010 lists a private individual on a public-use lake who allows seaplane pilots to use his privately owned dock. The SPB exists in FAA records because an active seaplane pilot on the lake had taken the effort to register it. The active pilot then sold his property. No deactivation of the SPB using FAA Form 7480-1 was undertaken. The new owner, who does not have a seaplane, has continued to send in the annual FAA registration form because he supports seaplane operation. The lake and water landing area are public use and continue to be shown on aeronautical charts. At any time, the new owner could discontinue the registration, make the dock private use, and deactivate the SPB. In doing so, the lake is still available for seaplane operations, though it would be removed from aeronautical charts and the FAA database registry.

The last example illustrates that if an SPB is listed as officially “closed,” the waterway may still remain available for use at a pilot’s own risk because it is a public-use body of water. This relationship contributes to the confusion about the term “seaplane base.”

To better understand what constitutes an SPB, one can reference the Arizona State Aviation Needs Study [*Arizona State Aviation Needs Study* (SANS) 2000]. The SANS describes seaplane facilities as being of two types: seaplane bases and seaplane landing areas. Seaplane bases have a resident operator who provides commercial services such as flight instruction, sightseeing flights, aviation fuel, or aircraft maintenance. Seaplane (or water) landing areas are designated bodies of water on which seaplanes can operate but where no seaplane-specific facilities are available.

The SANS study then lists the following SPBs as active in 2000: Lake Havasu Seaplane Base Lake, Lake Mead Seaplane Landing Area, Lake Roosevelt Seaplane Landing Area, and Lake Powell Seaplane Landing Area. In a 2008 update to the SANS, none of the SPBs were subsequently listed. A search of SPA’s 2013 *Water Landing Directory*, which receives information from local pilots and resources, reported the following lakes to have seaplane activity: Lake Havasu Seaplane Base (LaPlaca Flying Service), Lake Mead Seaplane Landing Area, Lake Mohave, Lake Roosevelt Seaplane Landing Area, Lake Powell Seaplane Landing Area, Mormon Lake, and Upper Lake Mary. In a telephone conversation on December 22, 2014, Kenneth Potts, A.A.E.,

airport grants manager with the Arizona Department of Transportation, said the reason was unclear as to why the previous four SPBs were no longer listed, other than that they are not listed in the NPIAS, though he indicated that the Arizona SASP does include non-NPIAS airports. Potts indicated that the state would probably take a closer look at SPBs in the next SASP update.

OWNERSHIP OPTIONS

Based on the literature search and the previous discussions, the term “seaplane base” therefore includes the following possibilities:

1. A body of water and the land surrounding it is privately owned. Seaplane operators are publicly allowed by the private owner to use the waterway or a land facility.
2. A body of water is publicly owned, but the land surrounding it is privately owned. The waterway is public use, but the land facilities may be privately owned and open to the public, or privately owned and private use.
3. A body of water is publicly owned and open to the public, and a government agency provides a docking area or facility.

This ACRP report focuses on public-use SPBs and includes all three scenarios. The majority of public-use SPBs in the United States are similar to privately owned land airports that are open to the public. The SPB landing, takeoff, and docking areas are available as public use, but the land and facilities are privately owned and operated or leased to a private operator, such as a private business marina or individual docking area.

An example is the SPB at Coeur d’Alene, Idaho. It is listed as being owned by the city. A note in the FAA’s *Airport/Facility Directory* lists the docks and office buildings as being owned by a private individual (*Airport/Facility Directory Northwest* U.S. 2014). The individual is then under contract to the city to manage the SPB for the city. In Indiana, many of the lakes available for seaplane operation are owned and operated under the authority of the Department of Natural Resources (DNR). However, of the 22 seaplane bases listed in Indiana, only one has a public landing area operated by DNR (*Water Landing Directory* 2011). The other lakes either have no facilities or have private docks owned by marinas, resorts, or individuals. These types of arrangements have implications for the development and preservation of SPBs throughout the United States.

An exception to the public ownership of SPB facilities is the state of Alaska. The Alaska Department of Transportation and Public Facilities (DOT&PF) owns and operates a large number of SPBs along with their related dock facilities. According to Verne Skagerberg of the Alaska Department of Transportation and Public Facilities in a telephone conversation on September 10, 2014, the department will, on occasion, contract with a local individual or firm to oversee operations if needed. Also, a number of SPBs are listed in the FAA database as being in the public domain. This means they are available for use by the public but that no one individual can make claim to them.

There are few privately owned waterways and few publicly owned SPB landside facilities. The former is because of the long-standing legal oversight of waterways by the federal government for commercial purposes on navigable waters, coupled with laws protecting the waterway environment. The few publicly owned SPBs (with the exception of Alaska) are the result of the historical development of seaplane operations by private industry, when private companies owned the land and constructed docks, ramps, and developed land areas.

Ownership of a river, lake bed, or the lands between high and low watermarks vary according to federal or state law. The SPB at Tavares, Florida, is an example of one of the few waterways that is controlled by a municipality (see chapter seven). The city’s property line includes the northern half of Lake Dora, which is where the water landing area is located. Municipal airports with water landing areas, such as New Iberia, Louisiana, is another example. Some lakes have homeowner or lake associations that seek, have certain rights, or are able to exercise control of activities on a body of water.

One last example of possible confusion surrounding the definition of an SPB is found in CFR Part 139. Part 139 is the regulation that requires an airport to have an operating certificate issued by the FAA in order to be served by scheduled air carrier aircraft with more than nine seats. While FAA’s basic definition of an airport includes an SPB, under Part 139 the FAA defines an airport as “an area of land or other hard surface, *excluding water*, that is used or intended to be used for the landing and takeoff of aircraft, including any buildings and facilities” (14 CFR 139.5; emphasis added). This means a Part 139 airport operating certificate can be issued only under the regulation to a land airport.

Because the definition of what constitutes a seaplane base and who owns it is unclear, clarification about SPB ownership was sought in the literature, as it has implications for the development and preservation of SPBs in the United States.

In *Compilation of State Airport Authorizing Legislation*, the author writes that the laws of all states provide for a number of common governmental structures that may be used to own and operate an airport (Howick 2012). The structures are (1) direct state ownership and operations, (2) state authorities and corporations, (3) state compacts (multijurisdictional), (4) municipal airports, and (5) private operators. The report goes on to explain how an airport under state jurisdiction has the authority to be owned and operated by different authorized political subdivisions.

In Alaska, four common ownership and operational arrangements have been established for the construction and development of a new SPB:

1. A public entity constructs, owns, and operates the facility.
2. A public entity constructs and owns but contracts with a private operator.
3. A private operator builds the facility on public land, operates it for a period of years, and returns the facility to the public owner at the end of that term.
4. A condominium concept where seaplane owners have ownership rights to a slip and other common assets in a private seaplane facility.

(*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008).

Table 3 identifies the different organizational structures that own or oversee seaplane bases in the United States as culled from the SPB operators that responded to the survey {Q2, Q3} and from the FAA database (“AirportIQ5010” 2014). Some SPBs have well-developed land facilities, though the majority do not.

TABLE 3
LIST OF PUBLIC-USE SEAPLANE BASE OWNERSHIP TYPES IN THE UNITED STATES

STATES OTHER THAN ALASKA			ALASKA	
14	MUNICIPALITY – City		12	CITY
3	MUNICIPALITY – County		3	BOROUGH
3	MUNICIPALITY – City & County		3	CITY & BOROUGH
4	MUNICIPALITY – Town		1	COMMUNITY
2	AIRPORT AUTHORITY		1	NATIVE CORPORATION
3	PORT		1	STATE – Department of Fish & Game
1	PARISH		41	STATE – DOT & Public Facilities
1	STATE – CA Bureau of Parks & Recreation		1	STATE – Division of Lands
1	STATE – CA Dept. of Water Resources		16	STATE – Dept. of Natural Resources
1	STATE – CA State Land Commission		14	STATE – Public Domain
1	STATE – Hawaii		4	FEDERAL – U.S. DOI – National Park Service
1	STATE – LA DOT & Development		1	FEDERAL – U.S. DOI – Fish & Wildlife Service
1	STATE – ME DOT		1	FEDERAL – U.S. DOA – Forest Service
1	STATE – NE DOT		1	FEDERAL – U.S. DOC – Nat’l Marine Fisheries
1	STATE – Ohio Division of Parks & Recreation		27	PRIVATE
5	FEDERAL – U.S. Army Corps of Engineers			
68	PRIVATE			
106	Subtotal	+	127	Subtotal = 233 TOTAL

Source: “AirportIQ5010” (2014).

Note: Total does not equal 247 SPBs found in the 2013/14 AOPA directory because four airports were determined to no longer be seaplane bases through study inquiry and 17 were not found in the current FAA 5010 database managed by GCR, Inc. DOI = Department of the Interior; DOA = Department of Agriculture; DOC = Department of Commerce.

PUBLIC ROLE AND PURPOSE

SPBs function in a number of different roles, and they serve a number of different purposes and uses. Seaplanes can operate in highly diverse environments, from congested airspace to unimproved remote locations. Similar to small GA airports and backcountry rural airstrips, a number of issues may impair or reduce seaplane operations. Those issues are described further in chapter five and throughout this study.

Role

The FAA defines a general aviation airport as a public airport that is located in a state and that, as determined by the Secretary of Transportation, does not have scheduled service or has scheduled service with less than 2,500 passenger boardings each year (FAA Modernization and Reform Act 2012). A commercial service airport is one that receives schedule or unscheduled air service and has enplanements or boardings of more than 2,500 passengers. The majority of SPBs are general aviation. A number of Alaskan airports are nonprimary commercial services. Only one SPB is listed as a primary commercial service airport (Lake Hood, Alaska). A primary commercial service airport is one that enplanes more than 10,000 passengers, while a nonprimary commercial service airport is one that enplanes between 2,500 and 10,000 passengers.

SPBs help to provide connections to the larger aviation system by providing access to their respective communities—a role consistent with the goals of the NAS. SPBs support commerce while also serving many functions such as access to medical flights, search and rescue, disaster relief, aerial firefighting, law enforcement, environmental and geological research, fish and wildlife conservation, and recreational use.

Under a national study, an effort was made to better identify the types of aeronautical functions GA airports provide in serving the public interest (*General Aviation Airports* 2012). Commonly referred to as the ASSET Report, it identified four new general aviation airport categories: National, Regional, Local, and Basic (Figure 4).

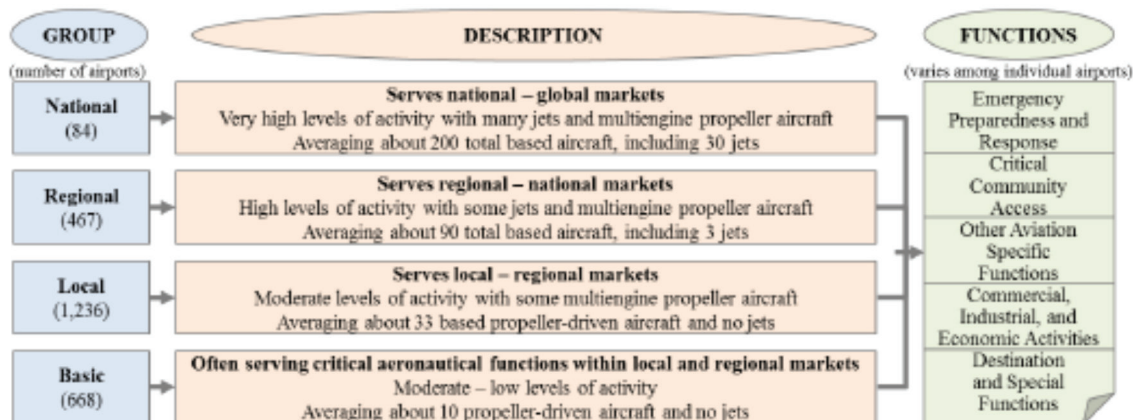


FIGURE 4 Classification of general aviation airports in the GA ASSET Report. (Source: *General Aviation Airports: A National Asset* 2012)

The classifications are based on existing activity and will help the FAA in its planning efforts under the NPIAS. A total of 38 SPBs are listed in the NPIAS. Under the ASSET study, no SPBs were listed in the National or Regional roles. Four SPBs are listed in the Local category and 20 are listed in the Basic category. Thirteen SPB facilities remain unclassified because of minimal activity and inadequate data (*Asset 2: In-Depth Review of the 497 Unclassified Airports* 2014).

As part of a SASP, a state aviation agency may recognize the importance of SPBs through a different classification scheme. For instance, the state of Washington classifies its airports according to the following roles (Washington State Department of Transportation 2011).

Class A—Commercial Service Airports

Class B—Regional Service Airports

Class C—Community Service Airports

Class D—Local Service Airports

Class E—Rural Essential Airports

Class F—Seaplane Bases

Fundamentally, an SPB serves as a transition point for seaplane operators. The transition can be from air to water and vice versa, and from water to land and vice versa. An SPB allows for seaplanes to safely take off and land on water, water taxi to and from a dock or beach area, and access land facilities for passenger processing, maintenance, and storage. Some SPBs support the transition role of seaplanes from water to land and vice versa by having lifts or dollies that allow for the removal and installation of pontoons or wheels on aircraft.

Purpose

This report highlights three major purposes or uses for seaplane bases. The first, evidenced mostly in the San Juan County area of Washington State and by the whole of Alaska, is for basic access to the NAS. The NAS is part of the overall transportation system in the United States. San Juan County has limited access to transportation because it is wholly comprised of islands. Boats, ferries, and aircraft are their lifeline to the continent.

The second basic purpose of SPBs is to serve the recreational needs of pilots and passengers. Seaplanes combine the recreational aspects of water usage combined with a flexibility of accessing more than one body of water.

An SPB's third basic purpose is the contribution it can provide to the local economy, whether that contribution is as a basic necessity for transporting persons or cargo, or to serve as an attraction for tourism or business. A number of public-use SPBs are actually sporting or hunting lodges that rely on seaplanes to bring customers to their remote location.

A study evaluating the possibility of a new SPB in Alaska summarizes several purposes for them (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008).

1. Access to National Aviation System
2. Business
3. Pleasure/recreation
4. Employment
5. Tourism
6. Sightseeing
7. Flight instruction and training
8. Medical evacuation
9. Aerial photography.

An SPB, like any other general aviation airport, can support many types of activities. Table 4 identifies the different uses general aviation airports provide and the percentage of use as reported in the NPIAS data (Foxy 2014).

When asked what purposes their SPBs serve, ACRP survey respondents echoed some of the same uses as the FAA study (Figure 5) {Q4}.

TABLE 4
TYPES AND PERCENTAGE OF ACTIVITIES AT GENERAL AVIATION AIRPORTS LISTED IN THE NPIAS

Category	Percent
General Aviation Use	
Personal	33.5
Instructional	15.3
Corporate/Executive	9.7
Business	8.7
Aerial Observation	5.4
Other	5.2
Aerial Application	3.9
Other Work Use	1.1
External Load (Rotorcraft)	0.9
Aerial Other	0.8
Sightseeing	0.7
Air Medical	0.4
SUBTOTAL General Aviation Use	85.6
On-Demand Federal Aviation Regulation Part 135 Use	
Air Taxi and Air Tours	11.4
Part 135 Air Medical	3.0
SUBTOTAL Part 135 Use	14.4
TOTAL ALL USES	100.0

Source: NPIAS, Foxx (2014).

Note: "Other" is defined as positioning flights, proficiency flights, training, ferrying, sales demonstrations, etc.

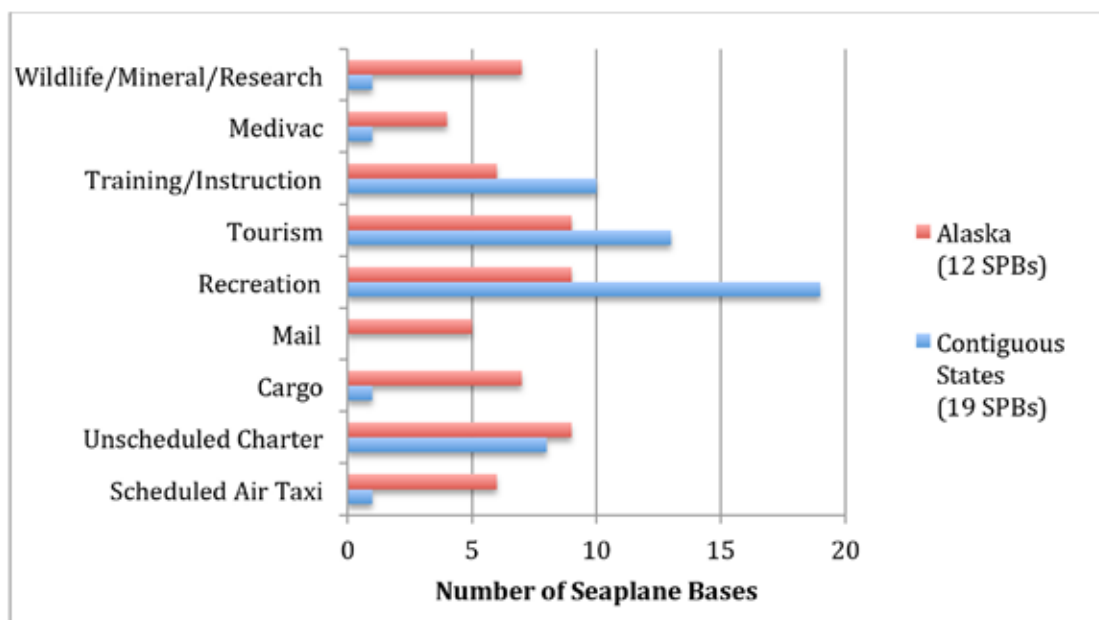


FIGURE 5 Purpose and use of seaplane bases cited by survey respondents. Note: Respondents selected multiple purposes as they applied to their SPB. (Source: SMQ Airport Services {Q4})

The survey for this report sought to identify the reasons each SPB was established {Q5}. A variety of factors affect the location of an SPB. In one case, a local oil company that used seaplanes requested that the city establish a base. In another case, recreational or commercial pilots requested to have a waterway formally recognized for their use to either conduct flight instruction or provide service to a resort or sporting lodge. Two cities sought to develop their waterfront areas for economic and recreational value and determined that an SPB would enhance those purposes. Twenty-one SPB locations are geographi-

cally affiliated with a city, village, or town, while another 10 are remote from a city or town and serve primarily as access to a recreational area or a sport/hunting lodge.

Twenty-four of the 31 SPBs in the survey were designed solely to serve seaplanes; two were designed primarily as marinas that later accommodated seaplanes; and five were designed to accommodate both seaplanes and boats {Q6}.

In an open-ended question asking the reasons pilots choose to use or visit their SPB, operators cited the following wide range of responses, followed by the number of responses (*Note*: respondents identified multiple purposes that may apply) {Q7}.

1. Convenience or only SPB available in the area (11)
2. Availability of fuel (7)
3. Commercial business (lodge, resort, client drop-off, supply pick-up) (5)
4. Recreational opportunities (4)
5. Tourism/sightsee/attend events/visit (4)
6. Hangars/tiedown/transient dock/security (4)
7. Location (3)
8. Training/instruction/rental (3)
9. Maintenance/ float change-out (3)
10. Restaurant/food (3).

REGULATION AND ENVIRONMENTAL ISSUES

The establishment and operation of an SPB can have regulatory oversight from a number of different federal, state, and local governing agencies. Most bodies of water in the United States fall under the purview of the federal government or states. The different forms of ownership or control have implications for the development and preservation of SPBs, especially in the areas of construction, maintenance, operation, use, and promotion.

The commerce clause of the U.S. Constitution creates the authority of the federal government to oversee navigable waterways that can be used to conduct interstate and foreign commerce. Bodies of water contained wholly within a state likely fall under state jurisdiction. However, a body of water's capability for use and transport in commerce determines whether a navigable waterway is subject to federal jurisdiction. A body of water may be entirely within a state, yet be subject to federal oversight.

Chapter II of 33 Code of Federal Regulations describes the authority of the U.S. Army Corps of Engineers (USACE) to regulate navigable waters of the United States (33 CFR 329). As stated in Section 329.4, the definition of navigable waterway is

Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity. (33 CFR 329.4)

This CFR definition applies specifically to the authority of the USACE. The Clean Water Act features an expanded definition of waters of the United States as it applies to instances of environmental determinations. The definition for "*waters of the United States*" under the act is found in 33 CFR Part 328.3 (33 CFR 328.3).

The USACE regulates the use, administration, and navigation of the navigable waters of the United States as public necessity may require for the protection of life and property (33 CFR 320). The act restricts the construction of piers and other structures along the shoreline or into the navigable waters of the United States unless a permit or other approval is obtained

from USACE (33 CFR 322). The USACE District Engineer grants permission for the construction or modification of an SPB on federal waters.

A key aspect of seaplane operation is that once the aircraft is on the water, it is considered to be a vessel. This has consequences for the applicability of rules and regulations governing pilot operation and SPB use on the water. In the air, seaplane operation is regulated by the FAA under 14 CFR Part 91: *General Operating and Flight Rules* (14 CFR 91); Part 119: *Certification: Air Carriers and Commercial Operators* (14 CFR 119); and Part 135: *Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft* (14 CFR 135).

The responsibility of the United States Coast Guard (USCG) is to promulgate, administer, and enforce rules and regulations governing the safety and life of persons and property on waters subject to federal jurisdiction. The USCG publishes navigation rules (*Navigation Rules and Regulations Handbook* 2014) that specifically define a seaplane as any aircraft designed to maneuver on the water and therefore as a vessel. The USCG district commander grants permission for an SPB to operate on federal waters and for the construction and operation of navigation aids. For non-navigable waterways located on federal lands, permits may be issued by numerous agencies, including the U.S. Forest Service (36 CFR 1; 36 CFR 3).

A number of regulatory and environmental laws affect the development and preservation of SPBs, such as the following:

- U.S. National Invasive Species Act of 1996
- Clean Water Act of 1972
- Oil Pollution Act of 1990
- Federal Water Pollution Control Act
- Nonindigenous Species Aquatic Nuisance Prevention and Control Act of 1990
- Clean Water Act as amended by Comprehensive Environmental Response, Compensation, and Liability Act
- Hazardous Materials Transportation Act
- Magnuson Act of 1976
- Shore Protection Act
- Endangered Species Act
- Marine Mammal Protection Act.

Despite various environmental issues that could be of concern to SPB operators, 15 operators expressed none as a concern for them {Q8}. Seven respondents expressed concerns about fluctuating water levels and its effect on erosion, aquatic vegetation, weed growth, or fish spawning. Four individuals were concerned with the water quality in and around the dock area as a result of potential fuel or oil spillage. Birds and other wildlife were a concern to only two individuals. One respondent each cited invasive species or noise as a concern.

SUMMARY

The history of seaplane development is well documented. However, sparse information is available on the history of SPB development. An SPB is defined as a dedicated area of water used or intended to be used for the landing and takeoff of seaplanes, water taxiing, anchoring, ramp service, possibly with shoreline, and onshore facilities. This definition can cause confusion when discussing licensing and permitting, capital improvement, governmental financial assistance, maintenance, environmental responsibilities, and public purpose, because a mix of SPB ownership options exist. Most waterways are owned by governmental entities, while the land facilities are often privately owned or operated.

SPBs function in a number of different roles, and they serve a number of different purposes and uses. An SPB is generally considered by the FAA to fulfill the role of a general aviation airport with a focus mainly on providing specialized services that scheduled airline service cannot provide. Fundamentally, the role of an SPB is to serve as a transition point for seaplane operators.

This report highlights three major purposes or uses for SPBs—to provide basic access to the NAS, to serve the recreational needs of pilots and passengers, and to make a contribution to the local economy through various commercial activities. Like any other GA airport, an SPB can support many types of activities. Recreational use is the most commonly cited. However, in Alaska and other remote areas where alternate transport modes are limited or nonexistent, SPBs and seaplane activity serve as a lifeline for the community to connect to the NAS.

CHAPTER THREE

ECONOMIC BENEFIT AND FUNDING

The reasons for developing an SPB vary across the country and reflect the socioeconomic and transportation needs of the local community. One of the main transportation benefits of an SPB is having access to the NAS, especially in Alaska and the San Juan area of Washington State. Seaplane operation at several of these communities is the primary means of access by the communities to other cities for travel and cargo shipment.

Economic benefits exist whether the SPB is used for commercial, recreational, research, training, or other purposes. SPB operators provide jobs, they purchase supplies and services from the local community, and they attract commercial and recreational activity to the area. People who use the SPB spend money on other transportation modes and at businesses in the community. The SPB operators themselves are investing in and contributing to the community through employment, expenditures on goods and services, and rent and taxes. These are all components of a measurable economic impact.

Nonfinancial benefits of an SPB vary by community and location, especially for Alaskan communities. Eighty-two percent of Alaskan communities do not have access to roads—accessibility is possible only by air and water transportation (*Statewide Aviation*, n.d.). For some communities, indirect employment and expansion of the tax base provide an incentive to operate an SPB facility. Such is the case for Tavares, Florida (see chapter seven).

ECONOMIC IMPACT

An economic impact study is a method and means to document and describe the financial and other benefits an organization or activity contributes to the community. Economic outputs are generally considered to be employment payroll and the purchase of goods and services by the SPB and its users. The market data captured by a study can then be conveyed to the community to illustrate the SPB's value and importance, and to show the possible consequences and impacts should SPB activity be restricted or hindered in the future.

Three airports responded that an economic impact study associated with their SPBs has been performed {Q9}. One was specific to the SPB, while the other two were part of larger regional metropolitan studies. The literature search discovered additional economic impact studies involving SPBs, though all were part of a larger airport, metropolitan, or state study, making it difficult to discern the exact impact of a single SPB.

Examples of economic and transportation benefits to a region are illustrated by the following examples:

- In the San Juan Island area of Washington State, travel to the remote islands can be an all-day affair on the ferry system. Commercial seaplane operators provide access in less than an hour.
- Several states—Maine and Alaska in particular—have robust sporting camp industries located in remote water areas of the state. Seaplanes become the avenue for transporting customers to those camps.
- National and state forest services, fisheries and wildlife services, and natural resources departments use seaplanes in their operations.
- Oil companies in the Gulf of Mexico region operate or use SPBs regularly to service their networks.
- Seaplanes can provide emergency response and relief when it may be difficult for other transport modes to do so.

Conducting an economic impact study for an SPB has its challenging aspects, depending on the size and type of operations conducted and its location. Difficulties arise primarily from lack of recorded usage data. Standard economic impact models may require adjustment, according to researchers (Gartner et al. 2005). The State of Minnesota commissioned an economic impact of its airports that included 16 public and private SPBs. The study used methodology established in the development of an airport economic impact calculator by Gartner et al. (2005). In the study, the authors identified the following nine airport-based activities that create economic activity:

1. Public airport operations and capital investments
2. Fixed base operators (FBOs)
3. Commercial scheduled air service
4. Retail businesses
5. General aviation
6. Freight operators
7. Private corporations with flight departments
8. Nonprofit and government entities
9. Other activities.

The authors of the Minnesota DOT economic study conclude that the model used does not detail all the benefits an airport can provide, as a number of nonquantifiable impacts are significant. Foremost among them would be medical/life support airlift, disaster relief, and aerial firefighting.

While not quantifiable as an economic impact, there is no doubt as to the essential service that medevac capability provides, especially in Alaska or remote areas where road accessibility is nonexistent or difficult. The value of an SPB can be immeasurable in those circumstances. The same is true for other types of services, such as aerial firefighting and natural resource conservation. Those activities are not intended to generate measurable economic activity but do provide the intangible value of protecting property and natural resources.

On the commercial side, several other airports and state systems have conducted economic impact studies that include SPBs. In addition to Minnesota, the states of Florida, Idaho, and Alaska have evaluated the economic impact of their airport systems to include SPBs.

The state of Florida completed a study in 2014 that documented the economic impact of 120 airports in the state (*Florida Statewide Aviation Economic Impact Study Update* 2014). This was accomplished as part of the overall Florida Aviation System Plan (FASP). The SPB at Tavares, Florida, was included in the study (see Appendix E).

The State of Idaho Division of Aeronautics, as part of its SASP, conducted an economic impact study of its airports in 2009. For each of its general aviation and commercial service airports, it published a brochure summarizing the economic impact, facilities and services, and recommended development costs of individual airports. Facility improvements are listed with expected funding sources (*Idaho Airport System Plan—Brooks Seaplane Base* 2009). Appendix F displays the economic impact sheet for the Brooks Seaplane Base.

Another example is Lake Hood SPB in Anchorage, Alaska. Deemed to be the largest active SPB in the world, the people of Anchorage, and the world for that matter, now know that Lake Hood was the SPB of choice for the majority of the 23,200 nonresident visitors to Alaska who purchased a flightseeing tour during their visit to Anchorage in the May 2011 through April 2012 period (*Economic Benefits of Lake Hood Seaplane Base* 2013). They also now know that Lake Hood accounts for approximately 230 jobs, \$14.0 million in payroll, and \$42 million in annual economic output. While Lake Hood is the exception among SPBs, the state DOT&PF works to ensure its value is conveyed to others as a means for continued viability of commercial, governmental, business, and personal use activity.

The state of Alaska pursued a study to evaluate the economic feasibility of a new floatplane facility located in Anchorage area (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008). The existing facilities at Lake Hood were at capacity with over 700 seaplanes and a long waiting list for future access (Figure 6). While the report concluded the financial cost of a new facility would most likely not make the proposed facility self-sustaining, it was noted in the report that only two of the public airports operated by DOT&PF operate profitably.



FIGURE 6 Aerial view showing congestion at Lake Hood Seaplane Base, Anchorage, Alaska. [Source: Alaska DOT&PF (*Siting Analysis, Sitka Seaplane Base—Sitka, Alaska* 2012)]

CAPITAL AND OPERATIONAL FUNDING

Across the United States, airports, including floatplane facilities, rely on a variety of funding sources to finance capital development, operations, and maintenance expenses. Major funding sources include federal and state grants, airport and special facility bonds, airport-generated income, and local governmental budget allocations (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008). The investment in future transportation development at the state level is often reflected in state transportation improvement plans or airport capital improvement plans. Also, because of the size and scope of harbor activity, a harbor master plan can be funded through sources from which the SPB can benefit.

To be eligible for federal funding, an SPB must be a public-use airport, be listed in the NPIAS, and have a current seaplane base layout plan (SBLP), per grant requirements under FAA's Airport Improvement Program (AIP) (Advisory Circu-

lar 150/5395-1A 2013). SPB maintenance or repair is not an eligible item for funding under AIP. As part of the application process, an AIP project requires justification to the FAA or must undergo a cost-benefit analysis to qualify. Two respondents identified this as a problem for them.

When asked about receiving external financial support for capital projects in the form of federal, state, or economic development aid, 11 SPB operators answered yes and 30 answered no {Q10}. Of the 11 that did receive assistance, seven were tied to an existing NPIAS airport that qualified for federal or state assistance. The remaining four received assistance from their respective state aviation agencies, one of which received outside community economic development grant aid and another of which received Federal Emergency Management Administration assistance as a result of a natural catastrophe.

When asked about funding sources for the improvements needed at their SPB, most operators cited internal funding sources or state aviation grant assistance (Figure 7) {Q11}. Federal AIP assistance was identified by those SPBs affiliated with a land airport that is in the NPIAS. The funds are contingent on any project at the SPB being qualified under the state or federal funding guidelines.

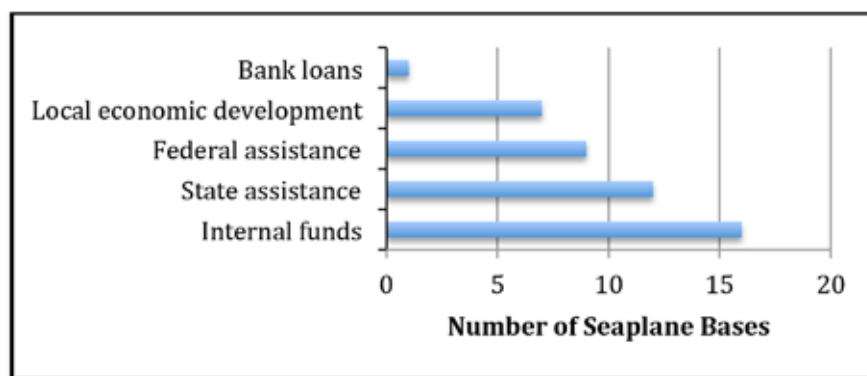


FIGURE 7 Funding sources for future SPB improvements. (Source: SMQ Airport Services {Q11})

FAA and State Grant Funding

Many NPIAS airports seek funding assistance through the congressionally authorized Airport & Airway Trust Fund. The trust fund receives its money in part through commercial airline ticket taxes and other similar commercial use fees. Noncommercial general aviation operators contribute to the fund through taxes on aviation fuel. Trust fund grants, appropriated by Congress and administered by the FAA, use the AIP as the mechanism for assisting airports. In addition to funding capital improvement projects at airports, the AIP provides grants to public agencies, and in some cases to private owners and entities, for the planning and development of public-use airports. Comprehensive information on AIP can found on the FAA website (<http://www.faa.gov/airports/aip/>). Information provided in the following paragraphs summarizes some of the applicable provisions and requirements.

AIP funding allocations are driven by a number of factors, including passenger enplanements, volume of cargo transported, the number and type of aircraft operations, and the priority of the capital funding or planning request. SPBs do not typically generate the level of landing, takeoff, and approach activity needed to qualify for major AIP funding. They may qualify for a funding category known as nonprimary entitlement funds that are specifically designed for GA airports. Otherwise, SPBs must compete for discretionary funds under AIP.

The largest allocations of AIP funds go to commercial service airports. Commercial service airports provide scheduled passenger service and enplane more than 2,500 passengers annually. Some SPBs may qualify as a commercial service airport, but they generally do so because they are located with a land airport that generates most of the traffic. From the survey, 12 of the SPBs are associated with or located adjacent to an existing airport and serve a public transportation need in conjunction with that airport {Q12}. Other SPBs receive allocations of federal money through their state block grant program.

Scheduled air carrier operators are required to report enplanement data to the U.S. Department of Transportation (14 CFR 241.19). Unscheduled air taxi and charter operators do not have the same requirement, but often do report the data for business purposes. Of importance for SPBs is to have all commercial operators report their operations and enplanement data to the FAA and

the U.S.DOT. The data are used to determine eligibility for federal financial assistance if other criteria are met. Just as important, this information helps illustrate to the general public the importance and use of the SPB.

AIP funds are to be used for public purposes and facilities. Under AIP, the FAA definition of an eligible airport includes any appurtenant area used or intended for airport buildings and facilities, including any necessary rights of way [49 U.S.C. § 47102 (3)] The majority of SPB landside facilities are operated by private entities, such as marinas or private individuals, thereby making them ineligible for funding assistance (see Table 1).

AIP funds for airport development are contingent on a project being shown on an approved SBLP. A layout plan, usually a product of the master planning process, demonstrates that the SPB meets certain design parameters and requirements for safe operations.

AIP grants can be used only for eligible projects identified in congressional legislation. The current emphasis is on enhancing capacity, safety, or environmental concerns, such as runway construction and rehabilitation, airfield lighting, and airplane noise mitigation. The number and cost of eligible airport projects submitted to the FAA by airports far exceeds the available grant funding authorized by Congress. To assist in determining which projects merit funding, the FAA uses a priority point system to rank the eligible projects. Based on the type of airport and project, the FAA then allocates the available funds in a normal budget cycle.

Local Funding

An economic advantage to communities of an SPB over a land-based airport is that the SPB does not require the acquisition of land area and the cost of construction and maintenance for runways and taxiways. The primary SPB investment cost for a community occurs in the transition area from water to land. Finding money to support or improve SPB infrastructure can be difficult, though, as many of the landside facilities are held by private entities, making them unavailable for public assistance. As with other business entities, SPBs are subject to the demands and consequences of a changing economy. Those SPBs operated by a public entity suffer the same pressures during times of budget deliberations for cost-benefit comparisons as do other public services operations.

In an open-ended question asking what facility improvements were needed at their SPB {Q13}, respondents provided a multitude of replies that reflect their individual situations. Dock repair was the most frequently identified improvement, followed by ramp replacement or repair and additional slips or pullouts. Two individuals cited obstruction removal and another two cited fuel facility repair or installation. Table 5 lists the improvements mentioned in the survey. Ten of the respondents indicated no improvements were needed.

TABLE 5
LIST OF FACILITY IMPROVEMENT NEEDS AT 31 SURVEYED SEAPLANE BASES

1	Floating dock repair/replacement (6)
2	Ramp repair/replacement (4)
3	More slips/pullouts (3)
4	Obstruction/vegetation removal (2)
5	Hangars (2)
6	Fuel system repair/maintenance (1)
7	More beach area/erosion control (1)
8	Dredging/deeper water access (1)
9	Removal of disability barriers (1)
10	Waterway edge lighting replacement (1)
11	Paved SPB taxiway to airport taxiway (1)
12	Signage for boaters and seaplanes (1)
13	Telephone service (1)
14	Additional counter space (1)
15	New roof (1)
16	More public parking (1)
17	Paved access road (1)

Source: SMQ Airport Services {Q13}.

Note: Totals exceed 31 as respondents provided multiple need responses.

Operating Budget

Preserving SPBs means maintaining the docks, beaches, slipways, and pullouts. Survey responses varied widely concerning the most expensive operating aspects of an SPB {Q14}. As one respondent noted, expenses tend to be minimal. Another concurred, especially when compared with the operating costs of the aircraft that use the facility. Tax and insurance costs are cited by several operators as their biggest expenses. Another two respondents stated that maintaining the access road to their SPB was the costliest aspect. Utility costs are further cited as the highest-cost items by other SPB operators. In a unique situation, one operator maintains a manmade waterway and must pay to have water pumped from nearby agriculture culverts to keep the SPB's water at acceptable levels.

A number of factors affect SPBs' operating budgets. Higher maintenance costs appear to be associated with saltwater SPBs than with freshwater SPBs. Wave, tidal action, and corrosion all take their toll on the docks and shore. But it is the SPB's level of GA activity that has the greatest financial impact on an SPB's preservation and sustainability. According to the survey, low utilization rates at a number of SPB facilities, especially those used in the northern tier of the United States, made it hard to justify expenditures for improvements.

On the revenue side, 15 of the survey operators indicated that a seaplane-based business currently operates at their facility, while 16 indicated that none do {Q15}. Fifteen of the 31 SPBs also do not have fuel available, a main sources of revenue income. SPBs tied to marinas may benefit financially from that relationship. However, one operator questioned his continued support of the seaplane dock because it had very limited use by seaplanes. The operator thought there exists potential for additional revenue to be produced by boat usage of the dock.

The short summer operating season is a factor for reducing revenue potential. A total of 18 SPBs are open year-round (11 in the lower United States and seven in Alaska) and 13 are open during the period early spring to fall (eight in the lower United States and five in Alaska) {Q16}. For those having partial availability, they range in operation from 6 to 8 months in the contiguous states and 4 to 6 months in Alaska.

An equal number of SPBs, five each in the contiguous states and in Alaska, make their bases available for ski plane operation during the winter, provided ice depths are thick enough to safely support the aircraft {Q17}. Five SPBs operators, all located in Maine, support winter operations at their SPB.

SUMMARY

To help promote SPB preservation, an economic impact study is a useful tool for demonstrating its importance and value. A number of states have conducted such studies for airports and SPBs within their state or within a particular region. An economic advantage to communities having an SPB is that it does not require the land area and related construction cost for runways and taxiways that a land airport requires. The body of water already exists for such a purpose.

Various sources have been used to fund SPB development. Internal funds are the main source, followed by state, federal, then economic development grants. To be eligible for federal funding, an SPB must be a public-use airport, be listed in the NPIAS, and have a current SBLP. State requirements may exist for the same or similar criteria.

Operating costs vary among SPBs, with dock repair or replacement needing the most attention. To offset costs, half of the SPBs are supported with an active seaplane business that generates revenue. The short summer operating season reduces revenue potential, and some SPBs counter this limitation by making the base available for ski plane operation during the winter.

CHAPTER FOUR

DEVELOPING SEAPLANE BASES

Developing SPBs refers to the establishment of new water landing areas and land facilities, the upkeep of older ones, and the means to do both. In this regard, the study provides an overview of documentation on existing SPB planning processes, design considerations, permits, regulatory requirements, and facility and service needs.

SEAPLANE BASE REGISTRATION

Registration with the FAA and the state is one step in the development of either a private-use or public-use SPB. State registration varies and the state aviation agency can assist with any requirements. To be listed in the FAA registry (5010 database), an SPB operator submits an application to the FAA using FAA Form 7480-1 *Notice for Construction, Alteration and Deactivation of Airports*, as required under 14 CFR Part 157 (14 CFR 157). The regulation requires any person who intends to do any of the following to notify the FAA of their intent to

- Construct or otherwise establish a new airport or activate an existing airport.
- Construct, realign, alter, or activate any runway or other aircraft landing or takeoff area of an airport.
- Deactivate, discontinue using, or abandon an airport or any landing or takeoff area of an airport for a period of 1 year or more.
- Construct, realign, alter, activate, deactivate, abandon, or discontinue using a taxiway associated with a landing or takeoff area on a public-use airport.
- Change the status of an airport from private use to public use or from public use to another status.
- Change any traffic pattern or traffic pattern altitude or direction.

Notice to the FAA is not necessary if an SPB has only visual flight rules (VFR) operation, is used for a period of less than 30 consecutive days with no more than 10 operations per day, or is used only intermittently, and that landing site is not an established airport, such as river, lake, or pond that is used or intended to be used for less than 1 year. Intermittent use of a site means it is not used for more than three days in any one week and no more than 10 operations are conducted in any one day. These rules convey that an official SPB designation is not needed for a seaplane to operate on a body of water.

ADVISORY CIRCULAR 150/5395-1A SEAPLANE BASES

Individuals seeking to develop an SPB can obtain guidance from AC 150/5395-1A *Seaplane Bases*. Contained in the AC is guidance on how to establish an SPB, the application of design standards, and factors and recommendations for consideration. While advisory in nature, several of the standards become mandatory if an operator is seeking federal funding assistance from the AIP or passenger facility charge programs. One mandatory requirement is the submission of an SBLP. The SBLP is similar to an airport layout plan for a land airport. Having an FAA-approved SBLP results in the inclusion of the SPB in the NPIAS.

Seaplane Base Layout Plan

An SPB operator seeking to obtain an FAA-approved SBLP would submit the plan to the FAA for evaluation and determination that safety standards are met. The evaluation considers both the water landing area and the land facilities. The planning process would include a site analysis and evaluation of the proposed or existing location. Planning requirements can also involve research into issues such as water quality, water depths and underwater obstacles surveys, airspace approach and obstacle surveys, easements considerations, and infrastructure needs.

Depicted on the SBLP would be any buildings, navigational aids, lighting, fences, cargo facilities, and maintenance or service areas, as applicable. A land airport layout plan is usually developed from a master plan study. For SPBs, a master plan

study and documentation is not a requirement for an SPB, just the SBLP. Should a more involved master plan be pursued, guidance can be found in the current edition of AC 150/5070-6B *Airport Master Plans*.

Thirteen of the 31 SPB operators surveyed do not have an SBLP {Q18}. Of the 11 SPBs that do have a layout plan, they have it primarily because they are included with a land airport's layout plan that is in the NPIAS. In the case of Alaska, the state DOT&PF has sought to develop SBLP for many of their state-owned SPBs. The state manages FAA funding for those SPBs through a pooled entitlement program of its nonprimary commercial service airports. Five SPB respondents indicated they have partial layout plans.

Airspace Obstruction Evaluation

The operational characteristics of seaplanes affect the design, layout, and type of facilities needed for an SPB. The performance capabilities of each aircraft will dictate the necessary length of water takeoff and landing area necessary, maneuvering areas, obstacle clearance, and water depth. A water landing and takeoff area can extend to beyond 10,000 ft for some aircraft. Some seaplanes can take off in less than 400 ft. AC 150/5395-1A recommends a minimum of 2,500 ft for the water landing and takeoff area, as do some state regulations. Figure 8 illustrates several of the operational and design factors suggested for an SPB, according to the advisory circular.

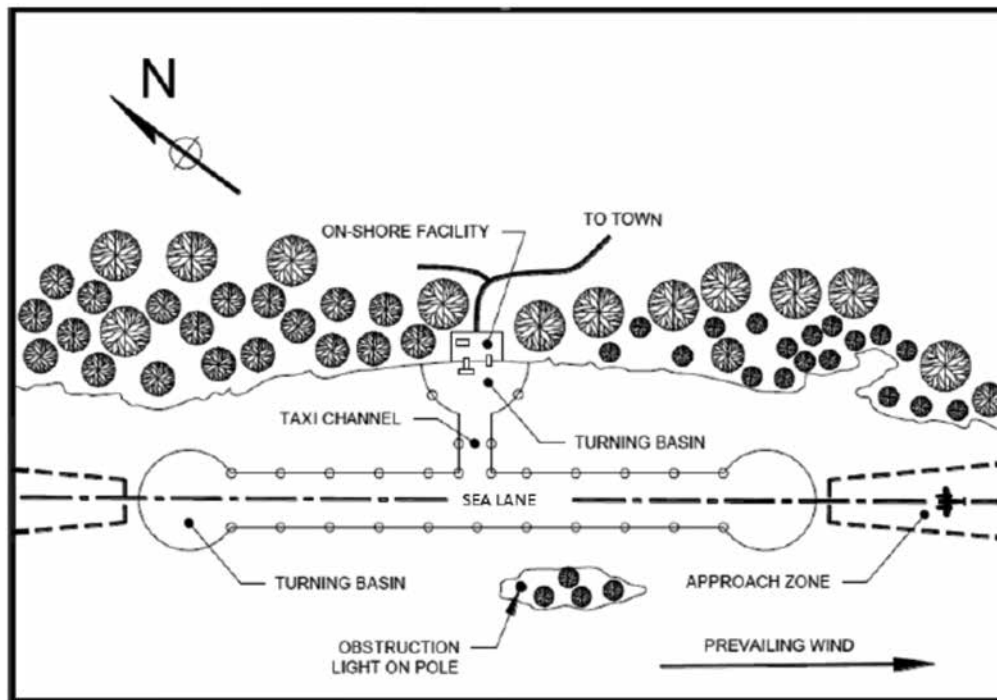


FIGURE 8 Design layout of a typical seaplane base. (Source: FAA Advisory Circular 150/5395-1A)

The submission of an SBLP triggers an evaluation of obstacles in the airspace and the impact of the SPB on other nearby aircraft operating areas. The airspace evaluation is conducted under CFR Part 77. Obstructions in the airspace approach to a water landing site affects the pilot's ability to safely land on the body of water. A typical safe approach will have a minimum horizontal glide path ratio of 20:1, with a flatter approach slope of 50:1 as an ideal. This means for every 20 or 50 ft of horizontal distance, an aircraft will descend 1 ft. The 50:1 ratio equates to roughly a 2.5-degree slope. Shoreline obstacles in the approach to a water landing area can result in a pilot landing further into the body of water than if the obstacle did not exist. Conversely, a shoreline obstacle in the departure path requires a seaplane to lift off or turn to the side sooner than ordinary in order to avoid the obstacle.

Siting and Developing a New Seaplane Base

Seaplane pilots know that the SPB facilities they fly to and from vary in size and amenities. They can range from a simple beach to a well-planned and well-constructed base that has infrastructure for amphibious aircraft to taxi onto the land and be housed and repaired in hangars. Onshore buildings for administrative and passenger use are found at SPBs that serve commercial air taxi or charter operations. In between the extremes are SPBs that consist of just a mooring buoy, a ramp, a slip, or a shoreline dock or pier. To understand the design of an SPB or to plan for one, an understanding of seaplane operational characteristics is necessary.

In a siting study conducted for the Sitka, Alaska, community, a number of factors were outlined for locating a new SPB (*Siting Analysis, Sitka Seaplane Base—Sitka, Alaska* 2012). As a result of a master plan update, the need for a new SPB facility to serve the community was acknowledged and the siting study was commissioned to identify an acceptable site. The study listed the following facility issues:

- Wind protection
- Wave protection
- Degree of icing exposure
- Meets capacity goal
- Room for growth
- Room for aircraft maneuvering
- Length of taxi distances
- Provision for adequate vehicle parking
- Provision for fueling facilities
- Drive-down ramp capability
- Area for on-site aircraft maintenance
- Protection from wildlife hazards
- Reducing conflicts with boat traffic
- Minimal dredging or rock removal
- Compatibility with adjacent land uses
- Property acquisition costs
- Capital cost requirements
- Operating and maintenance cost
- Revenue-generating potential.

As it relates to SPB operations studied in this report, four operators identified protection from weather or water depth as a reason for their site selection. Three SPBs identified that their location was selected owing to a need for a freshwater rather than saltwater landing area. One SPB was located to reduce interference with boating or marina activity.

FACILITY NEEDS AND AMENITIES

An important component in developing an SPB is identifying the needed or desired facilities and amenities. A master plan study can be helpful because it includes compiling an inventory of the existing facilities, a forecast of demand, and a projection of future facilities that are to be shown on an SBLP.

According to the survey, the most common means for obtaining information about facility needs is through interaction with pilots and users {Q19}. SPB operators conduct user surveys and questionnaires over the phone, through e-mail, or through monthly rent payment envelopes. Information is also collected from local GA pilot associations.

In 2012, the city and borough of Sitka sought to update a master plan that was completed in 2002. The update would look at relocating the existing SPB. The impetus for relocation consideration is outlined in the report's introduction:

The proposed SPB improvements are intended to address the existing facility's capacity, safety, and operational and condition deficiencies. Capacity concerns are evidenced by the existing SPB's full occupancy, a previous list of seaplane owners who had been waiting two years or more to rent a slip, expressions of interest from seaplane owners not currently using the SPB, and restrictions limiting commercial use. Safety concerns include concentrations of seabirds in and around the SPB's operating area, conflicts with boat traffic, lack of adequate taxi lane clearance between the SPB floats and neighboring Sitka Sound Seafoods (SSS) facility, and the submerged rock obstructions adjacent to the floats. Operational concerns include the lack of fueling facilities that requires seaplane operators to carry and dispense fuel from small containers, and inadequate vehicle parking. The existing SPB is also unable to adequately serve commercial traffic because it lacks sufficient vehicle parking, on-site aircraft maintenance, a drive-down ramp to the floats, a passenger shelter, and equipment storage. The existing SPB is 50 years old and is at the end of its useful life. The timber floats are weathered, have lost their preservative treatment, and are losing their floatation capability.

Source: Siting Analysis Sitka Seaplane Base - Sitka, Alaska.

The range of facilities provided at the SPBs surveyed for this report reflects the nature of their geographic location and the type of water access available {Q20}. Figure 9 identifies the types and numbers of shoreline facilities available at the surveyed SPBs. SPBs subject to tidal action require floating docks, while those on inland lakes may have stationary docks or none at all. Stationary docks, while simple in design and cost, are nonetheless subject to use depending on fluctuating lake levels during periods of drought, especially those located on reservoirs. The environmental conditions of exposure to salt water, tides, and wave action in Alaska result in the construction of more slipways than in other states.

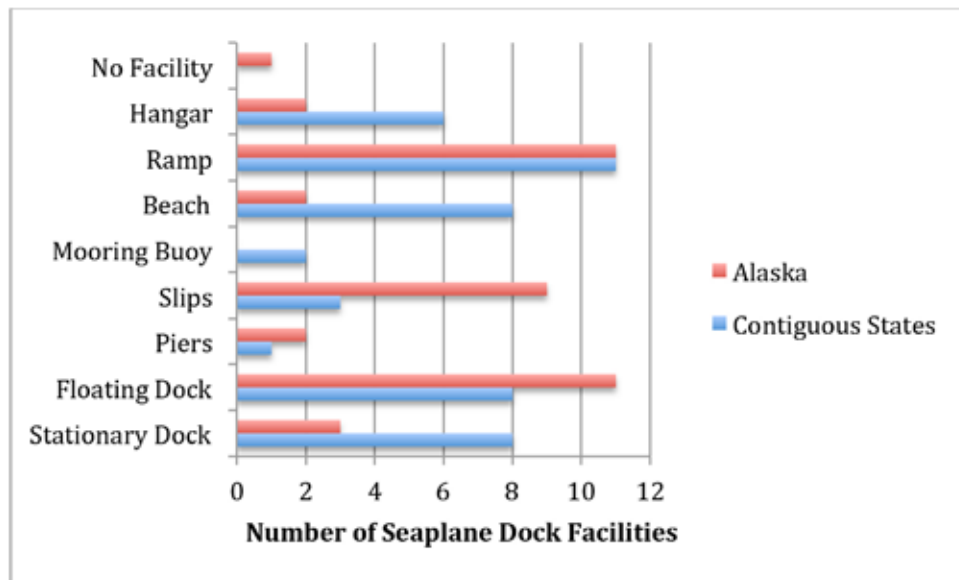


FIGURE 9 Type and number of dock facilities available at SPBs. Note: Total exceeds number of surveyed SPBs as multiple docking facilities are reported. (Source: SMQ Airport Services {Q20})

Amenities and Services

Table 6 presents data on what amenities and services surveyed SPBs have, and what amenities and services the operators want {Q21}. The major services and amenities provided by surveyed SPBs in the contiguous states—reflect a higher level of amenities than those in Alaska. The most consistent requests from SPBs in Alaska are to have what is usually provided in the contiguous United States—utilities such as electricity, gas, water, and waste treatment.

The results in Table 6 are consistent with information found in a study assessing the feasibility of a new floatplane facility near Anchorage, Alaska (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008). In that report, the authors ranked the amenities into three basic tiers: (1) basic physical facilities such as a fuel, tiedown area, power to the slips, float and wheel swap and storage areas, and pumpout restrooms; (2) service-related amenities such as repair services/facilities and on-site maintenance services; and (3) other amenities, such as the provision of water and natural gas, an FBO or special aviation service operator, and food concessions.

For a commercial air taxi or charter operator, the facility requirements differ in importance because they may be required to provide certain amenities and services as part of their operating certificate, federal law, or lease agreement. Their facility needs are customer vehicle parking, shelters for passengers, a fueling system, a ramp from shore to the seaplane float capable of supporting a small truck or van, storage for small equipment and supplies, freshwater for washing aircraft, electricity, and capabilities for aircraft maintenance (*Siting Analysis, Sitka Seaplane Base—Sitka, Alaska* 2012). The requirement for a passenger gangway capable of supporting a small van is for compliance with the accessibility requirements of the Americans with Disabilities Act, and for cargo loading.

Five of the survey respondents identified their facilities as having a U.S. Customs and Border Patrol (CBP) designation for international inspection processes. Four of the SPBs are colocated with a land airport having port-of-entry status. One seaplane base, because of its volume of traffic and operational routes, is a standalone CBP port-of-entry. Four other operators identified the CBP listing as a desired designation. The CBP website lists those airports eligible to receive non-precleared and precleared aircraft. It also features instructions for applying for a CBP designation (<http://www.cbp.gov/>).

TABLE 6
COMPARISON OF SERVICES PROVIDED AND SERVICES DESIRED AT SPBS

Amenities and Services	Contiguous U.S. (<i>n</i> = 19)		Alaska (<i>n</i> = 12)	
	Offered by SPBs	Desired by SPBs	Offered by SPBs	Desired by SPBs
Municipal or similar piped water	10	3	3	3
Well water	3	1	1	1
Municipal or similar piped sewer system	4	2	2	2
Septic system	5	0	0	1
Chemical toilet	3	3	3	1
Hazardous or biowaste disposal	0	1	1	1
Electricity	12	5	5	5
Telephone—landline	9	4	4	2
Cell phone capability	16	9	9	1
Wi-Fi or Internet access	11	4	4	1
Unicom	9	2	2	2
Air traffic control tower	4	4	4	0
Fuel—Mogas	2	0	0	0
Fuel—Avgas 100LL	10	6	6	2
Fuel—Jet A	3	3	3	0
Major maintenance repair and alteration	6	3	3	1
Minor maintenance repair and alteration	8	3	1	3
Wash rack or similar cleaning opportunity	6	1	5	3
Lift, dolly, railway, transition, or changeover services	7	3	5	3
Slips	6	5	4	1
Hangar or storage facility	7	4	3	2
Customs or TSA services	4	3	25	2

Note: Totals reflect multiple choices by operators.

Source: SMQ Airport Services {Q21}.

Aircraft Maintenance at Seaplane Bases

For an aircraft to remain in airworthy condition, it must undergo a thorough inspection annually and preventive maintenance as necessary. The annual inspection requires the opening of inspection and engine panels and cabin interiors, and ready access to the whole aircraft. The annual inspection is normally completed at a maintenance facility located at an SPB or at a land airport. Amphibious aircraft can easily access land-based maintenance facilities. Straight float aircraft require a hoist, dolly, lift, or rail system to be moved from the water to the land (Figures 10 and 11).



FIGURE 10 Straight float dolly. (Credit: S. Quilty, SMQ Airport Services)



FIGURE 11 Aircraft lifted from rail system with forklift attachment. (Credit: S. Quilty, SMQ Airport Services)



FIGURE 12 Maintenance being performed outdoors on a float seaplane. (Credit: S. Quilty, SMQ Airport Services)

A hangar for performing maintenance is valuable during inclement weather. Because a floatplane sits higher than a normal wheeled aircraft, regular aircraft hangar door openings and facilities may restrict accommodating a seaplane for shelter or maintenance. Figure 12 illustrates outside maintenance being performed on a float aircraft, as the aircraft will not fit inside an existing hangar. An alternative to a land airport is a floating hangar (Figure 13).

When queried about the overall condition of SPBs in use, 65% of the survey respondents described their facilities as being in good to excellent condition (Table 7) {Q22}.

Docking Facilities

In its role as a transition area, SPB docking and land facilities may be as simple as a small dock to accommodate a single aircraft, or be of different combinations of docks, piers, moorings, and ramps to accommodate a wide range of aircraft and activities (Figure 14). Where the shoreline may be rugged or marinas congested, mooring buoys may be placed away from



FIGURE 13 Floating hangar with ramp and rail dolly system. [Source: Alaska DOT&PF (Siting Analysis, Sitka Seaplane Base—Sitka, Alaska 2012)]

TABLE 7
CONDITION AND NUMBER OF FACILITIES AT SPBS

Condition	Contiguous U.S.	Alaska
Excellent	4	1
Very Good	5	2
Good	4	3
Fair	3	3
Poor	1	1

Source: SMQ Airport Services {Q22}.



FIGURE 14 Typical single seaplane base docking facility. (Credit: A. Faegre 1999. Used with permission.)

the shore and require alternate means for persons to reach the shore. Beaches have long been a basic facility to accommodate seaplanes, as their cost to develop or maintain is small in most cases. If a pilot wishes to protect his or her aircraft from the environment, secure an aircraft on land, or have major maintenance performed, a ramp leading from the water to the land facilities is beneficial, unless some sort of a lifting device is used.

For dock facilities located in saltwater environments, a slip or ramp that allows for seaplane floats to be pulled completely out of the water is valuable, as it allows for reduced exposure to saltwater corrosion and facilitates wash-downs and inspections. The provision of freshwater for aircraft wash-downs is also valuable. Figure 15 is an example of a floating dock with slipways to allow the aircraft to be parked out of the water. It also shows the gangway that allows for fluctuating tides.

The design and construction of shoreline facilities is influenced by a number of factors including available space, water depth, wave and tidal action, construction and maintenance costs, weather and environment exposure, overall purpose, and expected demand. Three key factors emerged from the literature regarding the effect of dock design on an aircraft's ability to dock properly:

1. Aircraft design: An aircraft wing will extend over a dock, pier, or ramp area unless a pilot noses the aircraft into the dock. If the seaplane is of a hull boat design, the wings are normally lower than those of a float plane. The pontoons located on the hull plane wings make it difficult to attach the aircraft sideways to a pier or dock. For that reason, hull planes are designed to nose-in to a dock. Slipways or beaches are good alternatives to docks.
2. Maneuvering space: Adequate maneuvering room is needed close to the docking area. The wing extension over the dock requires the elimination of tall mooring posts, pylons, or other vertical objects. Absent a reversibly controlled propeller, an aircraft cannot back up. Most seaplanes will have as standard equipment a paddle that the pilot can use to help in maneuvering. If a dock is to be used by both seaplanes and boats, consideration is to be given to the operational characteristics of the seaplanes and the need for adequate maneuvering area and an unobstructed dock or pier for wing clearance. Figure 16 gives an example of this need.
3. Wind direction: An aircraft presents a large fuselage side and tail surface that wants to weathervane into the wind. If the wind is not aligned to the dock area, it becomes more difficult for the pilot to position the aircraft properly.

The AC on SPBs suggests that seaplane dock facilities are most effective when separated from boat or other vessel areas. The AC also describes large float or pier structures laid out in a three-sided figure or an "H" layout that allow for parallel seaplane docking under a multitude of water or wind conditions (Figure 17). Seaplanes can tie up to mooring buoys, anchors,



FIGURE 15 Example of floating dock with gangway, pier, and slipways. (Credit: A. Faegre 1999. Used with permission.)

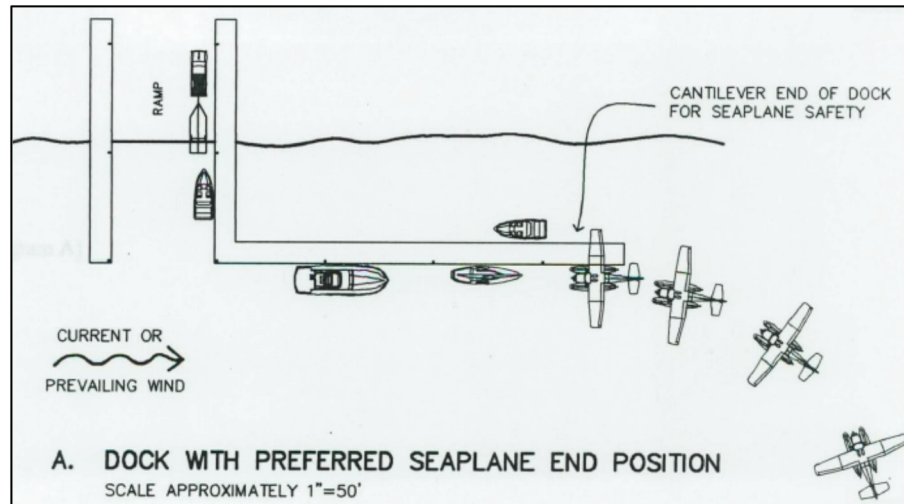


FIGURE 16 Example of a shared dock layout. (Credit: A. Faegre 1999. Used with permission.)



FIGURE 17 Typical H-dock layout design at Vancouver Seaplane Terminal, British Columbia. (Source: Google maps, Digitglobal, IMTCAN, Province of British Columbia)

or a barge, but getting the pilot and passenger to land requires the use of a skiff or boat. One marina in the survey provided this arrangement. As seaplanes have a tendency to weathervane, adequate clear space must be allotted for the weathervane action if moored to a buoy. Water current action will affect boats more so than the wind, so the mix of aircraft and boats in a mooring or anchoring area requires consideration of a possible interference. Aircraft and float manufacturers may provide ramp and docking guides for their particular aircraft or equipment.

A number of dock designs attempt to accommodate rising tides and water fluctuations. Figure 18 shows a galvanized steel piling used in Alaska for attaching a floating dock. A galvanized collar surrounds the piling to allow it to rise and fall with the 20-ft-or-greater shifts in tides. The collar is lined with an ultra-high-molecular-weight polyethylene wear surface that has a rubber backing. Figure 19 shows a typical freshwater dock with wood piling. The commercial service SPB at Vancouver Harbour (Canada) has a floating dock that uses a flexible bungee-type system. Underwater hawsers tie the dock to the sea floor anchors and stretch to maintain tension as waves, currents, and tides affect the dock (Gilbert 2010).

Protective skirting or tires installed at the water level help to prevent pontoons or hulls from slipping under the dock during tide or wave action. If made of wood, the AC suggests piers and docks be protected from attacks by various insects, fungi, and marine borers through the use of approved preservatives or coatings. Metal piers, decking, and fittings require protection from corrosion. A nonslip decking material is important to help prevent slip and fall accidents and injuries.



FIGURE 18 Example of a galvanized steel floating dock attachment. (Credit: V. Skagerberg, Alaska DOT&PF. Used with permission.)



FIGURE 19 Example of a wood piling float dock attachment with spacing to accommodate a seaplane. (Credit: S. Quilty, SMQ Airport Services)

SUMMARY

This section provided an overview of the SPB planning process, design considerations, permits, regulatory requirements, environmental considerations, and construction. It included information on the operational nature of seaplanes and how an SPB's design, layout, and type of facilities needed are affected. A larger planning effort, an SPB master plan, would generally include research on water quality, water depths and underwater obstacles surveys, airspace approach and obstacle surveys, easements considerations, and infrastructure needs. An important factor for why it is beneficial for SPBs to have a master plan is so they can be better recognized as part of the overall U.S. transportation network.

The range of facilities provided at the SPBs surveyed for this report reflects the nature of their geographic location and the type of available water access. The design and construction of shoreline facilities is influenced by a number of factors including available space, water depth, wave and tidal action, construction and maintenance costs, weather and environment exposure, its overall purpose, and its expected demand. Seaplanes have several operating characteristics to consider when operating on water versus land. The design of dock facilities is affected by factors such as no brakes to stop the aircraft on water, wind and wave action on the floats or hull, and the amount of seaplane draft.

CHAPTER FIVE

PRESERVING SEAPLANE BASES

Preserving SPBs refers to the efforts to manage the pressures and challenges that could reduce the opportunities for seaplane operation across the country. This chapter looks at how SPBs can present information to demonstrate their value through marketing, advertising, economic studies, planning, community education, and other outreach efforts.

DATA GATHERING AND MESSAGING

The preservation of an SPB requires the operator to know information about its use, its users, and its capabilities. As with any plan, and a master plan in particular, data collected about an existing facility are the foundation for analysis. With that data, forecasts can be projected and decisions can be made about the future of the SPB. Collecting information about what improvements are needed is one method to help preserve an SPB {Q23}.

Operational Data

The literature search and survey for this study indicates that limited operational data are collected on seaplane bases. Collecting information about what improvements are needed is one method to help develop or preserve an SPB. Because of their affiliation with a larger air carrier airport, two SPBs have used the master planning process to gather input from users. As with the planning process, information about facility improvements is obtained through interaction with pilots and users; through user surveys or questionnaires, via phone, e-mail, or payment envelopes; and through local general aviation pilot associations.

FAA Form 5010 Master Record contains operational data collected annually from airports around the country. At airports with air traffic control towers (ATCTs), the recorded number of takeoffs and landings are accurate for when ATCTs are open. Five SPBs in the survey are located adjacent to a land airport that has an ATCT and therefore their operations are counted when the ATCT is open (they are all part-time operations). Otherwise, the FAA will send a form to the SPB owner of record requesting updated information, or a state's aviation agency or contractor is tasked with the effort. In many cases, the information provided back to the FAA is an estimate of the level of activity or a partial count {Q24}. If an airport is served by an air taxi or charter operator, it often submits operational and enplanement data to the U.S. Department of Transportation, though it is not required to do so.

Other than through ATCTs, some of the SPBs collect data by relying on pilots to voluntarily sign in. Marinas and SPB operators that conduct flight training often track their activity levels for normal business purposes. Other data collected by SPB operators in the survey include fuel sales, slip rentals, moorage and docking fees, enplanements, and freight volumes. One SPB operator collects data on water evaporation rates from the local sewer treatment plant, because his SPB does not have a natural flow and he has to purchase agricultural water to maintain proper levels.

For the most part, data were not available because no one is present to keep track. Verne Skagerberg of the Alaska Department of Transportation and Public Facilities, in a telephone conversation on September 10, 2014, noted that even the state of Alaska, which makes a concerted effort to identify and report operational activities, has difficulty identifying or tracking what occurs at remote bases. One example of an SPB that keeps operational and business data is Tavares, Florida, as it staffs the SPB and related shore park with a municipal employee who monitors activities (see Appendix G).

Recognizing that data collection is not very robust at SPBs nationally, the survey asked what data are desired. The range of requested data reflected the level of activity and different uses of each SPB facility. On one end are those little-used SPBs that want basic data. On the other end are high-activity SPBs that prefer more sophisticated data. The following list summarizes data currently used and sought by SPB operators {Q25}. Thirteen operators did not respond to the question.

- Number of operations (5)
- Time of use data (1)
- Enplanement and deplanement data (1)
- Fuel sales (1)
- Volume of freight (1)
- Slip, tiedown, and hangar wait lists (1)
- Pilot input and feedback (1)
- Economic impact data (1)
- SPB management plans (1)
- Marketing data on current and potential users (1)
- Comparative SPB financial, lease rates, landing fees, and cost benefit data (1)
- Minimum standards and type of equipment to have at an SPB (1)
- Information on grass control, levee protection, and preventive maintenance (1)
- Pictorial drawings of sporting lodge SPB parking and boat launch locations (1)
- Accident and incident data (1).

Annually, the FAA sends a letter to the SPB owner listed on FAA Form 5010 informing him or her of the total passenger enplanements reported by the commercial operators, provided the commercial operators submitted the data to the USDOT and FAA.

One organization, Kenmore Air Harbor, has developed an SPB familiarization guide to train its pilots and help ensure safe operations. The guide consists of aerial pictures of the SPBs that Kenmore operates to and from. The guide's pictures were modified to show water takeoff (green) and landing (red) patterns, where to dock (black), and any operational consideration, such as noise abatement (yellow) (Figure 20). The illustrated guide serves as a good example of the use of data to enhance safety and promote SPB operation.

Safety Data

Safety data are often used in the aviation industry to measure shortfalls or successes in operations. At certificated airports served by air carriers, 14 CFR Part 139 requires that the airport be inspected daily for safety. No similar regulatory requirements exist for non-Part 139 airports and SPBs.

The responsibility for a public-use SPB's safety inspection mostly resides with state aviation agencies or other governmental agencies that issue operating or licensure permits, such as the USACE or DNR. For private SPB operators, the responsibility for safety inspection falls within an owner's normal expectation to exercise normal due-care under tort law. For commercial air taxi or charter operations, their own operating manuals identify means to ensure safe operations of the facilities they frequent. Pilots, using an SPB facility, normally note and report SPBs' safety and compliance conditions.

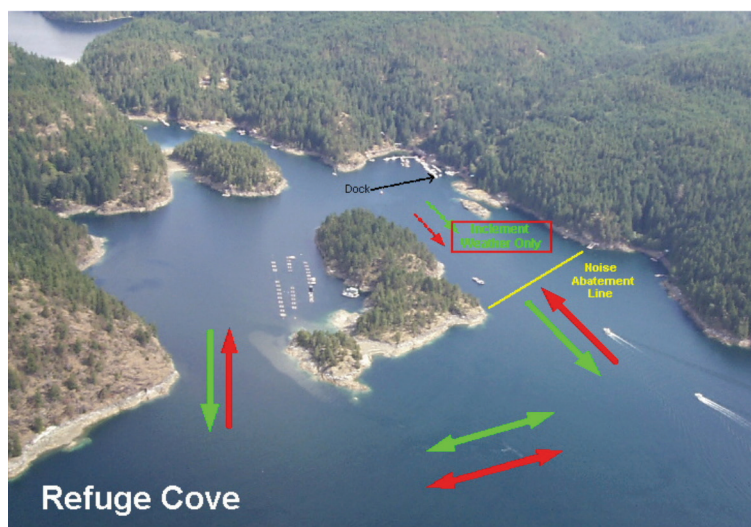


FIGURE 20 Illustration of a seaplane base guide for pilot use. (Source: J. Gowey, Kenmore Air Harbor. Used with permission.)

For one-third of the surveyed SPBs, no inspections are known to occur {Q26}. For another one-third, inspections are performed by SPB personnel, though the frequency was not cited. For the last one-third, the state assesses facilities for safety compliance or general condition on an annual or more frequent basis. The literature review and principal investigator inquiry did not turn up any specific guides or format for inspecting SPB facilities.

Overall, the SPBs in the study appear to have safe operations as evidenced by their response to whether an accident or incident occurred in the past 3 years {Q27}. Twenty-eight SPBs operate incident- and accident-free and only three indicated that they had a recent past incident. No details were provided on the nature of the accidents or incidents.

For the ability to respond to water emergencies, 12 SPBs rely on local community emergency services. Four of the SPBs have regular aircraft rescue fire-fighting response capability from their adjoining airports. Four operators have skilled dive teams available and another two have harbor marine patrol response capability. Collectively, 15 operators or their community response teams have boats available. Only one SPB has a spill response kit available. If a water accident involving an aircraft occurs, guidance may be obtained from *ACRP Synthesis 38: Expediting Aircraft Recovery at Airports* (Prather 2012). This synthesis contains information useful for the general recovery of aircraft, but it also suggests the need for recovery operations specific to seaplanes as an area for further research.

For recovering aircraft, six of 31 operators have a local salvage or tow company available to remove aircraft from the water {Q28}. Three SPBs have a lift crane or lift bag capability. Two operators would use their own personnel to retrieve the aircraft. The other 10 operators did not indicate any capability to retrieve an aircraft, and only two operators have a water rescue plan in place.

Accident Data

A review of the FAA's Accident and Incident Data System (<http://www.asias.faa.gov/>) found 53 reports related to seaplanes were filed between June 1978 and August 2013. Incident reports do not result from bodily injury but from aircraft damage only. Wind is the number one factor behind seaplane incidents (12), followed by pilot operational error (11), foreign object damage in the water area (9), landing with the gear either up (on hard runway) or down (on water runway) (6), taxiing-related issues (4), other (4), and mechanical problems (2).

A search of the NTSB accident database was difficult because it does not allow for a search by terms such as "seaplane" or "water." One must select the generic term "airplane," "helicopter," or "ultra-light" and then subsequently read each report to determine if it was related to a seaplane operation. The search can be refined if one knows which types of aircraft are often used in seaplane operations and searches under the aircraft type. There is a checkbox for "float" or "hull" under the heading "landing gear" on NTSB accident report Form 6120.1. However, it is not a searchable feature.

Other than a literature search, research into seaplane and SPB accidents was beyond the scope of this study. The search did find that the Seaplane Pilots Association (SPA) analyzed the NTSB accident reports from January 1983 to December 1995 and determined 195 accidents or incidents were recorded (*Seaplane Compatibility Issues* 1996). SPA searched the NTSB database by using known types of aircraft and analyzing whether the incidents involved seaplanes and whether they were water-related.

At the 2003 International Boating and Water Safety Summit, Aron Faegre, president of the Columbia (Washington) SPA, presented data on the number of accidents between boats or personal watercraft and seaplanes (Faegre 2003). Using the NTSB database and spanning the past 10 years, he reported that there were nine cases of significant interaction between a seaplane and a boat or watercraft. Six of the accidents were a seaplane encountering a boat wake. There was one instance each for a boat striking a seaplane and a seaplane striking a boat. The other situation involved the seaplane trying to avoid a personal watercraft that was chasing it.

The difficulty with compiling seaplane accident data also stems from different governmental agencies having jurisdiction over the water. Primarily, the USCG ensures safety on U.S. navigable waterways. On interior lakes and ponds, safety could be the responsibility of any of the government agencies mentioned in chapter three. As an illustration, a Florida newspaper reported USCG data of 662 boat accidents with 50 fatalities in Florida in 2012 (Hobson 2014). The newspaper researched newspaper articles from 2012 to March of 2014 for more information. The search revealed three seaplane accidents in Florida during that time period, none of which resulted in a fatality.

If an accident involving injury, death, disappearance of a person, or property damage greater than \$2,000.00 occurs on a waterway controlled by the National Park Service, the operator of the vessel involved is responsible for reporting the accident.

A study published by Transport Canada identified 1,432 seaplane accidents in Canada between 1976 and 1990 (*A Safety Study of Piloting Skills, Abilities, and Knowledge in Seaplane Operations* 2013). Its analyses identified the following as basic causes for the accidents:

- Loss of control
- Propeller contacts
- Nose down/nose over
- Collisions with objects
- Dragged wings
- Engine failure
- Hard landings
- Wheels-down water landing
- Overrun.

Another special Canadian study was undertaken in 2008 to evaluate hazard and safety risks associated with egress from floatplanes that have flipped and are submerged in the water. Besides serving as a model for undertaking a risk assessment, the safety analysis and report provided a statistical picture of the number and type of floatplane activities in Canada. The conclusions from the study and assessment were that there was no readily identifiable solution that would have a major impact on floatplane safety and that the floatplane safety review was inconclusive (Eley 2008).

COMPREHENSIVE TRANSPORTATION AND MANAGEMENT PLANNING

One practice that is beneficial for preserving SPBs is to have transportation plans that include SPBs. An example of such a plan was developed by San Juan County in Washington State. A comprehensive plan can benefit an SPB in that it will identify how the SPB fits into the transportation goals and policies of the region and community. Inclusion of an SPB in a transportation plan supports decision making to promote, guide development, and protect an SPB (*San Juan County Comprehensive Plan, Section B, Element 6: Transportation* 2013).

A 2004 comprehensive plan for the Seattle area included analysis of the impact of building height and density in the South Lake Union district of Seattle, Washington. The transportation plan considered the important transportation services that air charter and seaplane service providers such as Kenmore Air Harbor, Inc., and Seattle Seaplanes provide. The final environmental impact study report resulted in protecting the airspace approach and flight path to and from southern Lake Union by limiting the height of tall buildings within the district and below the flight path of aircraft (Figure 21).

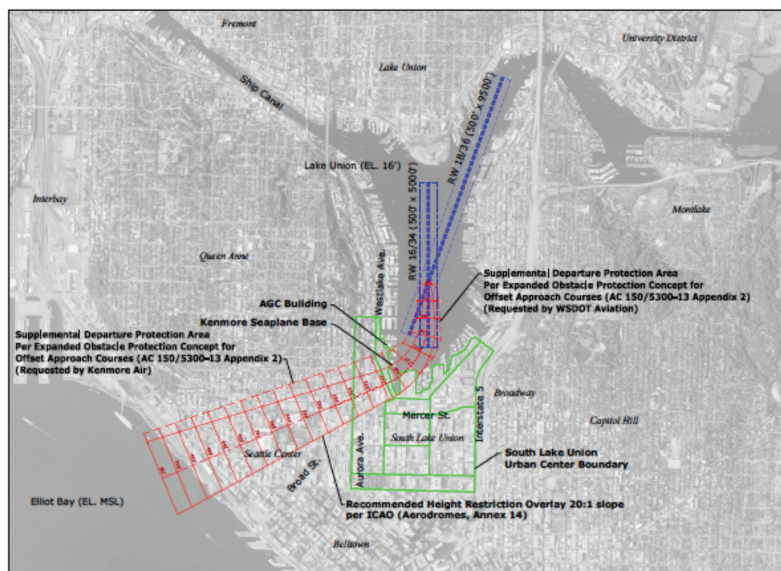


FIGURE 21 Proposed obstacle clearance limits for aircraft approaches to and departures from Lake Union SPB, Washington. [Source: *South Lake Union Height and Density Alternatives* (2012)]

One additional example of comprehensive planning is the *2001 Regional Airport System Plan* developed by the Puget Sound Regional Council (Washington), which includes four seaplane bases. In defining the roles that airports play within the region, the plan states the following: “Seaplane bases are a unique resource and an important component of the regional airport system. The region will support the preservation and enhancement of privately owned seaplane bases through identification of facility needs and through the Regional Council’s role in supporting compatible land use” (*2001 Regional Airport System Plan* 2001).

Compatible Land Use

Because conflicts and pressures can arise between an airport and its surrounding community, compatible land use and zoning are means to protect or secure an airport from unfavorable encroachment and potential restrictions on use. The conflicts and pressures normally arise from tall structures and residential communities being located in proximity to airports. The same holds true for SPBs, although they have added pressures of marine, boat, and personal watercraft activity using the takeoff and landing areas.

The FAA promotes compatible land use and protects airspace through a number of regulations, orders, and advisory circulars. When an airport sponsor accepts federal grant assistance, the agreement stipulates that airport sponsors will undertake compatible land use measures to protect the federal investment in the airport. The primary land use measures are to establish height or land use zoning requirements in the vicinity of the SPB. Of the 31 SPBs surveyed, 14 have some form of compatible land use measures in place and 17 do not (Table 8) {Q29}. Those SPBs that do have the measures in place are predominately in Alaska, where the state DOT&PF has been active in protecting its facilities and because it provides state assistance to fund or conduct airspace studies. The remaining SPBs in the contiguous United States are located with NPIAS land airports and fall under their protective airspace or zoning umbrellas.

ENVIRONMENTAL SAFEGUARDS

Environmental safeguards cover a broad range of conditions and actions that address different environments, including quality of life issues. A number of laws protect the water, air, and land, and SPB operators and pilots must be aware of them.

The literature search identified a number of articles in which seaplane pilots argue that seaplane operation is less of an endangerment to waterways than other water vessels. The survey asked if SPBs have requirements, processes, or procedures for safeguarding the environment {Q30}. Fifteen of the SPB operators specifically indicated no safeguards are in place. The nine airports that do have safeguards for the water environment referenced requirements under the Clean Water Act and subsequent Federal Water Pollution Control Act requirements. Those federal laws call for a national pollution discharge

TABLE 8

SPBS WITH COMPATIBLE LAND USE, ZONING, OR BUILDING RESTRICTIONS REQUIREMENTS

Identifier	Seaplane Base Name	Location
1C9	Frazier Lake Airpark	Hollister, California
78B	Buckhorn Camps Seaplane Base	Norcross (Millinocket), Maine
83B	Northern Maine Regional Seaplane Base	Presque Isle, Maine
.M57	Rangeley Lake Seaplane Base	Rangeley, Maine
KRNT	Renton Municipal Airport	Renton, Washington
KLHD	Lake Hood Seaplane Base	Anchorage, Alaska
CGA	Craig Seaplane Base	Craig, Alaska
KFAI	Fairbanks International Airport	Fairbanks, Alaska
OOH	Hoonah Seaplane Base	Hoonah, Alaska
ENA	Kenai Municipal Airport	Kenai, Alaska
ENN	Ketchikan Municipal Airport	Ketchikan, Alaska
8K9	Murphys Pullout Seaplane Base	Ketchikan, Alaska
KKTN	Nenana International Airport	Nenana, Alaska
A43	Taku Harbor Seaplane Base	Taku Harbor, Alaska

Source: SMQ Airport Services {Q29}.

elimination system permit, stormwater pollution prevention plan, and/or a spill prevention, control, and countermeasure plan. The requirements usually stem from the airport being affiliated with a larger airport or a harbor facility. Under the various plans, SPBs would need to monitor for biochemical oxygen demand, glycol, pH, and suspended oil and grease, if they met the minimum requirements under the regulation.

Invasive species prevention and control require a seaplane operator to exercise environmental safeguards. Invasive species are organisms that are not native to an ecosystem and that cause, or are likely to cause, economic or environmental harm or harm to human health (Executive Order 13112 1999). The U.S. Coast Guard, U.S. Fish and Wildlife Service, U.S. National Park Service, U.S. Departments of Agriculture and Interior, and state departments of natural resources have published information on invasive species control and prevention. Specific to seaplane operation, the USCG has published guidance and practices for seaplane operators (USCG-2000-7206 2000) and SPA has produced a video that describes the actions pilots can take to preserve the waters in which they operate (<http://www.seaplane.org>).

PUBLIC OUTREACH

Fourteen of the 31 SPBs do not specifically conduct or participate in public outreach. For a few others, their outreach efforts are limited to attending town council or public meetings, serving on a local airport or community planning committee, or being a chamber of commerce or local pilot association member. Two SPBs that are affiliated with land airports are part of the airports' overall outreach effort. One SPB in Alaska, citing its island stature, does not conduct outreach because seaplane activity is necessary for its community to function.

A common promotion activity at airports throughout the nation is to have a pancake breakfast, open house, or similar fly-in event. For SPBs, the event is normally called a splash-in. Information exists on how to organize a splash-in (Trescott 2012). Other outreach methods include promotional events such as an air fair, marketing, advertising, youth events, and social media outreach. Though social media is a growing source for information in many areas of everyday communication activity, there was no mention in the survey responses of social media use as a communication outlet.

Public Relations and Promotional Activities

Public relations is “a strategic communication process that builds mutually beneficial relationships between organizations and their publics” (“What Is Public Relations?” 2014). The communication process includes using strategies such as marketing, advertising, events, good will, sponsorships, educational workshops, social media, and similar means to affect how one thinks or feels about something—in this case, seaplane activity.

Information was sought on how SPB operators might attract new or future users to their facilities {Q31}. Some cited physical improvements, such as adding fuel servicing or increasing the number of pullouts, ramps, or hangars. Having a website and advertising on the web were popular choices, as were printing brochures and attending trade shows. Other suggestions were posting bulletins at airports and SPBs and being members of aviation associations and clubs. Placing a brochure with economic data where visitors can look at it, either in buildings and offices or on the web, may be a useful preservation practice. For example, the states of Florida and Idaho provide easily downloadable brochures (see Appendices E and F). In Florida, Tavares SPB officials mail the economic impact brochures to key individuals and the community at large.

Several operators rely simply on word of mouth. Four airports, all in Alaska, are in the enviable position of not having to do any promotion because they are at capacity and until they expand, promotion is unnecessary.

Through the literature search and the viewing of event calendars on a number of seaplane pilot-affiliated websites, it was evident that a number of communities use seaplane activity as a cause for celebration. The marketing and promotional activities for various festivals and splash-ins tend to be conducted by chambers of commerce and tourism councils. The draw of even a few seaplanes can attract many residents and is an opportunity to showcase seaplane activity. Research found that the use of social media is more prevalent with advocacy issues and means to “get the word out.”

Advocacy Activities

Advocacy is a necessary and important tool in the development and preservation of SPBs and seaplane activity. Advocacy typically arises because someone else is advocating for the exclusion or restriction of seaplanes and SPBs. Efforts to close or restrict

SPB activity are evident in newspaper articles and in the number of waterways that are closed or restricted to seaplane activity throughout the United States (*Water Landing Directory* 2011). Without advocacy efforts for the benefit of seaplane activity, many SPBs would not exist.

Backcountry airstrips share a common purpose with seaplane bases. In an ACRP synthesis on backcountry airstrip preservation, one common factor identified for the successful preservation of an airstrip is well-organized volunteer efforts (Anderson 2014). This is also true for SPBs. Because of the various SPB governmental ownership or control options, one particular beneficial advocacy method is to have individuals at the state and local levels monitor legislative or regulatory efforts for their impact on SPBs and then respond to those efforts.

A number of advocates exist for SPBs and related operations. Three primary advocate groups are state aviation agencies that are responsible for the safety and promotion of aviation within their state; pilot associations at the national, regional, and local levels; and private individuals. In the literature, one example of advocacy at the state level was found from the State of Michigan.

In 2000, the Michigan Bureau of Aeronautics advocated and passed a set of administrative rules establishing guidelines for seaplane operations on state waters and governing the establishment of seaplane regulations. The rule prohibited local municipalities from establishing new seaplane regulations without the approval of the Michigan Aeronautics Commission (Seaplane Operations 2000). At the time, local municipalities had the authority to establish seaplane regulations because codes were not in place to reserve that authority for the state. As a result, local municipalities established regulations in response to citizen concerns and complaints without regard to actual safe seaplane operating characteristics and safety records. This led to a patchwork of arbitrary regulations that were not posted or otherwise easily available to seaplane pilots. In proposing the regulation, the state believed the lack of state-centric rules hindered seaplane use and infringed on seaplane pilots' rights to use state waterways that were held in the public trust. Unfortunately, the rules were not upheld in a court challenge, as it was determined that only the Michigan legislature could approve such a rule that would be binding on local communities.

An example of advocacy on the part of a pilot association is the Open Waters Campaign conducted by SPA. The purpose of the campaign is to educate public policy makers about seaplane operations. Key educational points include safety, pilot professionalism and training, compatibility with boat traffic and residential areas, environmental impact, and noise impact. As part of its advocacy efforts, SPA has produced a number of videos and booklets (<http://www.seaplanes.org>). The materials discuss the valuable service provided by seaplane operations, address issues and concerns about those operations, and provides background information on the history, utility, and benefit of seaplanes to individuals and communities throughout the country.

SUMMARY

Preserving SPBs begins with planning for their possibility or continued existence. An SPB needs to be recognized in federal, state, and/or local planning documents so it will be considered when other development is undertaken or when decision making could affect its use. Individual initiatives and help from seaplane operator associations can accomplish this recognition through advocacy efforts. To support the argument of the viability and usefulness of SPBs, better data collection is needed to substantiate claims of viability and usefulness.

CHAPTER SIX

CHALLENGES AND GAPS IN PRACTICE

This chapter pulls together survey responses and the literature on the challenges SPB operators face in trying to develop and preserve SPBs, or in conducting the many operational aspects described in previous chapters. Gaps in practice can be related to the challenges. Both are presented in the chapter, as well as possible means to address either. Gaps in practice are related to the differences between what is discovered in the research portion of a synthesis study and what may be possible or achievable, based on current knowledge. A number of gaps were observed in this study.

DEVELOPMENT CHALLENGES

Foremost as a development challenge is the gaining of permission to operate an SPB on a particular body of water. The authority to establish and operate an SPB lies with a number of federal, state, and local bodies. Operating an SPB normally involves obtaining a permit or license. The SPB is then subject to annual inspections to ensure safety and compliance with applicable regulations. Obtaining the requisite permits is often a lengthy challenge, especially if opposition exists or if an environmental study is required. Varying regulations across the country and a lack of ready accessibility are significant challenges to seaplane pilots, because it makes it difficult to know what regulations apply to which bodies of water in each state, and where they can and cannot operate.

Chatham Municipal Airport (MA) SPB was decertified by the state of Massachusetts in 1999 owing to inadequate water landing area length and obstructions in the approach paths. In updating their airport layout plan in 2003, the recertification of the SPB was considered. During the evaluation it was determined that an application to the FAA and Massachusetts Aeronautical Commission for recertification would trigger the development of a SPB Master Plan and ALP. The MP and ALP study would investigate water quality and depths, obstacle clearance approach parameters, evaluation of easement needs, and an infrastructure analysis. Additionally, permits for developing the water and shore interface, docking facilities, and land infrastructure would need to be obtained from the USACE and the U.S. Coast Guard. The Massachusetts Department of Environmental Protection would require an evaluation of the environmental impacts under NEPA and their own MEPA. A Development of Regional Impact Permit (DRI) would be needed from the Cape Cod Commission (CCC). Lastly, to comply with the Wetlands Protection Act (WPA), a Wetland Order of Conditions would need to be obtained from the Chatham Conservation Commission (CCC). The following factors resulted in the recommendation to not pursue recertification: the cost for planning, obstruction removal, environmental constraints; the need to seek waivers for FAA and the Massachusetts Airport Commission, the little to no demand for SPB use. However, seaplanes can still use the pond at their own risk.

Source: Runway and Terminal Area Study and Airport Layout Plan Update 2001–2021 (2003).

In an open-ended question, SPB operators were asked to identify threats, barriers, and impediments to their continued operation {Q32, Q33}. Threat descriptions varied with the type of SPB operation, geographic location, and type of ownership or control. The general state of the economy was identified as the greatest perceived impediment to further SPB development, as the concern reflects the level of demand for services and the financial and capital cost of providing services. One example is a comment that an operator felt pressure to cut expenses and possibly rent or sell the SPB property to a commercial fish net repair company. Other threats, barriers, and impediments identified were

- Limited demand for services, especially for SPBs operated by resorts or sporting lodges
- Overall cost of flying
- Cost of taxes, permit fees, and insurance
- Lack of funding for infrastructure investment
- Availability and cost of space to expand land facilities
- Low numbers of seaplane pilots to contribute to the economic impact

- Lack of public understanding; public sentiment against seaplane operation
- Number of competing boat and recreational activities
- Residential encroachment
- Environmental regulation and issues such as noise and invasive species propagation
- Competition from wheeled aircraft at airports with instrument procedures
- Competition from the ferry system
- Weather conditions that preclude consistent operations.

To address the threats and barriers {Q34}, survey respondents provided ideas that covered both technical and philosophical possibilities:

- Promoting pilot awareness of community noise sensitivity
- Getting pilots to attend and advocate before community councils
- Eliminating permit fees for noncommercial operations
- Providing grant funding
- Enacting zoning and other encroachment protections
- Separating seaplane docks from marina areas
- Increasing flight activity
- Advocacy for change at the federal, state, and local levels.

To gain a better sense of the challenges facing SPB operators, they were asked to rate on a scale of 1 to 5 to what extent each of 31 items were a major issue or concern to them for the future existence or development of their SPB {Q35}. The rating scale was identified as 1—major concern; 2—some concern; 3—neutral; 4—little concern; and 5—no concern. Table 9 reflects the rankings based on the average of the responses. The rankings support many of the other survey findings addressed in this report. As stated in previous sections, the diversity of types of operational activity, funding support, and governing ownership prevent meaningful statistical analysis of the data.

When asked what organizations or groups present a difficult challenge for their SPB {Q36}, 26 of the 31 SPB operators indicated they do not have any organizations adversely affecting them. The remaining five operators cited individually the FAA, the local environmental protection agency, the local land use commission, a local “friends of” community organization, and the local DNR representative as posing difficulties for them. The responses reflect the individualistic nature of barriers that can vary with the type of SPB operation, geographic location, and type of ownership or control.

As a follow-up to the previous question, SPB operators were asked how they respond to difficult organizations {Q37}. The responses reflect the basic need for increased communication, such as meeting with them face-to-face, working with them, and generally educating them. As one operator, who did not identify a difficult organization, wrote: “We strive to maintain a welcoming, useful, and safe presence for users and visitors.”

SAFETY CHALLENGES

As reported by survey respondents, the following list and number of responses in parentheses identify what are considered to be safety challenges for SPB operation {Q38}:

- Mixture of boats and recreational activity in water runway area (12)
- Wildlife, primarily seabirds and geese (5)
- Line of site availability at SPB having an ATCT on adjacent land airport (2)
- Water surface obstacles (2)
- Fluctuating water levels (1)
- Alluvial fan deposits (1)
- Dock pilings (1)
- Docks in disrepair (1)
- Integrating sea and land operations (1)
- Grass growth (1)
- Weather (1)
- Pilot communication (1)
- Vandalism (1).

TABLE 9
RANKING OF MAJOR ISSUES AND CONCERNS TO SEAPLANE BASE OPERATORS

Rank	Rating	Major Issue or Concern
1	2.50	Boat, recreational, or other waterway use or traffic
2	2.52	Adequate tie-down and/or hangar capability
3	2.57	Availability of capital development funding
4	2.68	Adequate docking area
5	2.73	Presence of obstacles in the approach or departure path
6	2.77	Spillage of fuel, oil, or similar
7	2.97	Funding of daily operations
8	3.13	Public sanitary facilities
9	3.17	Risk and liability exposure
10	3.20	Deteriorating facilities such as ramps and docks
11	3.27	Cost of risk and liability insurance
12	3.30	Environmental regulation
13	3.33	Public acceptance or support for SPB operation
14	3.39	Availability of local ground transportation for seaplane users
15	3.42	Availability of fuel
16	3.47	Unsafe seaplane pilot operation
17	3.52	Public signage or way finding to your SPB
18	3.52	Water, sewer, or other public utility provisions
19	3.53	Invasive species control
20	3.60	Local law enforcement understanding of SPB operation
21	3.61	Availability to pilots of current information about your SPB
22	3.63	Availability of aircraft maintenance
23	3.63	Regulatory oversight
24	3.63	Noise complaints from the community
25	3.63	Too-low or too-high water levels
26	3.73	Available wind and weather information for pilots
27	3.83	Impact on fish and/or wildlife
28	3.93	Cost of local taxes, fees, or permits
29	3.93	Silt or dredging issues
30	3.97	Availability to pilots of an eating or lodging establishment
31	4.26	Availability of Wi-Fi or Internet services

Source: SMQ Airport Services {Q35}.

Interviews and the literature review did not turn up any specific inspection guide for SPB facilities. In general, inspections were primarily accomplished using excerpts from the inspection requirements found in 14 CFR Part 139, use of FAA Form 5010, or from individual state standards requirements. Inspections concentrated on checking the approach surfaces from the shore or through the use of satellite earth displays on the web. Inspectors were primarily from the state aviation agencies, the FAA for those SPBs affiliated with a Part 139 airport, and inspection contractors hired by either the state or the FAA. It was not reported that other governmental agencies inspect SPBs on a regular basis or to the same level as a dedicated aviation inspector.

AIRSPACE CHALLENGES

The shoreline of a seaplane base can be a challenge for aircraft takeoff and landing, primarily as it affects the arrival and departure paths to the water landing area. The growth of trees; the construction of buildings; the presence of power poles, cellular towers, and boat masts; rising terrain; the overflight of a residential area; and the proximity to other airports are other

examples of airspace challenges. Should an airspace analysis be recommended or required, the expense of conducting the analysis can be a hindrance to the sponsor of the SPB or study.

Approval of an official SBLP can require local communities in proximity to the SPB to file FAA Form 7460-1 *Notice of Proposed Construction and Alteration* for any construction or alteration on their property. This can be a challenge to the protection of the airspace if local land use and building codes are not enacted, or if the SPB operator does not monitor local building and construction activity.

MANAGEMENT CHALLENGES

While various authorities have rules and regulations governing seaplane operations on their respective water bodies, many of those rules and regulations detail the responsibility of the pilot to ascertain whether seaplane operations are permitted, prohibited, or restricted for a particular body of water. Additionally, pilots are required to know the boating laws of each governing authority.

The continued development and preservation of SPBs often falls to an entrepreneurial sponsor or champion from either the public or private sector to spearhead the effort. Ownership by a local governmental entity, such as a municipality, can be a solution because it may be in a better position to fund developmental effort and qualify for state or federal funding.

A gap exists in the recording of operational data. A review of FAA Form 5010 for the surveyed SPBs shows much of the data to be several years old and not consistent in their reporting period. Some were listed weekly, some monthly, and some annually. Annual operations reflect a 12-month activity level. Many SPBs operate only during the summer months. The operational figures reported for the shortened seasons were then extrapolated to reflect a 12-month level, even though no activity occurred during the winter months. The General Accounting Office found in 2012 that an FAA survey of general aviation activity has methodological and conceptual limitations (*General Aviation Safety* 2012).

As in any business, there may exist a time when one needs to seek or rely on outside support and expertise to maintain business operations, or to address new or novel situations. In the case of 14 SPB operators, their “go to” persons included individuals from the FAA, state aviation departments, and a plethora of seaplane pilot associations, both local and national {Q39}. Seventeen (17) operators, however, could not identify a knowledgeable source or contact within the FAA, state, or other organizations to obtain expertise, guidance, or information on SPB operation, design, or funding issues.

To address the need for knowledge or awareness of SPB issues, a number of sources are available to assist SPB operators {Q40}. Nineteen respondents indicated they are members of a seaplane or similar pilot organization, nine are members of airport management organizations, three are members of a local governing or planning commission, and one is a member of a marine trade association. Thirteen respondents do not belong to any trade organization.

An issue raised in the initial scope for this report suggested that local law enforcement lacks knowledge of the operating rules and requirements of seaplanes. The survey sought to identify ways to better inform law enforcement and policy makers about SPB operations {Q41}. None of the respondents indicated this is an issue for them, though one suggested it could be because of constant personnel turnover within the enforcement organizations. The general consensus is that open communication and education are solutions to such issues. Conducting a departmental briefing, providing a handout, engaging a local pilot association to educate pilots, offering an airport tour, and having pilots participate in emergency training exercises were all offered as suggestions to improve knowledge and relationships.

SPBs appear to be thriving in states that have active and supportive state aviation organizations. The laws of the state and the missions of the state aviation agencies recognize the importance and value of SPBs within the SASP. Further support is needed from local governments, and evidence exists that support is developing in certain states. As with any political effort within state and local governments, a strong advocate is often necessary to maintain those efforts.

FUNDING CHALLENGES

SPBs face a number of obstacles and constraints on the allocation of resources for developing, operating, and maintaining SPB facilities, as detailed in chapter three. At the federal level, support for airport development has declined during the period of June

2007 to June 2014 (Dillingham 2014). At the state level, lack of funding or support is evidenced by an economic development study conducted for the Lakes Region in the state of New Hampshire [*Lake Region Comprehensive Economic Development Strategy (CEDS) 2013 Report* 2013]. As a result of state budget reductions, no funding has been provided for any of New Hampshire's 24 public-use airports (including the one SPB in the region) for the 4 years prior to the study.

FAA's tool for identifying future airport capital projects that are eligible for AIP grants is the NPIAS and airport capital improvement program. To help rank the importance of the numerous capital projects submitted by eligible airports, the FAA uses a priority system based on the type of airport and project. SPBs have difficulty meeting the priority parameters.

For SPBs open to the public and seeking to generate revenue through the renting or leasing of slips, tiedowns, and storage, the economic principal of supply and demand comes into play. The same is true for the performance of aircraft maintenance. As noted in one study considering the development of a new SPB, an analysis of what users would be willing to pay for the services provided would not support the full cost of constructing or maintaining the proposed floatplane facility. It would need to be subsidized in some manner (*Economic Feasibility Study of a New Floatplane Facility Located in Anchorage, Alaska* 2008). While the study evaluated a large SPB, the development and construction of an SPB of any size could benefit from the development of a business plan to help determine future sustainability.

ENVIRONMENTAL CHALLENGES

Because SPBs are located on water, the presence of wildlife can be a challenge. Seabird activity is expected and is more difficult to prevent or disperse than wildlife mitigation techniques used at land-based airports. The growth of sea grass and weeds along the shore and in the water also present a difficulty, as removal must comply with environmental regulations.

Invasive Species

Invasive species are a major concern and challenge for SPB operators and pilots. The term "invasive species" is defined as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13112 1999). Seaplanes, like boats and other watercraft, can transport invasive species by organisms that have attached themselves to the hulls or pontoons, or by organisms existing in the pontoons that are eventually pumped out at a site different from their origin.

The invasive species concern is not just for transmission, but for the possibility of broad restrictive actions taken to prevent seaplane access to water bodies. A state or federal agency may seek to use the potential of invasive species transmittal as an opportunity to restrict seaplane operations. An example is the state of New Mexico Parks Division's attempt to prohibit seaplane operations within the state park system (Amendment to 19.5.2 NMAC 2012). The effort was not successful because the Bureau of Reclamation and USACE had already enacted regulations addressing seaplanes use and the spread of invasive species. This is an example of how several different governmental agencies have power over the waterways and may be at cross-purposes.

Prevention is the most important step in managing invasive species. The SPA and others have placed emphasis on increasing awareness and on reducing and preventing introductions. Voluntary guidelines and educational presentations exist for SPB operators and users (USCG-2000-7206 2000; *Aquatic Invasive Species* 2014).

Sound and Noise

Noise can clearly be an issue for seaplanes and SPB operators. Recognizing that noise is defined as any unwanted sound, some SPBs are located where the sound of seaplanes is welcoming and others where it is not. The perception of noise from any aircraft may be more related to what the sound represents than the actual sound itself (*Noise Exposure Maps Update* 2008). Opposition to the sound of any motorized vehicle or vessel in remote areas is understood to be a distraction from normal peace and quiet. For this reason and others, water bodies such as Waldo Lake in Oregon have been placed off-limits to seaplanes as a result of restrictions seeking to preserve the tranquility of the area (Use of Motors Prohibited on Certain Lakes 2013; Restrictions for Waldo Lake 2013). The challenge for SPB operators is to ensure discrimination does not exist with the allowance of other powered watercraft, or that information provided to the public about the actual noise level is not misrepresented.

Seaplane engine and propeller combinations can result in high decibel levels for short periods of time. The high decibel reading is considered unwanted sound to many. Advances in aircraft design and technology can help reduce noise level expo-

sure. Reducing the speed of the propeller tip reduces the decibel generated (Marte and Kurtz 1970). A common practice for seaplane operators or piston-engine aircraft is to change from a two-bladed propeller to three- or four-bladed propeller; doing so results in a decibel reduction without affecting the horsepower output of the engine.

Beyond technological solutions, the challenge is to reduce the decibel level, either by design or by relocating it in space or time (Quilty 2004/2005). Relocating sound in space means the farther away the source of sound is from the recipient, the lower the decibel level. For this reason, a water landing area's layout can reduce noise levels by locating a takeoff farther from shore, or by minimizing aircraft overflight in populated areas.

Reducing sound by relocating the source in time means operating the aircraft when the impact will have less effect on people. For instance, while seaplanes can operate from dusk until dawn, commercial operators on Lake Union in Seattle, Washington, voluntarily do not operate before 8 a.m., even though daylight comes much earlier during the high-demand summer months.

In selling the concept of seaplane activity to residents of Tavares, Florida, city administrators explained to local residents that seaplane activity most likely would occur on the weekends rather than during the weekday, and only during daylight hours in either case. FAA Handbook H8083-23 informs seaplane pilots that a night water landing should generally be considered only in an emergency, and that it can be extremely dangerous because of the difficulty of seeing objects in the water, judging surface conditions, and avoiding large waves or swells. New Iberia, Louisiana, is the only airport in the contiguous United States that has a lighted waterway. It is a water trench parallel to a land runway and has lights along the bank to provide the necessary visual reference to a pilot when landing at night.

FAA cumulative noise methodology involves the calculation of noise exposure over a 24-hour period. With no nighttime operations and few daytime operations at SPBs, exceeding the cumulative 65-decibel Day-Night Level standard for noise abatement mitigation can be rare, if it occurs at all. The U.S. Parks and Forest Divisions of the Department of Interior has regulations on its bodies of water establishing a maximum noise level of 75dB(A) for vessels under way and 88dB(A) for stationary vessels, per Society of Automotive Engineers (SAE) standards J1970 (SAE J1970 2011) and J2005 (SAE J2005 2011), respectively (36 CFR 3.15).

COMPATIBILITY CHALLENGES

The general public's lack of familiarity about SPB facilities, services, operation, and benefits can result in opposition to existing and future development. Typical concerns identified through the literature search, interviews, and the survey include the following issues and risks:

- Interference with expected tranquility through noise generation
- Visual disruption of scenic view
- Potential conflict with other motorized or nonmotorized vessels
- Environmental risk for water and air pollution from usage, accidents, and fuel spills
- Introduction of invasive species and other aquatic disturbances
- Disagreement over the concept of public purpose within the community
- Alternative public or private development and uses for SPB facilities
- Cross-purposes of various agencies missions, goals, or objectives.

GAPS IN PRACTICE

The literature research and the survey raised issues and gaps in practice that can most effectively be summarized by the following:

- Confusing use and application of the term "seaplane base"
- Not being able to easily determine the number of active seaplane pilots and aircraft
- Not being able to collect accurate or useful data on SPB activity
- Inconsistency in operational activity data collected as a result of seasonal use
- Differences in the level of SPB operator awareness or availability of data on the design of SPBs
- Unclear inspection criteria or absence of inspection guides for SPB facilities
- Desire for better information or support from governmental agencies in the promotion and preservation of SPBs

- Better guidance on emergency and community response to a seaplane incident
- Use of economic impact models to demonstrate the value and contribution of SPB operations.

SUMMARY

SPB development and preservation faces numerous threats, pressures, and challenges. Issues such as safety, management, funding, regulation, airspace, noise, sea and wildlife, invasive species, and public opposition are found across the nation.

From an operational safety perspective, the biggest challenge is operating on the water with a mix of boat and recreational activity.

From a developmental perspective, gaining permission to operate an SPB on a body of water and funding are the two main challenges. For the continued preservation of SPBs, the general state of the economy is the greatest perceived impediment. Limited demand, the cost of flying, and low numbers of seaplane pilots contribute to the challenge of preserving SPBs. A further impediment is a lack of public understanding of SPB operation, including the cross-purposes of governmental entities in fulfilling their mission and goals.

The continued development and preservation of SPBs often relies on having a sponsor or champion from either the public or private sector. SPBs appear to be thriving in those states that have active and supportive state aviation agencies.

CHAPTER SEVEN

CASE EXAMPLES

Seaplane bases fulfill a multitude of pilot and community needs. To one or more degrees, there are those that serve basic transportation access to the NAS, those that serve a more recreational purpose, and those that serve as an economic focal point for the community. Together with the case examples of Sitka, Alaska (see Textbox 1, chapter four) and Chatham, Massachusetts (see Textbox 2, chapter six), the two examples provided in this chapter illustrate the practices and challenges of developing an SPB for economic development purposes that serve both recreational and commercial activity. In a meeting on August 3, 2014, both Virgil “Lee” Lewis, regional manager/partner at AVCON Engineers and Planners, and John Drury, city administrator, City of Tavares, Florida, provided information on Tavares. In a meeting on September 6, 2014, John Gowey, director of flight operations for Kenmore Air Harbor, provided information on Lake Union, Washington.

TAVARES, FLORIDA—AMERICA’S SEAPLANE CITY™

Tavares, Florida, is a community of approximately 13,000 people located in central Florida and surrounded by lakes. In 2006 and prompted by the then-mayor, the city undertook a series of discussions to determine what the community vision for the future might be. The effort was facilitated by a regional community development organization whose purpose is to convene businesses, governments, and civic leaders across central Florida to work together to build a better future for the residents and businesses of its seven-county region.

Vision and Concept

The visioning sessions resulted in the people of Tavares desiring a community that was accessible, embraced business, reflected its historic past, and capitalized on its water access to Lake Dora. A history review showed that Tavares had a connection to one of the first female advocates of seaplanes, Clara Adams, and to the first commercial seaplane operator in the United States, Tony Jannus, who flew a route between Tampa, Florida, and St. Petersburg, Florida, in January 1914. Recent history at Tavares in 2008 showed an occasional seaplane beached on the shore of the local park while pilots and passengers ate at a popular waterfront restaurant.

Based on history and coupled with ownership of a lakefront park and a city manager that had a background in airport management, the city decided to focus its vision on its waterfront and distinguish itself as a seaplane-friendly city. The city perceived Tavares’s location in central Florida as a convenient stopping point for fuel and other amenities for pure float seaplanes on their way to the Bahamas and Central or South America. Further discussions suggested the city brand itself as America’s Seaplane City™.

The idea for America’s Seaplane City™ was to develop the waterfront and local businesses using the seaplane base as a theme for future activity. One of the community’s economic goals was to attract seaplane-related businesses to the area, including a number of seaplane light sport aircraft manufacturers. To turn the ideas into reality, the city engaged a branding firm to help develop the concepts of what could exist for the future. The concepts recommended the expansion of the existing park into a seaplane-themed children’s splash park. A new seaplane dock, ramp, parking, and tiedown area would be added to complement the existing city-owned marina. Aviation fuel would be made available. The existing boat ramp would be relocated, and shoreline enhancements for a beach area and picnicking would be further developed. The additional development of an over-the-water pavilion to host weddings and other community events was planned.

Gaining Support

As with any public development effort, the approval and support of the community was vital. Tavares’s City Council would need to change the city’s master plan to reflect the new SPB. It would also need to authorize and approve the expenditure of

funds. That meant voters would need to support it as well. A community education effort was undertaken by city administration to explain the concepts to various stakeholders. For Tavares, the major stakeholders were the local historical society members, teachers, retirees, and the business community, in particular restaurants and hotels. The identification of the SPB as a source of community pride and economic development were two key selling points, as was the educational possibilities for children.

The issue of noise was raised during the educational and information meetings. To relieve concerns, it was noted that seaplanes would not use the facility at night because the facility had no lights. Also the majority of activity would occur on the weekends and not during the week, as the SPB would be used by primarily by recreational pilots. Additionally, seaplanes were already using the lake and no noise objections had been registered. Last, the prospect of pilots using the downtown area to visit and spend tourist dollars overshadowed the potential drawback of noise exposure from a water landing facility.

In 2007, the city posted a request for proposals to start the process toward developing an airport. At the time, the development of a new SPB was not a common experience shared by many consulting or engineering firms. AVCON Engineers and Planners was selected to pursue and obtain an airport license from Florida's Office of Aviation and Spaceports. By becoming a licensed public-use airport, the city would have a permanent facility and increase eligibility for future state or federal funding.

State Approval Process

After studying the issues, the consultant outlined a number of steps necessary to obtain the license. State of Florida Administrative Code identifies the requirements for an owner to obtain a license to operate an airport (Airport Site Approval 2004). In essence, the state is responsible for ensuring the public's health, safety, and welfare, and its administrative code reflects those responsibilities at airports. The following list outlines the requirements:

1. The site has adequate area allocated for the airport as proposed.
2. The proposed airport will conform to licensing or registration requirements and will comply with the applicable local government land development regulations or zoning requirements.
3. All affected airports, local governments, and property owners have been notified and any comments submitted by them have been given adequate consideration.
4. Safe air-traffic patterns can be established for the proposed airport with all existing airports and approved airport sites in its vicinity.

In particular, the state code for licensing airports required the following:

- a. A legal opinion of property rights determination
- b. Geodetic coordinates
- c. Location map and schematic
- d. Facility layout schematic
- e. List of adjacent airports within 20 mi
- f. Notification to other local governmental entities
- g. Notification to property owners within 1,000 ft of the development
- h. Public notice in general
- i. Identification of waste sites in proximity to the airport
- j. Location of the traffic pattern

- k. Safety plan identifying factors associated with the airport's use
- l. Identification of security factors protecting public health, safety, and welfare
- m. FAA approval.

In seeking to comply with these requirements, an immediate problem arose—land use site approval was needed from the Florida Department of Transportation (FDOT). The question raised was does a water landing area fall under the state's land use permit requirement, or does some other governmental agency have jurisdiction over the water? It was discovered that, unique to Tavares among other Florida cities, the original plan had the city property line running through the center of Lake Dora, rather than along the shoreline. This meant the city controlled the lakebed and the water surface, which is uncommon because the majority of lakes in the state fall under state control. Having the proposed water landing area and shoreline lakebed area under city purview would save time and money in obtaining permits, in particular in confirming legal ownership of the property, which necessary under Florida statutes. It was still necessary to obtain a Florida Department of Environmental Protection permit to dredge the shoreline.

To obtain a state license and registration, the city submitted Florida Forms 725-040-12 *Public Airport Site Approval Application* and Form 725-040-11 *Airspace Obstruction Permit Application* and included a site map and scale drawings. In initial applications filed with the state, the city sought a nonstandard aircraft traffic pattern to keep traffic pattern flights over the water rather than over the downtown and residential areas. According to Florida statutes, a nonstandard pattern would require the city to install a segmented circle. Though this would normally not be difficult for a land airport, it did pose a difficulty for an SPB because the navigational aid needed to be in close proximity to the water landing area, either in the park on the shore, or in the water. The city decided to not pursue the nonstandard pattern.

FDOT also required an *Airspace Obstruction Permit Application Form*. It allows for evaluation of obstructions in the approaches to the water landing area and in the traffic pattern area. Other state DOT requirements were a windsock; two 80BC fire extinguishers; a public telephone; one USCG life preserver, ring, or throw line; and a spill control kit consisting of absorption booms.

As part of any development, Florida statutes require an airport sponsor to identify and notify all property owners having a structure greater than 25 ft aboveground and within 1,000 ft of the any new airport development proposed (*Airport Compatible Land Use Guidebook* 2010). The city had to identify all the property owners along the downtown and residential areas that were included within a 1,000-ft boundary of the shoreline, not just the defined water landing area. Notification was also required to local municipalities, zoning offices, and airports within a 20-mi radius. While some initial objections were raised for the use of Lake Dora, barriers were eliminated with the help of the local regional community development organization and effective communication practices.

Once the state reviewed and approved the SPB application and obstruction permits, the city submitted all paperwork to the FAA along with Form 5010-3 *Airport Master Record (Newly Established Public Use Airports)* and FAA Form 7480-1 *Notice of Landing Area Proposal*. Concurrently, the city sought a radio license from the Federal Communication Commission to operate a Unicom and have a common traffic advisory frequency.

Design, Construction, and Operation

From 2008 to 2010, the city pursued development of its waterfront park and SPB. Initial financing came from the city's internal improvement fund, bonds, and a grant from a state community development corporation grant. A lengthy EPA permit process involved dredging and reconstructing the shoreline. Once obtained, the permit allowed for continued unlimited "conditioning" without having to request additional permits. Several areas along the shore were set aside as environmental buffer zones. The installation of two fuel tanks was also required to receive environmental review and approval. Standard equipment and construction precautions were taken to prevent leakage and spillage from both the avgas and mogas tanks.

The state required a minimum water landing area of 2,500 ft by 250 ft wide and a minimum depth of 3 ft. Because the water levels on the lake do fluctuate, a depth of 4 ft was actually sought and ensured. The approach to the water landing area required a 20:1 clear approach for a distance of 5,000 ft from the ends of identified markers. Obstruction-free docks were constructed, as was a new ramp adjacent to the city's boat ramp. The docks also act as a breakwater. The seaplane ramp has a slope that is shallower than the boat ramp angle.

Fuel tanks were installed for both avgas and mogas. To accommodate a straight-float turbine seaplane destined for Central America, the city entered into an agreement with the adjacent city of Leesburg municipal airport to use police escort for a jet fuel truck to drive the short distance and service the aircraft.

The city built a small terminal building with pilot amenities for flight planning and sought to have an FBO operate the SPB in 2010. Upon receiving proposals deemed to be too costly, the city moved forward to provide services with its own employees. A single tenant operator provides seaplane flight instruction and sightseeing tours. Three aircraft are currently based there. Insurance for the SPB is covered under the city's existing liability insurance. The added cost was regarded as too small to be distinguishable. The city is also protected by state statute, with liability exposure limited to \$250,000 by state law.

Results

As part of its continued branding, the city has added a seaplane to its official logo and has trademarked America's Seaplane City™. It has also acquired the Internet domain names associated with the same. To help others easily find the SPB, it sought and achieved the installation of road signs from FDOT (Figure 22).

With a hotel located across the street from the SPB, a number of European students have come to Tavares for several days to obtain a commercial twin-engine rating from a local operator who stationed one of the few multiengine seaplanes in the country at Tavares. Twice a year the city holds a festival centered on the SPB, while another 14 festivals are held in the park annually. The pavilion has bookings out to 3 years.

From an economic development standpoint, Tavares continues to position itself to reap the full benefits of its efforts. After 4 years of operation, it is about to see its 10,000th operation as its employees log aircraft that use the facility. A number of local businesses have adopted a seaplane motif and seaplane-themed paraphernalia is available for purchase. The downtown area is slowly revitalizing itself with new building construction as a result of the city's investment and elimination of impact fees for developers.

Tavares's efforts have also sparked within the state of Florida an increased awareness of the potential for economic activity from seaplane base operation. The state's economic development agency and Office of Aviation have actively promoted and supported the further development of SPBs within the state. Those efforts have resulted in the relocation of a seaplane manufacturer to a lake adjacent to Tavares. To facilitate the move, residents were educated about the necessary zoning change needed to accommodate seaplane activity. Another major seaplane float manufacturer has opened a float conversion and maintenance facility adjacent to Tavares at the Leesburg Municipal Airport, which has lake access as well. The airport has recently acquired property and constructed a seaplane ramp that ties into its existing taxiway system. It is currently pursuing revision to its airport layout plan to include a waterway landing area. Another airport in the state, Flagler County Airport in Palm Coast, is pursuing reactivation of its SPB.



FIGURE 22 Highway road sign promoting the seaplane base at Tavares, Florida. (Credit: S. Quilty, SMQ Airport Services)

Next Steps

Tavares's city council is currently pursuing efforts to further expand the SPB and park. It has passed a bond issue to purchase additional land adjacent to the park and will relocate the boat ramp and parking area, while creating a dedicated seaplane parking and tiedown area to enhance safety.

To become eligible for FAA grant funding, the city recognizes its SPB must be listed in the NPIAS. To be listed in the NPIAS, it has to be included in the FASP. To be included in the FASP, the SPB has to be part of the Continuing Florida Aviation System Planning Process (CFASPP). CFASPP is a method used within Florida to regionally and continuously monitor the aviation environment and determine the development requirements needed to best meet projected aviation demands. In order to determine the aviation demands for Tavares, the SPB must conduct a master plan study and develop an SBLP. Tavares is currently pursuing a master plan and SBLP.

SEATTLE, WASHINGTON—LAKE UNION

Lake Union, Washington, has two designated water landing areas and two privately owned public-use land facilities. The lake and SPBs are good examples of the complexity of ownership, operating rights, and the need for advocacy. It's also an example of the confusion as to what constitutes an SPB.

Two primary commercial seaplane operators conduct operations using Lake Union, along with other private seaplane pilots. Kenmore Air Harbor, Inc., conducts scheduled air taxi and unscheduled charter operation to 45 scheduled destinations and over 100 charter locations using 20 aircraft—a mix of radial-engine piston Beavers and turbine-engine Otters. It also is an international port of entry with staffed CBP personnel.

Formed in 1946, Kenmore Air's passenger terminal is located on Lake Union. Its maintenance base is located in Kenmore, Washington, on Lake Washington. It conducts close to 35,000 operations at both of its facilities annually. Kenmore has been in operation for more than 65 years.

Also operating off of Lake Union is Seattle Seaplanes; it uses four smaller piston-engine aircraft and providing charter, sightseeing, and flight training. Seattle Seaplane registers approximately 2,500 operations annually, based on its 5010 Master Record from 2011. Seattle Seaplanes has been in operation for a little over 30 years. The people and city of Seattle have benefited from both operations.

Classification

To illustrate the difficulty in defining a seaplane base, a challenge exists in the classification of both 0W0 and W55. Both are identified as SPBs on Lake Union. Kenmore Air Harbor, Inc., does not report its enplanement data for W55, but data do exist for S60, its other facility on Lake Washington. W55 is not listed as being in the NPIAS or on AIP funding lists, despite the approximate 25,500 operations listed on its 5010 Master Record during its last inspection in 2011. It is listed as an unclassified GA airport under the 2014 update to the ASSET Report, but it is considered a primary commercial service airport with Washington State DOT in its 2012 statewide airport economic impact study.

Permitting

The SPB operations on Lake Union illustrate some of the complexity of ownership and permitting processes. A review of FAA Form 5010 illustrates some of the confusion described in chapter one. Both Kenmore Air Harbor, Inc., and Seattle Seaplanes are listed as separate SPBs—W55 (Kenmore Air Harbor, Inc.) and 0W0 (Seattle Seaplanes). What is owned and operated are the land facilities. However, W55 is 5,000 ft in length and listed under Kenmore Air. The other is 9,500 ft in length and listed with Seattle Seaplanes. Yet neither have ownership of the associated water landing area because it is a public lake. The owner listed in FAA Form 5010 refers to the land facilities and not the waterway.

The State of Washington owns Lake Union. The Seattle Police Department Harbor Patrol Unit polices the lake and responds to emergencies. Kenmore Air owns its land, building, and dock, but not the water area where the dock is located. It leases a defined water lot for the dock from the state. It also leases additional land to the south from a private lot owner.

Seaplane users of Lake Union are currently seeking to mark the 5,000-ft waterway in the lake. The purpose for marking the waterway is to better inform boaters and other watercraft users of the seaplane operating area. The city of Seattle controls the acquisition and placement of buoys and markings in agreement with the USCG, and the local tribal authority has fishing rights on the lake that requires accommodation.

An environmental impact statement is necessary for any build-out into the lake, such as with a dock. A dock can affect shading at the water bottom, which could possibly disturb eel grass and fish habitat in the vicinity of a dock, and any improvements would require review and/or permit from the following organizations: the USCG, USACE, and Washington State Departments of Natural Resource, Ecology, and Fish and Wildlife.

Airspace

As highlighted in chapter four, Seattle's Department of Planning and Development undertook comprehensive planning as part of a project to revitalize and develop the South Lake Union District of Seattle. Development demands were to construct tall buildings in the aircraft approach area to Lake Union.

The seaplane operators and pilots using Lake Union advocated for, and received, an air corridor to protect the approach and departure paths. The air corridor limits the height of buildings along the flight path (see Figure 21 in chapter five). Protection was necessary because the approach and departure to the south end of Lake Union falls under the 1,800-ft limit of FAA Class B airspace for Seattle International Airport. The famous Seattle Space Needle is along the flight path to and from Lake Union and tops out at 741 ft. Figures 23 and 24 show the construction occurring in the vicinity of Lake Union and the reason for protecting the approach and departure paths at Lake Union.



FIGURE 23 Construction cranes visible while on aircraft approach to Lake Union, Washington. (Credit: S. Quilty, SMQ Airport Services)



FIGURE 24 Seattle Space Needle and crane near departure corridor at Lake Union, Washington. (Credit: S. Quilty, SMQ Airport Services)

The corridor leaves seaplane pilots, which operate primarily under visual flight rules, only about 500 ft to safely maneuver along the flight path. If the wind blows from the south and seaplanes must take off over the city, their climb performance is restricted and the tall buildings can present a safety challenge, absent a corridor. The challenge is not just their height, but the effect they have on creating wind turbulence that can affect aircraft performance and operation. For this reason the comprehensive plan identifies the need for an environmental assessment of certain buildings proposed along the corridor. A building assessment would include a wind shear analysis of the design to determine its impact and ability to create hazardous wind turbulence.

Public Relations

Sound energy generated by seaplane operations on Lake Union is a concern, and seaplane operators have taken measures to be good neighbors. Pilots and operators have converted their aircraft from two-bladed propellers to three blades. Another measure taken over the years to help reduce noise levels from aircraft is the addition of turbine-powered aircraft. A turbine aircraft requires shorter runs for takeoff and can climb quicker to altitude than piston-powered aircraft. The result is a decrease in the duration of noise exposure.

With input from local pilots, voluntary abatement procedures were suggested. Two primary procedures involved not operating before 8 a.m. on weekdays and 9 a.m. on weekends, and to follow a defined flight path that reduces residential overflight below a certain altitude.

The interaction of seaplane activity has caused concern with other users of the public lake, such as boaters, personal watercraft, and other recreational users. Those types of activities have increased significantly as the Seattle area has grown. Often, the other water users are not familiar with seaplane operations, making it difficult for seaplane pilots to properly ensure safe operating distances. Seaplane operators are considering having the waterway marked. As part of the effort, a public information campaign has been developed, to include activities such as development of an informational brochure, attendance at public meetings and hearings, and communication with boating and recreational user groups. Additional buoys and lights are being recommended. The lights are to be strobes located on the buoys that would operate for 4 minutes once activated by an aircraft radio. The lights will warn boaters and other water users of an approaching or departing aircraft.

Economic Impact

The City of Seattle and the Washington State Department of Transportation's Aviation Division are seen as supportive of seaplane operations because they both recognize the economic impact each has on the community. Kenmore Air Harbor's operation serves San Juan County with scheduled flights, as well as other destinations. San Juan County consists of all islands and has no connection to the mainland. The ferry system substitutes for what would normally be a county's state highway system. Kenmore Air Harbor, Inc., and Seattle Seaplanes compete against this ferry system. Individuals will commute between the islands and Seattle area using the commercial seaplane operators because they are convenient to use and they save time over the ferry and mainland road system.

In an economic impact report developed by Washington State DOT Aviation in 2012, Kenmore Air Harbor SPB (which included Seattle Seaplane operations) was identified as a primary commercial airport that enplaned 27,260 passengers, conducted 36,800 operations, and had a visitor spending impact of a little over \$8 million. The maintenance facility has visitor spending of \$1.8 million. The total labor impact of just Lake Union was 515 jobs, with a total direct, indirect, and induced payroll effect of \$30.8 million. The total economic impact for Kenmore Air Harbor SPB was calculated to be \$62.7 million.

CHAPTER EIGHT

CONCLUSIONS

The history of seaplane development is well documented. The history of seaplane base development is not so well documented. With the exception of research in Europe in the 2003–2013 period (FUSETRA 2012), little research is being conducted in the United States on seaplane operations and their possible benefit to communities across the country. This report documents literature and practices in developing and preserving SPBs by surveying 31 SPB operators in 11 states.

As with any group with common goals and interests, the seaplane community promotes its operations through literature and activities. It is outside the seaplane community where understanding and interest are lacking, thereby presenting an outreach challenge to the seaplane community. The survey and literature showed pockets of different challenges that exist across the country depending primarily on the SPB's location and the people affected, whether it is in an urban setting, a remote natural area, or an isolated community that depends on seaplanes to connect it to other communities.

An SPB, like any other general aviation airport, can support many types of activities. The study found that seaplane bases can be grouped into three general categories: (1) those that exist to meet basic community transportation needs and access to the national airspace system because of the town's remote location; (2) those that serve a recreational or sporting purpose; and (3) those that serve as an economic focal point for community development, commercial services, and tourism. Recreational use is the most commonly cited purpose in the survey. However, in Alaska and other remote areas where alternate transport modes are limited or nonexistent, SPBs and seaplane activity serve as a lifeline for the community by connecting it to the NAS. The recognition of SPBs as a means to promote economic development appears to be an area for growth. As communities work to develop their SPBs, they serve as an attraction for economic development and tourism within the community.

A major gap was identified in defining exactly what constitutes a seaplane base. The literature search identified conflicting and confusing terminology. The unclear definition of an SPB has implications when discussing licensing and permitting, capital improvement, governmental financial assistance, maintenance, environmental responsibilities, and public purpose.

Relative to licensing and permitting, the research highlights the varying number of governmental entities that have regulatory oversight over a water landing area can be an impediment to continued SPB operation. The different missions, goals, and capabilities of the oversight agencies can be in conflict with other agencies. SPBs tend to do well where a knowledgeable and interested person advocates for the base.

Capital and operational funding of an SPB is clearly a challenge. The lack of activity and the lack of government or public interest are two factors. The study points out that while SPBs allow access to the NAS, the majority of SPBs do not rise to the level of activity to warrant inclusion in the NPIAS, thereby making them ineligible for AIP funding. Exceptions are those SPBs affiliated with a larger land airport. SPBs appear to benefit the most when they are affiliated with a land airport or where a supportive state aviation agency program is in place.

This study documents data collection to be a weak area in need of improvement. To help demonstrate the value and benefit of an SPB, the collection of use and other operational data is necessary. Close to half of the SPB operators indicated that they do not collect operational data nor specifically conduct or participate in public outreach. Those operators that do reach out vary in their data collection efforts. Splash-ins are a common marketing tool at SPBs with active operators.

The majority of SPBs throughout the United States do not have active SPB operators. The lack of active SPB operators is primarily the result of either low activity that makes an SPB operation unsustainable on its own, or the remote locations of many SPBs. In asking what amenities or services the SPB operators would like to have at their SPB, the responses report little is wanted or needed beyond what exists, except in Alaska, where the SPBs are more remote and basic utility services are the most desired amenity.

The range of facilities provided at the SPBs surveyed reflects the nature of their geographic location and the type of water access available. The design and construction of shoreline facilities is influenced by a number of factors including available space, water depth, wave and tidal action, construction and maintenance costs, weather and environment exposure, its overall purpose, and its expected demand. Weather and water action take a toll on SPB facilities.

Preserving SPBs begins with planning and advocacy. The SPB needs to be recognized on federal, state, and/or local planning documents, so it is considered when other development or decision making could affect its use. Individual initiatives and help from seaplane operator associations can accomplish this recognition through advocacy efforts.

To help promote SPB preservation, an economic impact study is a useful tool for demonstrating an SPB's importance and value. The research found that a number of states conducted economic impact studies for airports and SPBs within their state, or within a particular region. However, the economic models need refinement to better address the unique aspects of SPB operations. In particular, better data collection is needed to help validate any model used to determine economic impact.

The research and survey identified numerous threats, pressures, and challenges that face the development and preservation of SPBs. Issues such as safety, management, funding, regulation, airspace, noise, invasive species, and public education are found across the nation. From an operational safety perspective, the biggest challenge is operating on the water with a mix of boat and recreational activity. From a developmental perspective, gaining permission to operate an SPB on a body of water and funding are the two main challenges.

For the continued preservation of SPBs, the general state of the economy was identified as the greatest perceived impediment. Limited demand, the cost of flying, and low numbers of seaplane pilots contribute to the challenge of preserving SPBs. Cited as further impediments are a lack of public understanding of SPB operation and the sometimes conflicting cross-purposes of mission and goals of governmental entities that have regulatory authority over seaplane activity.

The continued development and preservation of SPBs often relies on having a sponsor or champion from either the public or private sector. SPBs appear to be thriving in those states that have active and supportive state aviation agencies or a seaplane pilot organization.

The research concluded that support from governmental agencies in the promotion of SPBs varies from little to very supportive. Owing to the different governing agencies that can have oversight of SPB facilities and operation, a lack of consistency exists in how SPB information is disseminated and standards enforced. A more uniform and publicly available database or tool of available information may close the gap. A review of governmental regulations related to SPBs could promote consistency across the regulatory entities. Additionally, consideration for better definitions of "water-landing area" and "seaplane base" is suggested to help avoid a misunderstanding of terms.

FURTHER RESEARCH

A number of challenges and gaps in practices are outlined in this report. Additionally, survey respondents were asked specifically if there were research areas that might be pursued to address other perceived gaps {Q42}. The following list summarizes potential research problems to be considered, as suggested by respondents and the literature research:

- Research to identify ways to collect actual SPB operational and user data.
- Research to identify ways to collect and disseminate seaplane pilot and aircraft data, as distinct from marine vessels or land-based aircraft.
- Aggregate, compile, and publish current seaplane base data.
- Research ways to address different regulatory agency oversight issues across states.
- Research ways to address rising insurance costs.
- Research to identify additional technological or noise reduction techniques for seaplane operations.
- Research to develop an emergency response guide for SPB operators and communities.
- Evaluate how to grow interest and participation in seaplane activity.
- Research methods for detecting foreign object debris on or in the water.
- Research funding mechanisms to help SPBs maintain or expand capabilities.
- Research a wheel/float arrangement for amphibian aircraft that will not cause an aircraft to flip when landing in the water with wheels down.

As a result of research in Europe, a basis may exist for using FUSETRA's findings and conclusions in the future development and preservation of seaplane bases and activity in the United States.

In a technical report produced by the U.S. Navy, suggestions are made for possible research into advanced seaplane design that includes advanced hull designs to optimize aero-/hydro-dynamic performance, reduce spray, reduce structural loads, and improve fatigue characteristics; the application of suitable composite materials to minimize weight and prevent corrosion; the use of nonconventional landing systems to provide better docking and beaching methods; advances in high-lift devices to reduce takeoff and landing distances; and the use of all-weather sea surface monitoring and prediction systems to locate benign patches of water and anticipate adverse seastate conditions (Odedra et al. 2004).

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ACRONYMS

AC	Advisory circular
AIP	Airport Improvement Program
AOPA	Aircraft Owners and Pilots Association
ATCT	Air traffic control tower
CBP	U.S. Customs and Border Patrol
CFASPP	Continuing Florida Aviation System Planning Process
CFR	Code of Federal Regulations
DNR	Department of Natural Resources
DOT	Department of Transportation
DOT&PF	Department of Transportation and Public Facilities (Alaska)
EU	European Union
FASP	Florida Aviation System Plan
FBO	Fixed base operator
FUSETRA	Future Seaplane Traffic
GA	General aviation
NAS	National Airspace System
NPIAS	National Plan of Integrated Airport Systems
SANS	State Aviation Needs Study
SASP	State airport system plan
SBLP	Seaplane base layout plan
SPA	Seaplane Pilots Association
SPB	Seaplane base
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
VFR	Visual flight rules

APPENDIX A

Survey Instrument

Seaplane Base (SPB) Operators Survey Questions

A. Seaport Identifier: _____

B. Your Name: _____

C. Telephone Contact: _____

1. When was your SPB established for public use?

It was established in (year) _____

2. What organization has primary regulatory oversight of your SPB landing area?

3. What other regulatory entities have an impact on your operation?

4. What purposes does your SPB serve? (Check all that apply.)

Scheduled Air Taxi

Unscheduled Charter

Cargo

Mail

Recreational

Sightseeing/Tourism

Instruction/Training

Medevac

Wildlife, mineral exploration, research, or similar

Other (please describe: _____)

5. For what reason(s) was your SPB located where it is?

6. Is your SPB designed as a separate facility or was it designed as a marina?

Separate

Marina

Designed as both

7. For what reasons do seaplane pilots choose to use your facility?

8. What environmental issues affect your SPB?

9. **Has there been an economic impact study performed in your community or state that includes the SPB?**
- Yes
- No
10. **Has your SPB received financial or economic development assistance from external sources (federal aid program, grant, community, etc.) that helped in the development or continued operation of your seaplane facility?**
- Yes
- No
- Don't know
11. **To make infrastructure improvements to your SPB facilities, where might you access funding (check all that apply)?**
- Internal funds
- Bank loans
- Local economic development grant or assistance
- Bond financing
- State assistance (please identify: _____)
- Federal assistance (please identify: _____)
- Other (please describe: _____)
12. **Is a hard and/or soft surface landing area colocated with your SPB that allows for either type of seaplane operation?**
- Yes
- No
13. **What facility improvements are needed at your SPB?**
- _____
14. **What are the most expensive aspects of operating and maintaining your SPB?**
- _____
15. **Is there currently an active seaplane business at the base?**
- Yes
- No
16. **What months of the year is your SPB open?**
- Full year
- Only between the months of _____ and _____
17. **Is your SPB used in the winter for aircraft ski operation or other activity?**
- Yes
- No

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18. Do you have an official (FAA, state, local) SPB layout plan or SPB master plan?

- Yes
 No
 Partial
 Don't know

19. How do you determine or collect information about what facilities to provide or other user needs and desires for your SPB?

20. What type of shoreline facilities and/or seaplane capability does your SPB offer (enter the number of each for any that apply)?

_____ Stationary dock _____ Piers _____ Mooring buoy _____ Ramp
 _____ Floating dock _____ Slips _____ Beach area _____ Hangar
 _____ No transition capabilities available

21. Which of the following are available at your SPB (check all that apply) and which would you like to have (check all that apply)?

Available		Like to have
<input type="checkbox"/>	Municipal or similar piped water	<input type="checkbox"/>
<input type="checkbox"/>	Well water	<input type="checkbox"/>
<input type="checkbox"/>	Municipal or similar piped sewer system	<input type="checkbox"/>
<input type="checkbox"/>	Septic system	<input type="checkbox"/>
<input type="checkbox"/>	Chemical toilet	<input type="checkbox"/>
<input type="checkbox"/>	Hazardous or biowaste disposal	<input type="checkbox"/>
<input type="checkbox"/>	Electricity	<input type="checkbox"/>
<input type="checkbox"/>	Telephone—landline	<input type="checkbox"/>
<input type="checkbox"/>	Cell phone capability	<input type="checkbox"/>
<input type="checkbox"/>	Wi-Fi or Internet access	<input type="checkbox"/>
<input type="checkbox"/>	Unicom	<input type="checkbox"/>
<input type="checkbox"/>	Air traffic control tower	<input type="checkbox"/>
<input type="checkbox"/>	Fuel (type: ____)	<input type="checkbox"/>
<input type="checkbox"/>	Major maintenance repair and alteration	<input type="checkbox"/>
<input type="checkbox"/>	Minor maintenance repair and alteration	<input type="checkbox"/>
<input type="checkbox"/>	Wash rack or similar cleaning opportunity	<input type="checkbox"/>
<input type="checkbox"/>	Lift, dolly, railway, or other transition or changeover services	<input type="checkbox"/>
<input type="checkbox"/>	Slips	<input type="checkbox"/>
<input type="checkbox"/>	Hangar or storage facility	<input type="checkbox"/>
<input type="checkbox"/>	Custom or TSA services	<input type="checkbox"/>
<input type="checkbox"/>	Other (describe: ____)	<input type="checkbox"/>

22. **What is the general repair condition of your SPB physical facilities (ramps, docks, parking areas)?**
- Excellent
- Very good
- Good
- Fair
- Poor
- Other (please describe: _____)
23. **What activities do you conduct or what data do you collect to improve the acceptance of SPB operations within the community? (Examples: Activities could include attending public meetings, being a member of a local business organization, public or media outreach, promotional events, educational sessions, youth events, marketing, advertising, festivals, open houses, etc.). Please describe all activities:**
- _____
24. **How is the number of the operations that is reported to the state or FAA annually counted or determined at your SPB?**
- _____
25. **It is thought that not much information or data exist on SPBs, whether it be operational data, marketing information, financial information, pilot data, economic impact, etc. What kind of information or data currently are, or would be, beneficial to you in the operation of your SPB, or that you'd like to see available? Please list:**
- A. Data or information currently collected or disseminated: _____
- B. Data or information that would be beneficial to have: _____
26. **Who or what organization conducts any type of compliance and/or safety inspections at the SPB?**
- _____
27. **Have there been any accidents/incidents at your seaplane base in the last 3 years involving aircraft operation, fueling, mooring, or general operation?**
- Yes
- No
28. **Were a seaplane accident or incident to occur, what capabilities do you or your community have available to (A) respond to injuries and (B) to recover the aircraft?**
- A. _____
- B. _____
29. **Has the local community or state established compatible land use, zoning, building restrictions, or other protective measures for your SPB?**
- Yes
- No
30. **What safeguards, methods, or infrastructure are used at your SPB to protect the environment?**
- _____
31. **What means or methods might you use to attract new or future users to your facility?**
- _____

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32. **What threats, barriers, or pressures currently exist or are on the horizon for the continued operation or preservation of an SPB, public-use or private-use?**
-

33. **What do you believe is the greatest impediment to the further development of SPB operations in general? Please describe:**
-

34. **To fix any of the threats or barriers mentioned in Question 32, what would you suggest be changed, corrected, or promoted?**
-

35. **On a scale of 1–5, with 1 being a *major concern* and 5 being of *no concern at all*, to what extent are EACH of the below an issue or concern for the future existence or development of your SPB?**

1 – Major concern

2 – Some concern

3 – Neutral

4 – Little concern

5 – No concern

Enter the number 1–5 for EACH of the following:

_____ Availability to pilots of current information about your SPB

_____ Availability of fuel (type: ____)

_____ Availability of Wi-Fi or Internet services

_____ Availability to pilots of an eating or lodging establishment

_____ Availability of local ground transportation for seaplane users

_____ Public signage or way to find your SPB

_____ Public sanitary facilities

_____ Water, sewer, or other public utility provisions

_____ Adequate docking area

_____ Adequate tie-down and/or hangar capability

_____ Availability of aircraft maintenance

_____ Spillage of fuel, oil, or similar

_____ Presence of obstacles in the approach or departure path

_____ Boat, recreational, or other waterway use or traffic

_____ Impact on fish and/or wildlife

_____ Invasive species control

_____ Environmental regulation

_____ Regulatory oversight

_____ Noise complaints from the community

_____ Cost of local taxes, fees, or permits

_____ Too-low or too-high water levels

- _____ Silt or dredging issues
- _____ Available wind and weather information for pilots
- _____ Unsafe seaplane pilot operation
- _____ Deteriorating facilities such as ramps and docks
- _____ Risk and liability exposure
- _____ Cost of risk and liability insurance
- _____ Availability of capital development funding
- _____ Funding of daily operations
- _____ Public acceptance or support for SPB operation
- _____ Local law enforcement understanding of SPB operation
- _____ Anything else? _____

36. What organizations or groups present a difficult challenge for your SPB?

Who: _____

Their position: _____

37. How do you respond to the concerned groups mentioned in Question 37 to counteract the pressures noted?

38. What safety-related challenges do SPB operators face?

39. Do you have a knowledgeable SPB contact or source within the FAA, state, or other organizations that you are able to seek expertise, guidance, or information from on SPB operation, design, or funding?

No

Yes

If yes, please identify the individual, group, or organization(s): _____

40. What seaplane, airport, trade, or community organizations are you a member of? Please list all:

41. It is suggested that local law enforcement is not aware of the operating rules and requirements of seaplanes. What are ways to better inform them and policy makers about SPB operations?

42. What research areas do you think would benefit future SPB operations?

43. COMMENTS: Please enter any qualifying information or comments about your SPB operations for any of the questions above.

THANK YOU VERY MUCH for assisting other seaplane bases to learn and benefit from your SPB operation and experiences!!!

Sincerely,

Stephen M. Quilty, A.A.E.

Stephen M. Quilty, A.A.E.

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813-388-9132

SMQ Airport Services

Lutz, FL 33559-8509

SMQAirportServices@gmail.com

The mission of SMQ Airport Services is to support the airport management profession with training and education, safety audits, SMS and SRA facilitation, organizational development and assessment, and special research study.

APPENDIX B

Number of Public and Private Seaplane Bases in The United States

State	No. of Public SPBs	No. of Private SPBs	Total No. of SPBs
Alabama	1	3	4
Alaska	128	37	165
California	6	6	12
Connecticut	1	3	4
Florida	5	22	27
Georgia	0	2	2
Hawaii	1	0	1
Idaho	4	4	8
Illinois	1	6	7
Indiana	14	18	32
Iowa	1	0	1
Louisiana	3	2	5
Maine	19	15	34
Maryland	1	5	6
Massachusetts	1	5	6
Michigan	2	5	7
Minnesota	14	19	33
Mississippi	3	0	3
Missouri	3	0	3
Montana	2	7	9
Nebraska	0	1	1
Nevada	0	1	1
New Hampshire	1	7	8
New Jersey	1	3	4
New Mexico	1	0	1
New York	8	16	24
North Carolina	0	3	3
North Dakota	0	10	10
Ohio	2	1	3
Oklahoma	1	0	1
Oregon	1	5	6
Pennsylvania	4	7	11
Rhode Island	0	1	1
South Carolina	1	1	2
South Dakota	1	2	3
Texas	1	2	3
Vermont	0	4	4
Virginia	1	4	5
Washington	13	8	21
West Virginia	0	10	10
Wisconsin	7	6	13

Source: AOPA Airport Directory 2013–2014

APPENDIX C

List of Survey Participants

California		
1.	1C9	Frazier Lake Airpark, Hollister
Florida		
2.	FA1	Tavares SPB, Tavares
Louisiana		
3.	KARA	Acadiana Regional Airport, New Iberia
4.	2L0	Pineville Municipal Airport, Pineville
Maine		
5.	21M	Currier's SPB, Greenville Junction
6.	70B	Millinocket SPB, Millinocket
7.	78B	Buckhorn Camps SPB, Millinocket
8.	M57	Rangeley Lake SPB, Rangeley
9.	83B	Northern Maine Regional SPB, Presque Isle
10.	92B	Long Lake SPB, Sinclair
11.	3B5	Twitchell Airport, Turner
Missouri		
12.	2M5	Stockton Lake SPB, Stockton
Montana		
13.	8S1	Polson Airport, Polson
Oregon		
14.	1O0	Lake Woahink SPB, Florence
South Carolina		
15.	T73	Kirk Air Base Airport, Lancaster
Washington		
16.	83Q	Port of Poulsbo Marina Moorage SPB, Poulsbo
17.	KRNT	Renton Municipal Airport, Renton
18.	W39	Roche Harbor SPB, Roche Harbor
19.	KSFF	Felts Field Airport, Spokane
Wisconsin		
20.	KEZS	Shawano Municipal Airport, Shawano
Alaska		
21.	CGA	Craig SPB, Craig
22.	KFAI	Fairbanks International Airport, Fairbanks
23.	3Z9	Haines SPB, Haines
24.	OOH	Hoonah SPB, Hoonah
25.	KENA	Kenai Municipal Airport, Kenai
26.	KKTN	Ketchikan International Airport, Ketchikan
27.	KLHD	Lake Hood SPB, Anchorage
28.	8K9	Murphys Pullout SPB, Ketchikan
29.	A43	Taku Harbor SPB, Taku Harbor
30.	L93	Robe Lake SPB, Valdez
31.	ENN	Nenana Municipal Airport, Nenana

APPENDIX D

A Quick Reference Guide for Public Policymakers



Seaplane Operations

A quick-reference guide for public policymakers

What are seaplanes?

Seaplanes are simply aircraft equipped with floatation gear that are designed to take off and land from the water's surface. While on the water, seaplanes are essentially boats.

What are seaplanes used for?

Seaplanes are used for a wide variety of purposes. For example, civil service applications include medivac, fire fighting, wildlife management, and patrol duties. Seaplanes are particularly useful for transporting people and supplies to remote areas otherwise inaccessible by air and not easily reached by conventional modes of transportation. Seaplanes are also popular among recreational users.

How do seaplanes interact with other waterway users?

The record shows that seaplanes do not pose a significant hazard to other waterway users. In a recent 13-year study of seaplane operations based on NTSB accident reports, it was found that only 3 collisions occurred between boats and seaplanes, 2 of which involved fatalities. One of the fatal incidents was a pre-arranged rendezvous. It is extremely rare for a seaplane accident or incident to involve anyone other than the occupants of the seaplane.

What is the environmental impact of seaplanes?

Negligible, according to a study by the U.S. Army Corps of Engineers. Seaplanes have no oily bilge water or sewage discharge, no underwater engine exhaust, propeller, or other underwater protrusions, and seaplanes do not generate a significant wake.

How much noise do seaplanes generate?

While seaplanes are louder than many other waterway users, the noise a seaplane generates during takeoff and landing is brief and infrequent. Unlike personal watercraft or ski boats, seaplanes are not a source of ongoing background noise. Averaged over time, seaplane operations have a negligible impact on noise pollution.

How do I learn more?

The Seaplane Pilots Association is happy to provide additional information and support at no charge to anyone interested in exploring seaplane issues. Our goal is to foster informed decision making with respect to regulation of seaplane operations. The association can be reached at:

Seaplane Pilots Association
4315 Highland Park Blvd, Suite C
Lakeland, FL 33813

Phone: (863) 701-7979
Fax: (863) 701-7588
Email: spa@seaplanes.org

(Source: <http://seaplaneturkiye.com/seaplane%20operations.pdf>)

APPENDIX E

Sample Florida Seaplane Base Economic Brochure

**THE ECONOMIC IMPACT OF
Tavares Seaplane Base
(FA1)**

Aviation's Benefit for Florida

Florida's economic well-being is intrinsically entwined with its vibrant airport system and its robust aviation industry. The aviation system in Florida allows the state to capitalize on an increasingly global marketplace. Aviation in Florida both sustains and leads economic growth and development. Airports in Florida are important economic engines, and support vital health, welfare, emergency, and safety-related services.

Florida's system of commercial service and general aviation airports are important to businesses throughout the state. Air travel is essential to tourism, Florida's number one industry. Protecting and investing in airports throughout Florida will support the aviation industry and the economic benefits described in this report. With continued support, Florida's dynamic aviation system will continue to provide a significant economic return in the years to come.

Florida Department of Transportation
Aviation and Spaceports Office
www.dot.state.fl.us/aviation

FDOT

FLP

FA1

Florida's Statewide Benefits from Aviation

Florida realizes significant annual economic benefits from aviation. The Florida Department of Transportation completed a comprehensive economic impact analysis to measure these benefits. Benefits measured in the FDOT study considered direct and indirect economic impacts and induced impacts that result from the multiplier effect. A summary of Florida's annual economic benefits from aviation follows:

Impact Category	Total Employment	Total Payroll (BILLIONS)	Total Output (BILLIONS)
AIRPORTS			
VISITORS ARRIVING BY AIR	170,107	\$8.1	\$36.3
CONSTRUCTION AT AIRPORTS	765,225	\$20.7	\$67.2
MILITARY AVIATION	17,388	\$0.6	\$2.2
AIR CARGO	137,482	\$6.4	\$12.8
AVIATION EDUCATION	129,587	\$5.0	\$10.3
AVIATION BUSINESSES	11,891	\$0.5	\$1.0
FEDERAL AVIATION ADMINISTRATION	76,217	\$2.8	\$13.6
TOTAL ANNUAL ECONOMIC BENEFITS	4,534	\$0.4	\$0.6
	1,312,431	\$44.5	\$144.0

Tavares Seaplane Base

Located in Lake County one mile southeast of the central business district of Tavares and approximately 40 miles northwest of Orlando, Tavares Seaplane Base serves the seaplane needs of central Florida. The seaplane base features an east-west water runway on Lake Dora that measures 3,000 feet in length. Facilities include a floating fuel dock with 100LL and marine gas, three floating seaplane slips, a grassy beaching area protected by floating docks positioned offshore, a shallow-angle concrete ramp leading to paved parking for amphibians, and additional fuel pumps in the amphibian parking area. The Prop Shop serves as the facility's administrative office and offers seaplane supplies, refreshments, and souvenirs to local and transient users.

Opening in April 2010, Tavares Seaplane Base is one of the newest seaplane bases in the country and has transformed Tavares into "America's Seaplane City" as a result of the waterfront development it has spurred. The seaplane base supports seaplane tours and flight training activity provided by Jones Brothers Air & Seaplane Adventures. The seaplane base has also become a regular attraction for Florida pilots and a rest stop for planes trekking from as far as Mexico, Italy and France. The city-staffed airport management provides aircraft support to local and transient users.

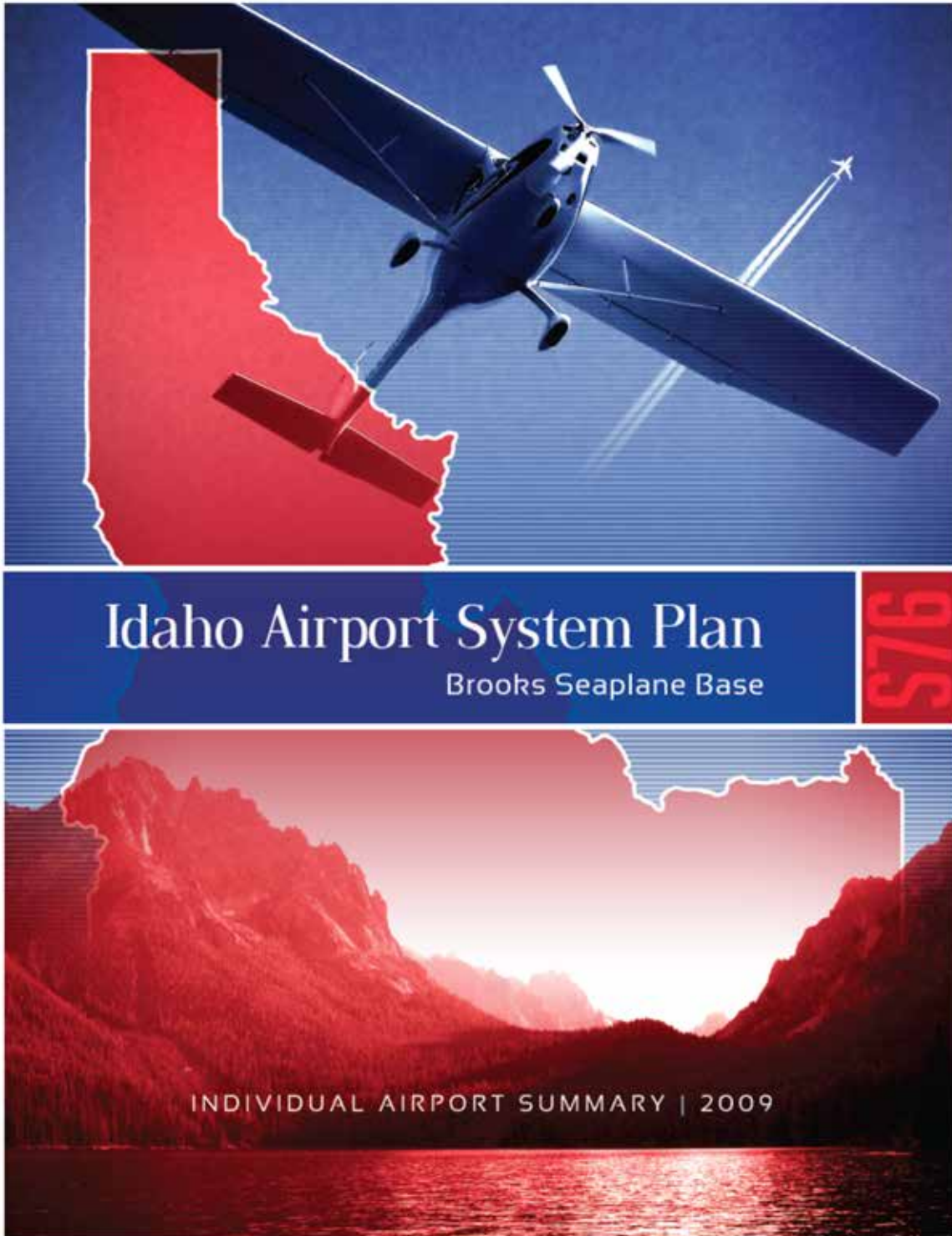
The annual economic impact of Tavares Seaplane Base is associated with direct impacts that come from operations and construction projects at the seaplane base. Indirect impacts are associated with spending from visitors who arrive in the area via seaplanes.



(Source: <http://www.florida-aviation-database.com/dotsite/economicimpact/FA1.pdf>)

APPENDIX F

Sample Idaho Airport Base Economic Brochure



Understanding the Airport

Coeur d'Alene is a growing city, with a population near 42,000, located in northern Idaho. It is commonly referred to as the "City by the Lake" due to its location along the northern border of Lake Coeur d'Alene. The city is located at the intersection of US Highway 95 and Interstate 90. While the city's economy was originally based on mining and timber, it is now quite diversified. A growing economic segment is tourism, supported by luxury resorts, abundant golf courses and the wide range of outdoor recreation activities. Nearby attractions include Coeur d'Alene National Forest, Coeur d'Alene City Park and Beach, and the Coeur d'Alene Casino. The largest employers in the area are Hagadone Corporation, Kootenai Medical Center, Idaho College, and local and federal government agencies.

The Brooks Seaplane Base provides access into Coeur d'Alene by seaplanes and other amphibious aircraft. It is located south of the city center on Lake Coeur d'Alene. The seaplane base is publicly-owned by the City of Coeur d'Alene. There is one business located at the seaplane base, Brooks Seaplane Service. The company maintains a self-fueling operation, as well as offering sightseeing and charter flights to various destinations in northern Idaho. The utilization of this seaplane heavily supports tourism in northern Idaho, because it provides an entry point to remote lakes and rivers.

Airport Roles

The Idaho Airport System Plan (IASP) has identified five functional roles for the 75 public-use airports included in the study. These roles expand on the Federal Aviation Administration's (FAA) role categories of commercial service and general aviation airports. Airports that are included in the FAA's National Plan of Integrated Airport Systems (NPIAS) are eligible for federal funding.

Role Summary	
IASP Role	Basic Service
Federal Role	General Aviation
NPIAS	No

Forecasts

When planning for new or additional airport facilities, projections in the form of based aircraft and annual operations can be helpful in determining the type and size of necessary improvements. Historical demand and local socioeconomic indicators, as well as state and national trends and the airport's master plan were reviewed in developing the airport's forecast.

The table below highlights the forecast activity for Brooks Seaplane Base.

Activity Forecast Summary		
ACTIVITY	2007	2027
Based Aircraft	2	2
Annual Operations	2,900	3,500

Facilities & Services and Recommended Development Costs

Facility and service objectives were developed for each of the five role categories of the IASP. These objectives provide guidance on the minimum level of facilities and services needed for the airport to fulfill its identified role in the system.

In order to continue to serve the aviation needs of surrounding communities and the State of Idaho, the IASP has identified several important projects for the airport. Many of these projects are eligible for federal and/or state funding. Recommended development costs include projects needed to meet each of the recommendations of the Idaho Airport System Plan as well as projects from the airport's capital improvement plan (CIP). While these projects are included as part of the IASP, it is recognized that execution of these projects is dependent on the local economic environment. Further, if the minimum system objective is exceeded, then maintenance of that objective is recommended.

The following table summarizes current facilities and services, the airport's facility and service objectives, projects recommended to meet the objectives within the context of the system plan, and the estimated development costs to implement the projects. Planning and environmental recommendations serve as guidance related to the development needed for the airport to fulfill its role in the overall statewide system.

Brooks Seaplane Base is an integral component to the State's system of airports. It provides access to our nation's air transportation network, provides community benefits, and generates economic activity. The proposed development improvements will ensure that Brooks Seaplane Base continues to provide area residents and businesses with the aviation infrastructure necessary for the 21st century.

	EXISTING	SYSTEM OBJECTIVE	RECOMMENDATION	DEVELOPMENT COST
AIRSIDE FACILITIES				
Primary Runway Length	15,000 feet	2,708 feet or greater	None	\$0
Runway Width	2,000 feet	Not Applicable	None	\$0
Runway Strength	Not Applicable	Not Applicable	None	\$0
Taxiway Type	Water Runway	Not Applicable	None	\$0
Instrument Approach	Visual	Visual	None	\$0
Visual Aids	None	Wind Cone	Install Wind Cone	\$3,000**
Runway Lighting/Reflectors	Water Runway	Maintain Existing	None	\$0
Weather Reporting Facilities	None	None	None	\$0
LANDSIDE FACILITIES				
Terminal with Public Restroom	None	None	None	\$0
Hangar Storage	None	None	None	\$0
Apron Spaces	None	2 Spaces	Add 2 Spaces	\$7,800**
Auto Parking	50 Spaces	Parking Spaces	Add 10 Spaces	\$22,000**
SERVICES				
Phone	None	Yes	Provide Phone	\$1,000**
Restroom	None	Yes	Provide Restroom	\$10,000**
FBO	None	None	None	\$0
Maintenance Facilities	None	None	None	\$0
Fuel	None	None	None	\$0
Ground Transportation	None	None	None	\$0
PAVEMENT MAINTENANCE, PLANNING/ENVIRONMENTAL AND MISCELLANEOUS				
Pavement Maintenance				\$0
Master Plan/ALP/Environmental				\$20,000**
Snow Removal Equipment				\$0
Visual Aids/NAVAIDS/Approach				\$0
Other CIP Projects				\$0
TOTAL				\$63,800
<i>*Airport Capital Improvement Plan (CIP) Project **Idaho Airport System Plan (IASP) Project</i>				

[Source: Idaho Airport System Plan—Brooks Seaplane Base (2009)]

APPENDIX G

Example of Seaplane Base Data Collected at Tavares, Florida

SEAPLANE BASE & MARINA

MONTHLY BUSINESS REPORT

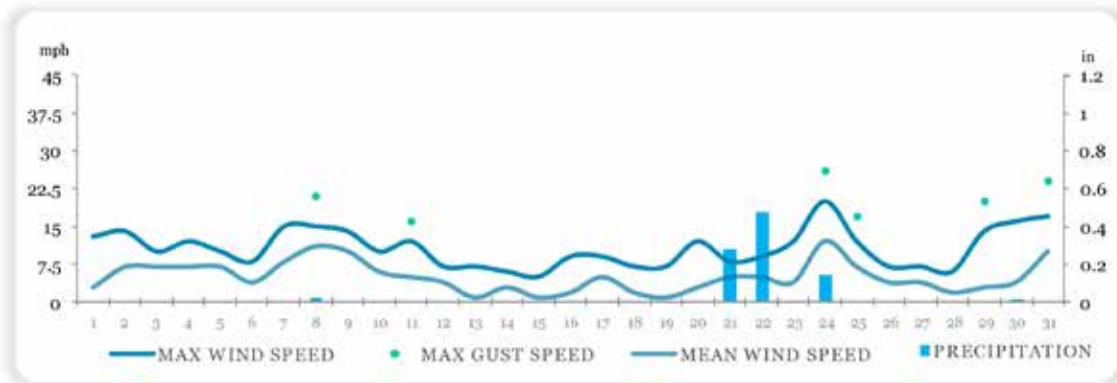
DECEMBER 2014



SUMMARY

DECEMBER 2014 EXPERIENCED COOL WEATHER WITH 4 RAINY DAYS, A TOTAL PRECIPITATION OF 1.99 INCHES. ONE SPECIAL EVENT WAS HELD AT WOOTON PARK: CHRISTMAS CELEBRATION. THE SEAPLANE BASE CELEBRATES ITS 10,000TH SEAPLANE VISIT TO DATE.

WEATHER



COMPARISON TO FY 2014 DECEMBER

- ▼ 6% SEAPLANE VISITS
- ▲ 36% PROP SHOP NET REVENUE
- ▲ 100% BOAT SLIP RENTALS FILLED
- ▼ 11% FUEL SALES (\$)
- ▲ 9% FUEL SALES (GAL)

SEAPLANES

SEAPLANES

223 VISITS

13 LESS THAN LAST YEAR DECEMBER

FY 2015 SEAPLANES

644

OCTOBER 2014 TO SEPTEMBER 2015

SEAPLANE VISITS



SEAPLANE VISITS TO DATE

10,165

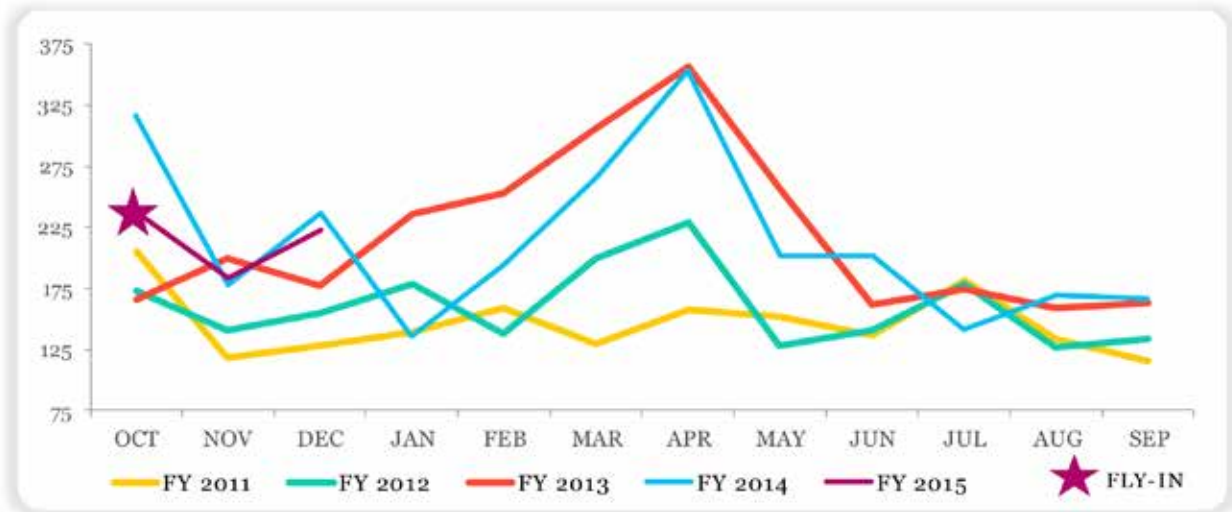
APRIL 2010 TO DECEMBER 2014

FY 2014 (2,559) FY 2013 (2,605) FY 2012 (1,917)
 FY 2011 (1,750) FY 2010 (690)

COMPARISON TO FY 2014 DECEMBER

▼ **6%** SEAPLANE VISITS

SEAPLANE TRAFFIC



PROP SHOP SALES

NET REVENUE

\$799

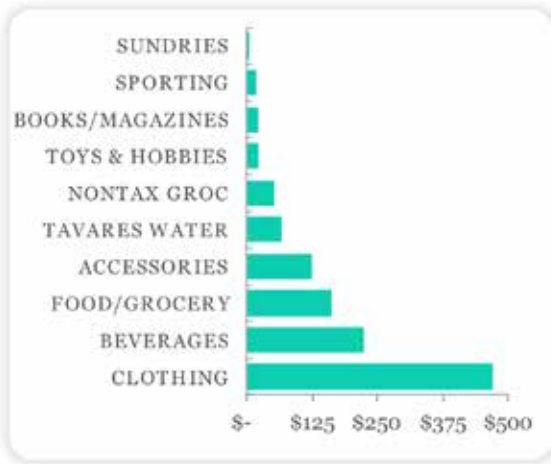
\$284 MORE THAN LAST YEAR DECEMBER

FY 2015 NET REVENUE

\$3,637

OCTOBER 2014 TO SEPTEMBER 2015

SALES BY CATEGORY



PAVILION RESERVATIONS

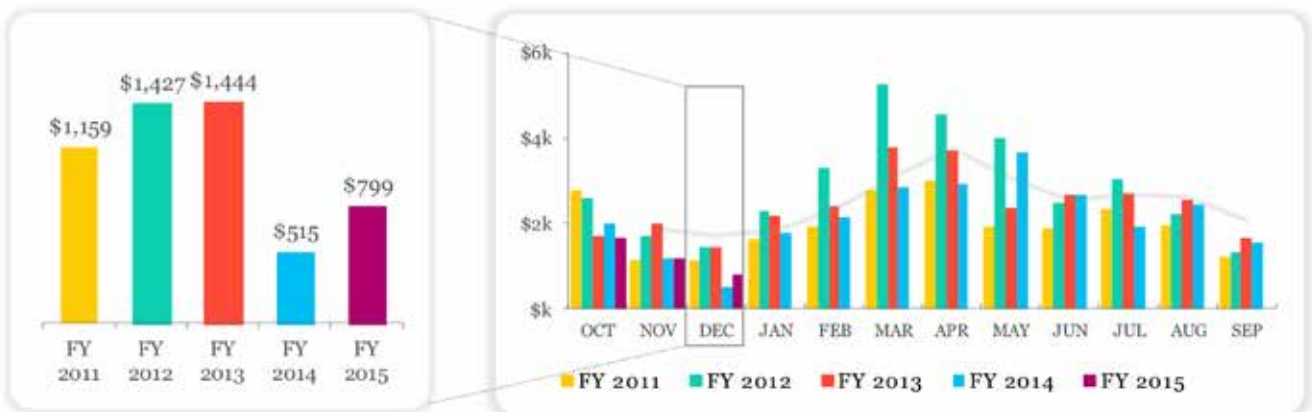
3 ► **\$190**

\$160 MORE THAN LAST YEAR DECEMBER

TOP SELLING ITEM BY CATEGORY

- ACCESSORY: TAVARES DECAL (4)
- BEVERAGE: MOUNTAIN DEW (26)
- CLOTHING: CITY LOGO ROYAL BLUE T-SHIRT (9)
- FOOD/GROCERY ITEM: CHEETOS (17)
- TOYS/HOBBIES: SEAPLANE TOY (6)

NET REVENUE TREND



COMPARISON TO FY 2014 DECEMBER

▲ 36% PROP SHOP NET REVENUE

FUEL SALES

TOTAL FUEL SALES

\$12,325

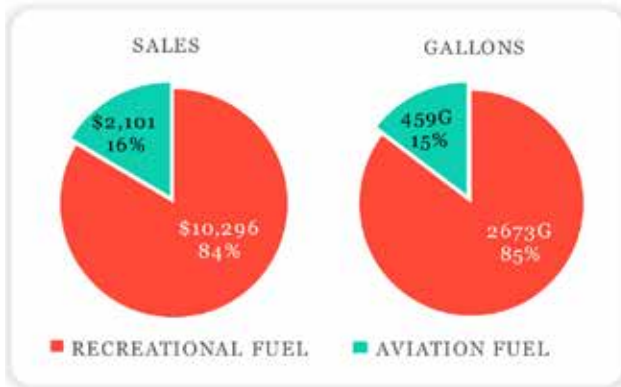
\$1,405 LESS THAN LAST YEAR DECEMBER

FY 2015 FUEL SALES

\$48,307

OCTOBER 2014 TO SEPTEMBER 2015

SALES BY FUEL TYPE



RECREATION GALLONS SOLD

2,673

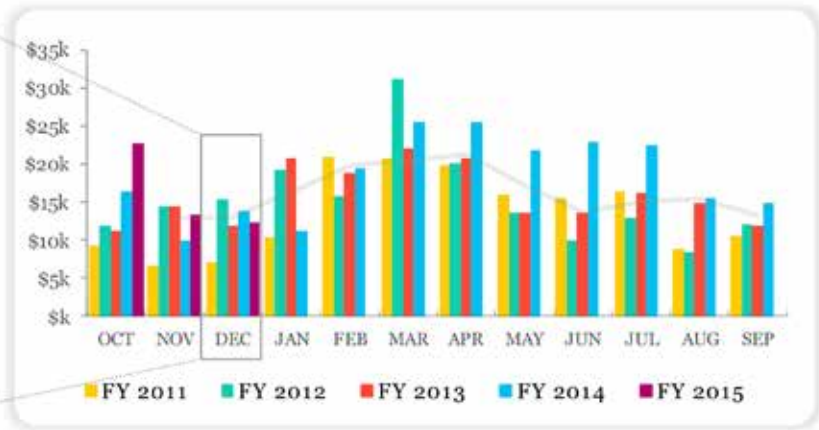
886 MORE THAN LAST YEAR DECEMBER (▲33%)

AVIATION GALLONS SOLD

459

610 LESS THAN LAST YEAR DECEMBER (▼133%)

FUEL SALES(\$) TREND



COMPARISON TO FY 2014 DECEMBER

▼ **11%** FUEL SALES (\$)

▲ **9%** FUEL SALES (GAL)

SPLASH PARK *Closed For The Season*

TOTAL ATTENDANCE FOR 2014

23,443

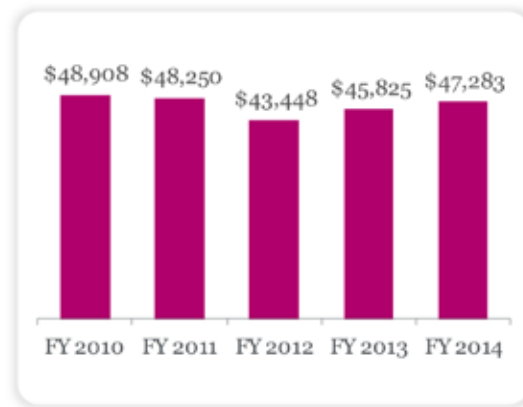
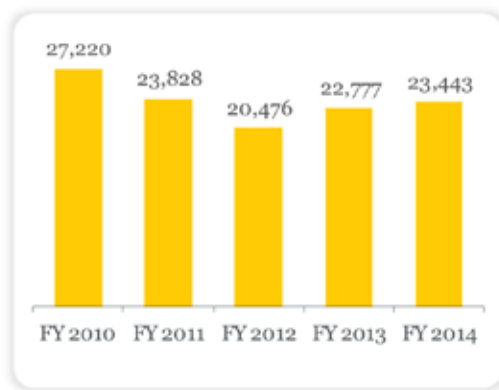
666 MORE THAN LAST YEAR

TOTAL REVENUE FOR 2014

\$47,283

\$1,458 LESS THAN LAST YEAR

ATTENDANCE & REVENUE TRENDS



ATTENDANCE TO DATE

117,744

FY 2014 (23,443)
 FY 2013 (22,777) FY 2012 (20,476)
 FY 2011 (23,828) FY 2010 (27,220)

REVENUE TO DATE

\$233,713

FY 2014 (\$47,283)
 FY 2013 (\$45,825) FY 2012 (\$43,448)
 FY 2011 (\$48,250) FY 2010 (\$48,908)

COMPARISON TO FY 2013

- ▲ **3%** ATTENDANCE
- ▲ **3%** REVENUE

DECEMBER 2014

(Source: Economic Development Manager, Tavares, Florida. Used with permission.)

Abbreviations used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI-NA	Airports Council International-North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

TRANSPORTATION RESEARCH BOARD

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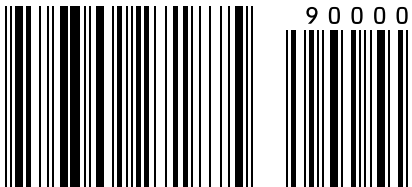
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