



2017

Funding Industrial Aviation

Kim Kenville
kimberly.kenville@und.edu

James F. Smith

Follow this and additional works at: <https://commons.und.edu/avi-fac>

Recommended Citation

Kim Kenville and James F. Smith. "Funding Industrial Aviation" (2017). *Aviation Faculty Publications*. 58.
<https://commons.und.edu/avi-fac/58>

This Book Chapter is brought to you for free and open access by the Department of Aviation at UND Scholarly Commons. It has been accepted for inclusion in Aviation Faculty Publications by an authorized administrator of UND Scholarly Commons. For more information, please contact und.common@library.und.edu.

This PDF is available at <http://nap.edu/24838>

SHARE    



Funding Industrial Aviation (2017)

DETAILS

50 pages | 8.5 x 11 | PAPERBACK
ISBN 978-0-309-46321-8 | DOI 10.17226/24838

CONTRIBUTORS

Kimberly A. Kenville and James F. Smith; Airport Cooperative Research Program; Airport Cooperative Research Program Synthesis Program; Synthesis Program; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine

SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine 2017. *Funding Industrial Aviation*. Washington, DC: The National Academies Press.
<https://doi.org/10.17226/24838>.

GET THIS BOOK

FIND RELATED TITLES

Visit the National Academies Press at NAP.edu and login or register to get:

- Access to free PDF downloads of thousands of scientific reports
- 10% off the price of print titles
- Email or social media notifications of new titles related to your interests
- Special offers and discounts



Distribution, posting, or copying of this PDF is strictly prohibited without written permission of the National Academies Press. (Request Permission) Unless otherwise indicated, all materials in this PDF are copyrighted by the National Academy of Sciences.

Copyright © National Academy of Sciences. All rights reserved.

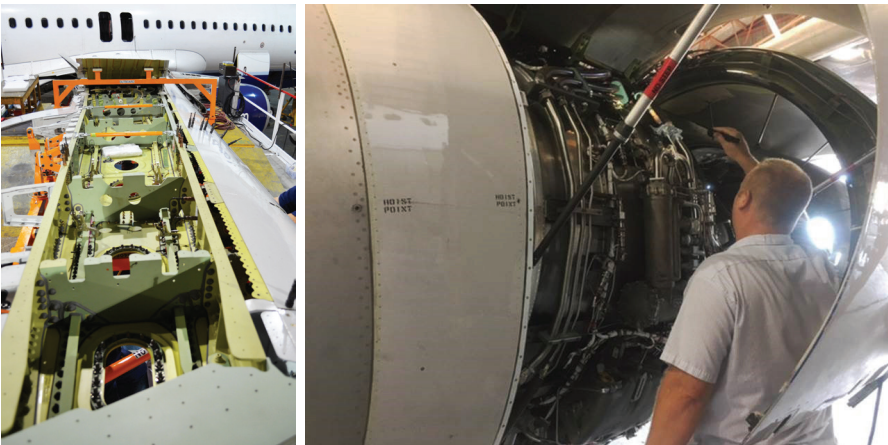
ACRP

SYNTHESIS 79

AIRPORT
COOPERATIVE
RESEARCH
PROGRAM

Funding Industrial Aviation

Sponsored by
the Federal
Aviation Administration



A Synthesis of Airport Practice

 TRANSPORTATION RESEARCH BOARD

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

ACRP OVERSIGHT COMMITTEE***CHAIR**

Kitty Freidheim
Freidheim Consulting

VICE CHAIR

Kelly Johnson
Northwest Arkansas Regional Airport Authority

MEMBERS

Gloria G. Bender
TransSolutions
Thella F. Bowens
San Diego County Regional Airport Authority
Benito de Leon
Federal Aviation Administration
Deborah Flint
Los Angeles World Airports
Rhonda Hamm-Niebrugge
Lambert-St. Louis International Airport
Margaret McKeough
Metropolitan Washington Airports Authority
Scott McMahon
Morristown Municipal Airport
Frank Miller
Hollywood Burbank Airport
Bob Montgomery
Southwest Airlines
Eric Potts
Freese and Nichols, Inc.
Megan S. Ryerson
University of Pennsylvania

EX OFFICIO MEMBERS

Sabrina Johnson
U.S. Environmental Protection Agency
Mark Kimberling
National Association of State Aviation Officials
Laura McKee
Airlines for America
Christopher Oswald
Airports Council International—North America
Neil J. Pedersen
Transportation Research Board
Melissa Sabatine
American Association of Airport Executives
T.J. Schulz
Airport Consultants Council

SECRETARY

Christopher J. Hedges
Transportation Research Board

* Membership as of November 2016.

TRANSPORTATION RESEARCH BOARD 2017 EXECUTIVE COMMITTEE***OFFICERS**

CHAIR: **Malcolm Dougherty**, *Director, California Department of Transportation, Sacramento*
VICE CHAIR: **Katherine F. Turnbull**, *Executive Associate Director and Research Scientist, Texas A&M Transportation Institute, College Station*
EXECUTIVE DIRECTOR: **Neil J. Pedersen**, *Transportation Research Board*

MEMBERS

Victoria A. Arroyo, *Executive Director, Georgetown Climate Center; Assistant Dean, Centers and Institutes; and Professor and Director, Environmental Law Program, Georgetown University Law Center, Washington, DC*
Scott E. Bennett, *Director, Arkansas State Highway and Transportation Department, Little Rock*
Jennifer Cohan, *Secretary, Delaware DOT, Dover*
James M. Crites, *Executive Vice President of Operations, Dallas–Fort Worth International Airport, TX*
Nathaniel P. Ford, Sr., *Executive Director—CEO, Jacksonville Transportation Authority, Jacksonville, FL*
A. Stewart Fotheringham, *Professor, School of Geographical Sciences and Urban Planning, Arizona State University, Tempe*
John S. Halikowski, *Director, Arizona DOT, Phoenix*
Susan Hanson, *Distinguished University Professor Emerita, Graduate School of Geography, Clark University, Worcester, MA*
Steve Heminger, *Executive Director, Metropolitan Transportation Commission, Oakland, CA*
Chris T. Hendrickson, *Hammerslag Professor of Engineering, Carnegie Mellon University, Pittsburgh, PA*
Jeffrey D. Holt, *Managing Director, Power, Energy, and Infrastructure Group, BMO Capital Markets Corporation, New York*
S. Jack Hu, *Vice President for Research and J. Reid and Polly Anderson Professor of Manufacturing, University of Michigan, Ann Arbor*
Roger B. Huff, *President, HGLC, LLC, Farmington Hills, MI*
Geraldine Knatz, *Professor, Sol Price School of Public Policy, Viterbi School of Engineering, University of Southern California, Los Angeles*
Melinda McGrath, *Executive Director, Mississippi DOT, Jackson*
Patrick K. McKenna, *Director, Missouri DOT, Jefferson City*
James P. Redeker, *Commissioner, Connecticut DOT, Newington*
Mark L. Rosenberg, *Executive Director, The Task Force for Global Health, Inc., Decatur, GA*
Daniel Sperling, *Professor of Civil Engineering and Environmental Science and Policy; Director, Institute of Transportation Studies, University of California, Davis*
Gary C. Thomas, *President and Executive Director, Dallas Area Rapid Transit, Dallas, TX*
Pat Thomas, *Senior Vice President of State Government Affairs, United Parcel Service, Washington, DC*
James M. Tien, *Distinguished Professor and Dean Emeritus, College of Engineering, University of Miami, Coral Gables, FL*
Dean H. Wise, *Vice President of Network Strategy, Burlington Northern Santa Fe Railway, Fort Worth, TX*
Charles A. Zelle, *Commissioner, Minnesota DOT, Saint Paul*

EX OFFICIO MEMBERS

Alberto Ayala, *Deputy Executive Officer, California Air Resources Board, Sacramento*
Mary R. Brooks, *Professor Emerita, Dalhousie University, Halifax, Nova Scotia, Canada, and Chair, TRB Marine Board*
Jack Danielson, *Executive Director, National Highway Traffic Safety Administration, U.S. DOT*
Audrey Farley, *Executive Director, Office of the Assistant Secretary for Research and Technology, U.S. DOT*
LeRoy Gishi, *Chief, Division of Transportation, Bureau of Indian Affairs, U.S. Department of the Interior, Washington, DC*
John T. Gray II, *Senior Vice President, Policy and Economics, Association of American Railroads, Washington, DC*
Michael P. Huerta, *Administrator, Federal Aviation Administration, U.S. DOT*
Daphne Y. Jefferson, *Deputy Administrator, Federal Motor Carrier Safety Administration, U.S. DOT*
Bevan B. Kirley, *Research Associate, University of North Carolina Highway Safety Research Center, Chapel Hill, and Chair, TRB Young Members Council*
Howard McMillan, *Acting Administrator, Pipeline and Hazardous Materials Safety Administration, U.S. DOT*
Wayne Nastro, *Acting Executive Officer, South Coast Air Quality Management District, Diamond Bar, CA*
Craig A. Rutland, *U.S. Air Force Pavement Engineer, U.S. Air Force Civil Engineer Center, Tyndall Air Force Base, FL*
Reuben Sarkar, *Deputy Assistant Secretary for Transportation, U.S. Department of Energy*
Todd T. Semonite (Lieutenant General, U.S. Army), *Chief of Engineers and Commanding General, U.S. Army Corps of Engineers, Washington, DC*
Karl Simon, *Director, Transportation and Climate Division, U.S. Environmental Protection Agency*
Joel Szabat, *Executive Director, Maritime Administration, U.S. DOT*
Walter C. Waidelich, Jr., *Acting Deputy Administrator, Federal Highway Administration, U.S. DOT*
Patrick T. Warren, *Executive Director, Federal Railroad Administration, U.S. DOT*
Matthew Welbes, *Executive Director, Federal Transit Administration, U.S. DOT*
Richard A. White, *Acting President and CEO, American Public Transportation Association, Washington, DC*
Frederick G. (Bud) Wright, *Executive Director, American Association of State Highway and Transportation Officials, Washington, DC*
Paul F. Zukunft (Admiral, U.S. Coast Guard), *Commandant, U.S. Coast Guard, U.S. Department of Homeland Security*

* Membership as of April 2017.

AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP SYNTHESIS 79

Funding Industrial Aviation

A Synthesis of Airport Practice

CONSULTANTS

Kimberly A. Kenville
University of North Dakota
Grand Forks
and
James F. Smith
Smith-Woolwine, Inc.
Panacea, Florida

SUBSCRIBER CATEGORIES

Aviation • Finance • Policy

Research Sponsored by the Federal Aviation Administration

 **TRANSPORTATION RESEARCH BOARD**

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

2017

AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

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). ACRP carries out applied research on problems that are shared by airport operating agencies and not being adequately addressed by existing federal research programs. ACRP is modeled after the successful National Cooperative Highway Research Program (NCHRP) and Transit Cooperative Research Program (TCRP). ACRP undertakes research and other technical activities in various airport subject areas, including design, construction, legal, maintenance, operations, safety, policy, planning, human resources, and administration. ACRP provides a forum where airport operators can cooperatively address common operational problems.

ACRP was authorized in December 2003 as part of the Vision 100—Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), Airlines for America (A4A), and the Airport Consultants Council (ACC) as vital links to the airport community; (2) TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academy of Sciences formally initiating the program.

ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for ACRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel appointed by TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

Primary emphasis is placed on disseminating ACRP results to the intended users of the research: airport operating agencies, service providers, and academic institutions. ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties; industry associations may arrange for workshops, training aids, field visits, webinars, and other activities to ensure that results are implemented by airport industry practitioners.

ACRP SYNTHESIS 79

Project A11-03, Topic S01-14

ISSN 1935-9187

ISBN 978-0-309-38999-0

Library of Congress Control Number 2017932224

© 2017 National Academy of Sciences. All rights reserved.

COPYRIGHT INFORMATION

Authors herein are responsible for the authenticity of their materials and for obtaining written permissions from publishers or persons who own the copyright to any previously published or copyrighted material used herein.

Cooperative Research Programs (CRP) grants permission to reproduce material in this publication for classroom and not-for-profit purposes. Permission is given with the understanding that none of the material will be used to imply TRB, AASHTO, FAA, FHWA, FMCSA, FRA, FTA, Office of the Assistant Secretary for Research and Technology, PHMSA, or TDC endorsement of a particular product, method, or practice. It is expected that those reproducing the material in this document for educational and not-for-profit uses will give appropriate acknowledgment of the source of any reprinted or reproduced material. For other uses of the material, request permission from CRP.

NOTICE

The report was reviewed by the technical panel and accepted for publication according to procedures established and overseen by the Transportation Research Board and approved by the National Academies of Sciences, Engineering, and Medicine. The opinions and conclusions expressed or implied in this report are those of the researchers who performed the research and are not necessarily those of the Transportation Research Board; the National Academies of Sciences, Engineering, and Medicine; or the program sponsors.

The Transportation Research Board; the National Academies of Sciences, Engineering, and Medicine; and the sponsors of the Airport Cooperative Research Program do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of the report.

Published reports of the

AIRPORT COOPERATIVE RESEARCH PROGRAM

are available from:

Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

and can be ordered through the Internet by going to
<http://www.national-academies.org>
and then searching for TRB

Printed in the United States of America

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, non-governmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. C. D. Mote, Jr., is president.

The **National Academy of Medicine** (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the **National Academies of Sciences, Engineering, and Medicine** to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at www.national-academies.org.

The **Transportation Research Board** is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to increase the benefits that transportation contributes to society by providing leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied committees, task forces, and panels annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

Learn more about the Transportation Research Board at www.TRB.org.

TOPIC PANEL S01-14

RICHARD S. CRIDER, *Port of San Antonio, San Antonio, Texas*

MARK EARLE, *Colorado Springs, Colorado*

GARY MOLYNEAUX, *King County International Airport/Boeing Field, Seattle, Washington*

CARL E. REMUS, *Tulsa Airport Authority, Tulsa, Oklahoma*

LIYING GU, *Airports Council International–North America (Liaison)*

SYNTHESIS STUDIES STAFF

STEPHEN R. GODWIN, *Director for Studies and Special Programs*

JON M. WILLIAMS, *Program Director, IDEA and Synthesis Studies*

MARIELA GARCIA-COLBERG, *Senior Program Officer*

JO ALLEN GAUSE, *Senior Program Officer*

GAIL R. STABA, *Senior Program Officer*

TANYA M. ZWAHLEN, *Consultant*

DON TIPPMAN, *Senior Editor*

CHERYL KEITH, *Senior Program Assistant*

DEMISHA WILLIAMS, *Senior Program Assistant*

DEBBIE IRVIN, *Program Associate*

COOPERATIVE RESEARCH PROGRAMS STAFF

CHRISTOPHER J. HEDGES, *Director, Cooperative Research Programs*

LORI L. SUNDSTROM, *Deputy Director, Cooperative Research Programs*

MICHAEL R. SALAMONE, *Senior Program Officer*

KAREN NEELEY, *Program Associate*

EILEEN P. DELANEY, *Director of Publications*

ACRP COMMITTEE FOR PROJECT 11-03

CHAIR

JOSHUA D. ABRAMSON, *Easterwood Airport, College Station, Texas*

MEMBERS

DEBBIE K. ALKE, *Montana Department of Transportation, Helena, Montana*

GLORIA G. BENDER, *TransSolutions, Fort Worth, Texas*

DAVID A. BYERS, *Quadrex Aviation, LLC, Melbourne, Florida*

DAVID N. EDWARDS, JR., *Greenville–Spartanburg Airport District, Greer, South Carolina*

BRENDA L. ENOS, *Massachusetts Port Authority, East Boston, MA*

LINDA HOWARD, *Independent Aviation Consultant, Bastrop, Texas*

FAA LIAISON

PATRICK W. MAGNOTTA

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

ADAM WILLIAMS

AIRPORTS CONSULTANTS COUNCIL

MATTHEW J. GRIFFIN

AIRPORTS COUNCIL INTERNATIONAL–NORTH AMERICA

LIYING GU

TRB LIAISON

CHRISTINE GERENCHER

Cover figure: (left) Winglet installation at HAECO at Lake City Gateway Airport (HAECO photo); (right) Engine inspection at HAECO at Lake City Gateway Airport (HAECO photo).

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*

The focus of this report is on how airports fund the infrastructure to support industrial aviation development. For this report, industrial aviation development includes but is not limited to—

- Aircraft maintenance, repair, and overhaul (MRO)
- Specialized aviation services such as paint and interior completion (single service operators, SSOs)
- Aircraft manufacturing and assembly
- Aircraft fabrication and development
- Aviation warehousing
- Cold ports
- Spaceports
- Unmanned aerial systems (UAS) platform development

Information used in this study was acquired through literature review, survey results from 53 airports, and interviews of a subset of experts on funding mechanisms for industrial aviation.

Dr. Kim Kenville, Kim Kenville Consulting, and Dr. James F. Smith, Smith-Woolwine, Inc., synthesized the information and wrote the report. The members of the topic panel are acknowledged on page iv. 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.

CONTENTS

1	SUMMARY
3	CHAPTER ONE INTRODUCTION
	Background, 3
	Framework, Definitions, and Funding Sources, 4
	Scope of This Study, 7
	Study Methodology, 7
10	CHAPTER TWO SURVEY RESULTS
	What Is the Governance Form of Your Airport?, 10
	Types of Industrial Development, 10
16	CHAPTER THREE DISCUSSION OF SURVEY RESULTS AND FLORIDA CASE EXAMPLE
	Introduction, 16
	Rates and Charges, 17
	Industrial Aviation in Florida, 17
	Industrial Aviation at 10 Florida Airports, 19
	Development Funding in Florida and Other States, 22
	Summary, 31
32	CHAPTER FOUR FINDINGS
	Lessons Learned, 32
	Evaluating Alternative Funding Methods and Project Success, 33
34	CHAPTER FIVE CONCLUSIONS
	Road Map to Successful Aviation Industrial Development, 34
	Further Research, 34
36	ACRONYMS
38	GLOSSARY
39	REFERENCES
40	APPENDIX A PARTICIPATING AIRPORTS
	APPENDIX B SURVEY RESULTS (available at www.trb.org by searching for “ACRP Synthesis 97”)

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.

FUNDING INDUSTRIAL AVIATION

SUMMARY The focus of this report is how airports fund the infrastructure to support industrial aviation development. For this report, industrial aviation development includes but is not limited to the following:

- Aircraft maintenance, repair, and overhaul (MRO) services
- Specialized aviation services, such as painting and interior completion, by single service operators (SSOs)
- Aircraft manufacturing and assembly
- Aircraft fabrication and development
- Aviation warehousing
- Cold ports
- Spaceports
- Unmanned aerial system (UAS) platform development.

Sixty-four airports were identified as possibly having industrial aviation facilities and were surveyed about the nature of the development, types of infrastructure required to support the development, nature and effectiveness of the funding mechanisms used, and lessons learned. Fifty-three airports (83%) completed the survey. In addition, intensive case examples were done with 10 Florida airports and the Florida Department of Transportation's Aviation and Spaceports Office.

The literature review, survey results from 53 airports, and interviews of a subset of experts on funding mechanisms for industrial aviation infrastructure were analyzed. The results suggest the following strategies for success in funding industrial aviation:

1. Industrial aviation infrastructure development uses a diverse set of funding mechanisms and always benefits from a team approach. Funding sources are frequently combined. Airports that have funded industrial aviation infrastructure projects have used the following tools for collaborative success:
 - Development of project goals and objectives
 - Documentation of current business and aviation activities and forecasts of benefits from additional industrial aviation infrastructure
 - An updated airport layout plan (ALP) that reflects desired development, including infrastructure needs
 - Development of an all-star team from each funding entity, as combining funding methods is a complex process that creates multiple opportunities for challenges and successes
 - Well-established working relationships with state aviation, economic development, and FAA staff
 - Effective working relationships between the airport and jurisdictional partners to ensure mutual understanding of all the options, responsibilities, challenges, and opportunities of funding mechanisms and development schemes
 - Understanding of the needs of secured funding partners

- Long-term marketing and communication plans for the duration of the project
 - Marketing, marketing, and marketing! This includes outreach to current airport users, potential tenants, and constituents in the local community
 - Flexibility and patience
 - Detailed recordkeeping.
2. Airports that are undertaking industrial aviation development can find many diverse funding sources and strategies through outreach to other airports in similar situations and with similar goals. Additional research describing specific industrial aviation developments and their funding mechanisms can provide a road map with indicators of duration, hurdles, and multiple issues that need to be factored into funding for industrial aviation infrastructure.

Based on the findings in this synthesis, the following questions are suggested for further research:

- What variables and metrics can be used to define industrial aviation development at airports?
- What are the metrics that can allow industrial aviation uses to access FAA funding for infrastructure development?
- How have successful industrial aviation airports worked with the FAA to get funding for infrastructure for potential industrial aviation tenants?
- How do airport-owning localities (sponsors) structure industrial development incentives in accordance with FAA requirements?
- How might an airport's role in industrial aviation development evolve during the course of the project, from conception to completion?
- What roles do marketing and property management play in project selection and funding?
- Which methods for determining fair market value and fair market rent are suited to industrial aviation airports?
- What are some models of effective goal statements that can be used in master plans and airport layout plans to facilitate industrial aviation development and infrastructure funding?
- What is an effective model for a land management role for the airport instead of the historical facilities development and management role?
- Which methods and criteria can be used to quantify public or common use infrastructure investment associated with industrial aviation development?
- What are the primary issues in funding non-aeronautical development at airports?
- What, if any, are the benefits of using specialized financial consultants for industrial aviation development at airports?

CHAPTER ONE

INTRODUCTION

BACKGROUND

From the beginning of the Airport Cooperative Research Program, innovative methods for funding airport development have been a primary interest. In fact, airport development funding methods were defined and analyzed in the first ACRP synthesis report, *ACRP Synthesis 1: Innovative Finance and Alternative Sources of Revenue for Airports* (Nichol 2007). The report’s findings are summarized graphically in Figure 1.

STRATEGIC TARGETING OF AIRPORT FUNDING SOURCES

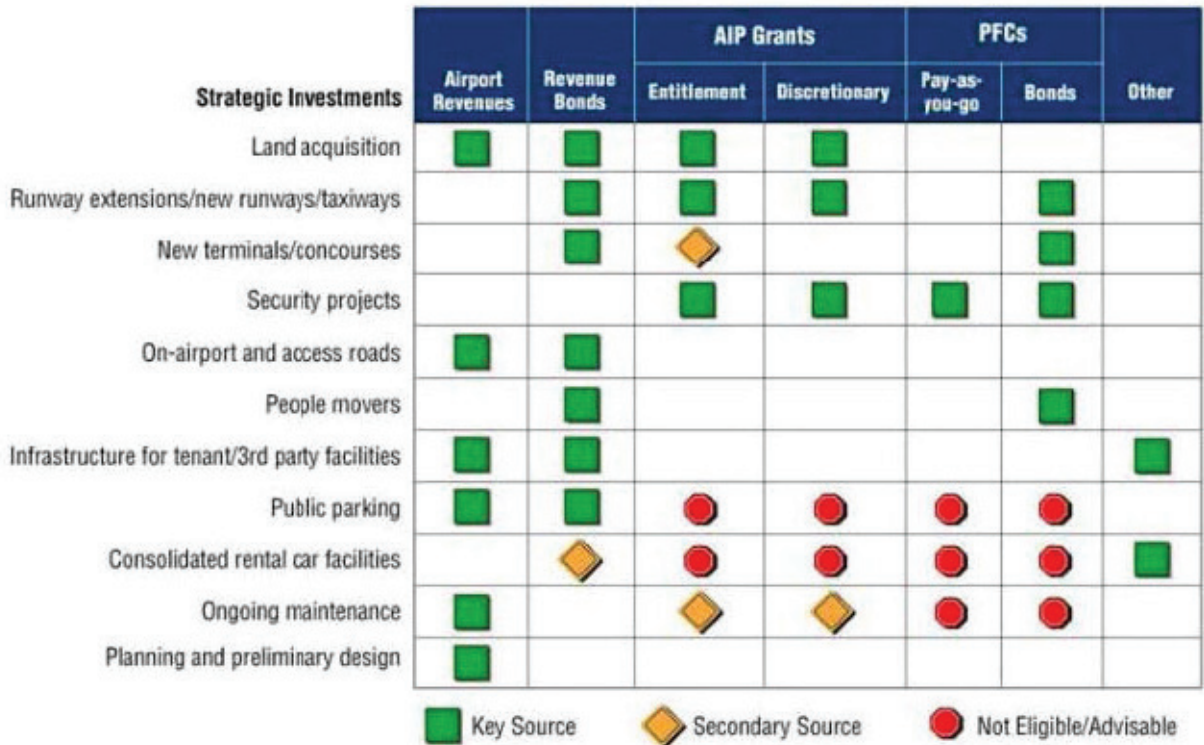


FIGURE 1 Airport funding sources (Nichol 2007).

Aerospace—civilian and military—accounts for slightly more than 5% of the U.S. national economy (FAA 2014a). Civil aviation has a very large impact on the overall U.S. economy. In 2012 the U.S. civil aviation industry supported 11.8 million jobs, accounted for \$1.5 trillion in total economic activity, and contributed 5.4% to the U.S. gross domestic product (FAA 2014a). Typically, these contributions come from airline operations, airport operations, aircraft manufacturing, and general aviation operations, but they also include aspects of industrial aviation such as maintenance and repair, specialized aviation services, and other activities that are the focus of this study. On the basis of 2012 FAA data, industrial aviation activities directly accounted for at least \$90.2 billion in output and 1.4 million jobs (FAA 2014a). In other words, industrial aviation accounts for at least 12% of the total civil aviation contribution to the U.S. economy.

Although industrial aviation makes significant contributions in terms of employment, support, and sustainability to the domestic aviation system, its importance is often overlooked or undervalued. Industrial aviation activities are often critical

to local economies and very important to the National Airspace System (NAS), but funding the infrastructure to support industrial aviation development at airports is complicated. Some airports and their agency partners have developed alternative funding strategies when projects have been found to be ineligible for FAA funding.

The importance of industrial aviation activities to the NAS is obscured by their absence as one of the criteria for defining the categories in the National Plan of Integrated Airport Systems (NPIAS). Current criteria include number of based aircraft, number of annual operations, number of enplaned passengers, and proximity to other airports in the NPIAS. The criteria also permit the inclusion of airports that meet special needs, such as access to remote populations. Industrial aviation development typically does meet these criteria.

The American Association of Airport Executives (AAAE) Industrial Aviation and Military Relations Committee makes the following points regarding a proposed change to the NPIAS criteria and categories. The committee's goal is to recognize the importance of industrial aviation to the overall health and success of the NAS.

Despite the significant role industrial airports play within the complex aviation ecosystem, the metrics applied to characterize and describe airports, and therefore the reports that define the NPIAS and the NAS, fail to quantify the significance of the industrial aeronautical activities based at civil airports.

Industrial airports ultimately strengthen the NAS because its providers of services and suppliers feed and support the end-user airlines and aircraft operators that require airport facilities, and that proximity of the end-users to those providers is significant.

Industrial aviation is ultimately a consumer of airport capacity, so a deeper understanding of the requirements, demand, and forecast of industrial aviation growth is important to the health, stability, and long-term viability of our domestic NAS and systems of airports.

Greater awareness and understanding of the attributes important to the success of industrial aerospace is needed to protect and nurture this important dimension of our domestic economy and aviation industry. (AAAE Industrial Aviation and Military Relations Committee talking points, R. Crider, personal communication, Sept. 21, 2016)

This synthesis focuses on aviation activities, not airport classifications, and does not take a position on the proposed NPIAS change. It uses a definition of industrial aviation activities that includes but is not limited to the following:

- Aircraft maintenance, repair, and overhaul (MRO) services
- Specialized aviation services, such as paint and interior completion, by single service operators (SSOs)
- Aircraft manufacturing and assembly
- Aircraft fabrication and development
- Aviation warehousing
- Cold ports
- Spaceports
- Unmanned aerial system (UAS) platform development.

The objective of this synthesis is to identify and document alternative methods and practices for funding industrial aviation investments that are not eligible for traditional airport funding through Airport Improvement Program (AIP) grants and passenger facility charges (PFCs). This study also provides lessons learned and effective practices from airports that have been successful in funding industrial aviation activities. The audience for this synthesis includes airport operators, government entities, economic development agencies, commercial developers, and other industry partners. The synthesis defines funding types found at airports with industrial development, analyzes the survey results, describes an important case example, and makes suggestions for airports that are just beginning their development.

FRAMEWORK, DEFINITIONS, AND FUNDING SOURCES

For every funding source considered by every airport in this study, the airports reported that they absolutely complied with all requirements for each funding program. Each funding source, whether government or commercial, has compliance standards. The airports' absolute commitment to compliance can be seen in the airport statements in chapter two and in the aggregated survey data in web-only Appendix B.

The survey listed potential funding sources in alphabetical order; the following are brief definitions or descriptions of these sources. Several sources were not listed in the original survey but were introduced by one or more airports under "Other (please specify)."

Agricultural Lease: The agriculture sector relies heavily on leases for land and equipment to meet the needs of farmers. With absentee ownership of farmland growing in the United States, farmers and ranchers lease many of the acres they farm and graze today. Both private parties and government entities may enter into leasing arrangements, so these contracts vary substantially in complexity and scope. The most common form of lease in agriculture is a land lease; the cash rent lease and the crop-share lease are the two most frequently used (<http://nationalaglawcenter.org/overview/agleases>).

Airport Capital Funds/Equity: Collected rentals, fees, and charges for the lease and use of facilities to passenger and cargo airlines, concessionaires, and other entities that provide airport support services. Total revenues less expenses equal net operating income (Nichol 2007).

Airport Improvement Program: The FAA, through the Aviation Trust Fund, provides grants to public agencies (and in some cases to private owners and entities) to plan and develop public use airports that are included in the National Plan of Integrated Airport Systems (NPIAS) (<http://www.faa.gov/airports/aip/overview>).

Airport Improvement Trust: A public trust with a sole beneficiary. For example, the purpose of the Tulsa Airport Improvement Trust (TAIT) is “to operate, maintain, construct, improve and/or lease airport facilities serving the City and incur indebtedness as may be necessary to provide such facilities. Any indebtedness is payable solely from revenues of TAIT, and has no authority to level taxes” (<http://www.tulsaairports.com/about-tait/formation-of-airport-authority>).

Airport Privatization: A broad range of activities that entail varying levels of private involvement. The Government Accounting Office (GAO) stated that “the privatization spectrum can include contracting out, public-private partnerships, vouchers, and franchising as well as the actual sale” (Nichol 2007). The FAA’s Airport Privatization Pilot Program (APPP) (http://www.faa.gov/airports/airport_compliance/privatization) allowed five airports to be transferred from public ownership to private ownership; one of these airports, Airglades International Airport, is included in this study.

Airport Revenue Bond: General airport revenue bonds (ARBs) are the most commonly issued bonds for airport infrastructure. Their credit rating is based on revenues generated at the airport from airline rates and charges, parking, rental car operations, terminal concessions and other leases, interest, and any other revenues of the airport (Nichol 2007). The underlying economic status and outlook of the entire community affects the credit rating of an ARB.

City (or County) Economic Development Income Tax (CEDIT): A local income tax that can be levied to support approved capital improvements to promote economic development in the locality (http://iga.in.gov/static-documents/8/2/c/0/82c08d23/TITLE6_AR3.5_ch7.pdf).

Commercial Paper: An unsecured, short-term debt instrument issued by a corporation, typically to finance accounts receivable or inventories or to meet short-term liabilities. Maturities on commercial paper are rarely longer than 270 days. Commercial paper is usually issued at a discount from face value and reflects prevailing market interest rates (<http://www.investopedia.com/terms/c/commercialpaper.asp>).

Direct Private Investment: Direct investment refers to an investment in a business enterprise designed to acquire an interest in the enterprise. Direct investment provides capital funding in exchange for an equity interest (<http://www.investopedia.com/terms/d/direct-investment.asp>).

Economic Development Bonds: Through an economic development bond program, a finance authority (such as the Iowa Finance Authority) issues tax-exempt bonds on behalf of private entities or organizations for eligible purposes. The responsibility for repayment rests with the applicant, who must find an entity to purchase the bonds (adapted definition: <http://www.iowafinanceauthority.gov>).

Federal Grants and Loans, EDA: The U.S. Economic Development Administration (EDA) has a number of planning grant programs that can help airports or partnerships involving airports. EDA’s Public Works program helps distressed communities revitalize, expand, and upgrade their physical infrastructure (<https://www.eda.gov/pdf/about/Public-Works-Program-1-Pager.pdf>).

Federal Grants and Loans, USDA: The U.S. Department of Agriculture offers the following kinds of grants and loans: farm loans, housing assistance, rural development loan and grant assistance, support for beginning farmers and ranchers, crop and livestock insurance, federal state marketing improvement programs, a specialty crop block grant pro-

gram, the farmers market promotion program, and an organic cost-share program (http://www.usda.gov/wps/portal/usda/usdahome?navid=GRANTS_LOANS).

Foreign Trade Zone (FTZ): An FTZ does not provide direct funding for industrial aviation development; rather, an airport or locality might establish an FTZ as an incentive for development at the airport (19 U.S.C. 81a-81u).

General Obligation Bonds: General obligation bonds can be issued to finance airport capital improvements, backed by general tax revenues of the city, county, or state that owns and operates the airport (Nichol 2007).

Ground Lease: A ground lease is an agreement in which a tenant is permitted to develop a piece of property during the lease period, after which the land and all improvements are turned over to the property owner. A ground lease indicates that the improvements are owned by the property owner unless an exception is created; all taxes incurred during the lease period are paid by the tenant. Because a ground lease allows the landlord to assume all improvements once the lease term expires, the landlord can sell the property at a higher rate (<http://www.investopedia.com/terms/g/ground-lease.asp>).

Industrial Development Bonds: These are private activity bonds issued by state and local governments on behalf of nongovernment corporations and businesses (http://www.msrb.org/Glossary/Definition/INDUSTRIAL-DEVELOPMENT-BOND-_IDB_.aspx).

Infrastructure Bank: An infrastructure bank is typically a state agency that provides loans for infrastructure projects, with repayments committed to additional infrastructure projects (<http://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2011/12/06/infrastructure-banks-explained-a-common-state-tool-gets-mixed-marks>).

Military Airport Program (MAP): MAP is a funding program to help former military airports transition to civilian airport uses. An airport must achieve designation in the NPIAS before it can apply for MAP. Funding is for 5 years and can be renewed (https://www.faa.gov/airports/aip/military_airport_program).

Passenger Facility Charge: The Passenger Facility Charge (PFC) Program allows the collection of PFC fees up to \$4.50 for every enplaned passenger at commercial airports controlled by public agencies. PFCs are capped at \$4.50 per flight segment with a maximum of two PFCs charged on a one-way trip or four PFCs on a round trip, for a total of \$18. Airports use these fees to fund FAA-approved projects that enhance safety, security, or capacity; reduce noise; or increase air carrier competition (<http://www.faa.gov/airports/pfc/>).

Public-Private Partnership: A public-private partnership (PPP, 3P, or P3) is a service provided by government and one or more private sector companies. A PPP involves a contract between a public sector authority and a private party in which the private party provides a public service or project and assumes substantial financial, technical, and operational risk in the project (https://en.wikipedia.org/wiki/Public%E2%80%93private_partnership).

Redevelopment Bonds: A qualified redevelopment bond is a tax-exempt private activity bond issue of which 95% or more of the net proceeds are used to finance certain specified real property acquisition and redevelopment in blighted areas (<http://definitions.uslegal.com/q/qualified-redevelopment-bond>).

Revolving Loan/Investment Funds: The U.S. Economic Development Administration's Revolving Loan Fund (RLF) Program supplies small businesses and entrepreneurs with gap financing to start or expand their business. The EDA's regional offices award competitive grants to units of local government, state governments, institutions of higher education, public or private nonprofit organizations, EDA-approved economic development district organizations, and Indian tribes. Each EDA-funded RLF sets its own underwriting and risk management policies, and determines interest rates, loan terms, and maximum assistance levels in accordance with its own policies and the unique characteristics of each loan. Businesses should contact EDA-funded RLFs directly to inquire about details (<https://business.usa.gov/program/revolving-loan-fund-program>).

Special Facility Bonds: These bonds are issued by a single tenant and used to finance unit passenger terminals or portions of terminals, hangar and maintenance facilities, cargo buildings, and ground equipment support facilities for the exclusive use of an airline (Nichol 2007).

Special Tax Districts: In the United States, special tax districts are independent, special-purpose government units that exist separately from, and with substantial administrative and fiscal independence from, general purpose local governments

such as county, municipal, and township governments. They are formed to perform a single function or a set of related functions ([https://en.wikipedia.org/wiki/Special_district_\(United_States\)](https://en.wikipedia.org/wiki/Special_district_(United_States))).

Tax Increment Financing: Tax increment financing is a financing procedure used by many local governments to pay for redevelopment and improvement of existing structures. The cost of the improvements is assessed to future tax revenues by each taxing unit that levies taxes against the property. The taxing unit at the local level is responsible for determining how much of the increase in property tax resulting from the improvements will be used to repay the construction costs. The property that is seeking to use TIF must be located within the city's jurisdiction. (http://www.investorwords.com/8715/tax_increment_financing.html)

Through-the-Fence (TTF) Agreements: TTF operations encompass the ground movement of aircraft back and forth between land adjacent to but not part of airport property and the airport's airside infrastructure (e.g., runways and taxiways). TTF operations may include residential, commercial aeronautical, noncommercial aeronautical, non-aeronautical, and government/military activities. Raising revenues for the airport was not found to be a significant feature of TTF agreements (Ward et al. 2014).

SCOPE OF THIS STUDY

This synthesis analyzes data from airports that are geographically distributed and that represent a variety of project attributes, including size, population, diversity of funding mechanisms, and aviation industrial mix. The following information is of interest for collection, analysis, and concise reporting:

- Definition of the project.
- Governance framework, original property conveyance, category and size of airport, and mix of aeronautical activities.
- The classification of project land for aeronautical or non-aeronautical purposes, and further designations within the airport master plan, airport layout plan, or other land use plans.
- The catalyst for development; for example, recruitment of a tenant, general economic development, or a request from a third party developer.
- History of project coordination and of the process of working with the FAA and other agencies, including issues and their resolution.
- A discussion of the airport's project investment strategy, partners' interest in terms of investment contribution, how goals and objectives are met, and revenue stream once the project is completed.
- The process, if any, for engaging stakeholders for support of the project, and the outcome of that engagement.
- The initial timeframe for development and how that may have changed over the course of the project.
- The economic impact of the project, including job creation.
- Lessons learned.
- Outstanding issues for further research.

STUDY METHODOLOGY

Data for this study were collected using a literature review, an online survey, and one case example. The data were analyzed using a mix of quantitative (online survey) and qualitative (case example) methods.

Literature Review

The literature review focused on finding reports of industrial aviation development, its funding, and general descriptions of the funding methods. In addition to articles in popular media and trade magazines, many airports that are marketing their facilities for industrial development feature their efforts on their websites. Several airports in the survey have laid out steps an interested party can take to pursue development opportunities at the airport. None of the websites list the funding sources used by the airports for industrial aviation development or infrastructure.

Survey

The survey data were gathered using an online tool provided by the Transportation Research Board. A non-random, purposive sample of 64 airports was selected based on the AAAE Military and Industrial Airport Committee roster, combined with the topic panel's professional knowledge and researchers' awareness of airports that had industrial development in progress or had

completed it. Of the 64 airports invited to participate, 53 responded, for a completion rate of 83%. The participating airports are identified in Appendix A. The online survey questions and survey data are reproduced as Appendix B.

The airports that participated in this study are located all across the lower 48 states (Figure 2). The majority of airports that responded are classified as general aviation (GA), reliever (RL), non-hub primary (NH), or commercial service (CS). A smaller number of small-hub (SH), medium-hub (MH), and large-hub (LH) airports were surveyed. Table 1 illustrates the distribution of airports among the NPIAS categories. The FAA does not have a formal definition for airports that regularly engage in aviation industrial development.

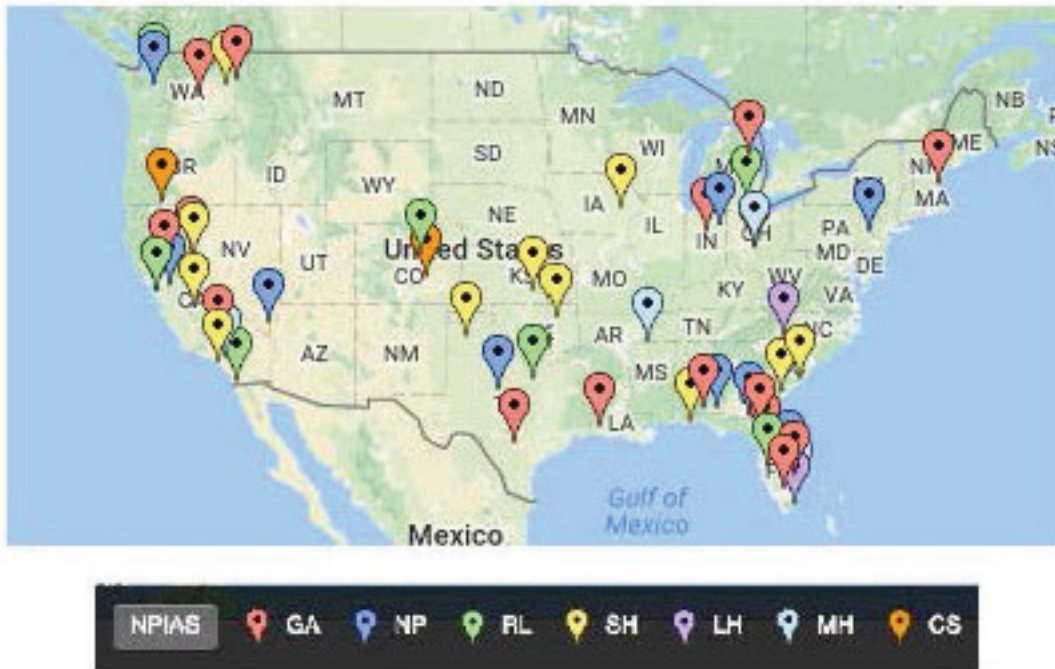


FIGURE 2 Geographic representation of survey respondents (Kenville and Smith 2016 data).

TABLE 1
NPIAS CATEGORIES (2015) OF AIRPORTS PARTICIPATING IN STUDY

Category		Number
General aviation	GA	16
Reliever	RL	7
Commercial service	CS	3
Non-hub primary	NP	9
Small hub	SH	11
Medium hub	MH	5
Large hub	LH	2
Total		53

Source: Kenville and Smith data (2016).

Former military installations converted to civilian airports can be added to the National Plan of Integrated Airport Systems, after which they may apply to be part of the Military Airport Program. Being in NPIAS is an absolute prerequisite for being considered for MAP status. According to the FAA, MAP includes the following:

Through this program, FAA awards grant funds to the civil sponsor of a military airfield for the development of aviation facilities for the public. This program also assists new sponsors in converting former military airfields to public use to add system capacity and reduce congestion at existing airports experiencing significant delays. In addition, the MAP provides financial assistance to the civilian sponsors who are converting, or have already converted, military airfields to civilian or joint military/civilian use.

To aid in this process, MAP grants may be used for projects not generally funded by the AIP [Airport Improvement Program], such as building or rehabilitating surface parking lots, fuel farms, hangars, utility systems, access roads, and cargo buildings. (www.faa.gov/airports/aip/military_airport_program)

Civilian airports that were part of MAP were initially segregated and their history under various iterations of the Base Realignment and Closure Program (BRAC) was specifically queried in the survey. Thirty-two (60%) of the 53 airports included in this survey were former military installations that had been part of the BRAC initiatives before 1987 (27 airports) or of the more recent rounds of closures, from 1988 through 1995 (five airports). The connection to BRAC may explain why these airports have pursued aviation industrial development. Most of these former military airports probably have large amounts of developable land and expansive airfields, so industrial development is a good fit. Local economic development groups were enlisted to help the airfields develop civilian uses and jobs to replace the activities formerly supported by the Department of Defense.

Initial survey data indicated that the BRAC and MAP funding mechanisms were not significant at any of the airports in this study. The survey results from all 53 airports are discussed in chapter two, and the anonymized aggregated raw data are presented in online Appendix B.

Data Analysis and Presentation

Most questions are in “check box” format, but open-ended questions allowed the airports to expand or explain answers not appearing among the check box options. All data gathered are presented in chapter two and Appendix B. As indicated, this analysis of the data is for all 53 responding airports. The 10 Florida airports and the 43 non-Florida airports are compared in chapter three. The primary analytical tool was a qualitative method that examined the thematic content. The common themes discovered are discussed in chapters two and three and summarized in chapter four. Aggregated numbers from Florida, the other states, and the block grant states were compared side by side and criteria given for judging the significance of observed differences or similarities. The non-random nature of the sample and the small number of airports prevented the application of quantitative analytical methods other than determining percentages of respondents in certain categories of answers (descriptive analysis).

Florida Case Example Methodology

As the airports for this survey were identified, it became clear that Florida had some striking success stories for aviation industrial development that could be replicated in other locations. To leverage the successful programs used by the Florida Department of Transportation (FDOT), the researchers decided to treat the 10 Florida airports as a separate group. They are discussed in chapter three as a case example. The results from the 10 Florida airports are compared with those from the 43 airports in 21 other states represented in the survey. Within the Florida case example, one airport and its industrial aviation activity are described in detail to illustrate the scope and importance of such development to the airport and its community. A series of three group interviews with the Airport Development Section in FDOT’s Aviation and Spaceports Office provided valuable information regarding the development of all aspects of the case example. The FDOT staff reviewed the Florida case example in preparation for this synthesis.