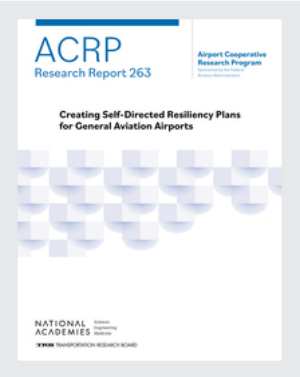
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ACRP

Research Report 263

Airport Cooperative Research Program

Sponsored by the Federal Aviation Administration

# Creating Self-Directed Resiliency Plans for General Aviation Airports

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP RESEARCH REPORT 263

# Creating Self-Directed Resiliency Plans for General Aviation Airports

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## 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 RESEARCH REPORT 263

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# FOREWORD

By Jordan Christensen
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*ACRP Research Report 263: Creating Self-Directed Resiliency Plans for General Aviation Airports* is a guide and toolkit that prepares general aviation (GA) airports to respond to, adapt to, and recover from all varieties of stressors and shocks while maintaining operations. Specific tools were created for GA airports to identify shocks and stressors, conduct risk assessments, and determine potential impacts to the airports. A PowerPoint slide deck provides an overview of the Resiliency Toolkit and is available for stakeholder presentations, and a flyer that explains the benefits of GA airports engaging in resilience planning is available for distribution. This guide and toolkit will aid GA airport sponsors, too, in the resilience-planning process and in creating or strengthening their plans.

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There are nearly 3,000 GA airports that are important to the communities in which they operate and are key contributors to the successful network of the national airport system. GA airports are uniquely positioned assets in any community, and it is therefore essential for GA staff to understand, predict, and address shocks (e.g., airplane accidents, severe weather, and utility outages) and stressors (e.g., employment challenges, aging infrastructure, and climate change impacts) before they happen. GA airports typically have limited resources and staff to address these issues, making self-directed resiliency-planning guidelines (without the aid of consultants and costs) imperative.

Under ACRP Project 02-92, "Creating Self-Directed Resiliency Plans at General Aviation Airports," the Cadmus Group, with support from C&S Engineers, Inc., was asked to develop products GA airports of various categories and sizes can use to enhance their resilience. The research included a review of resources, outreach to GA airports to identify current resilience practices and what they need or are interested in regarding those practices, airport interviews, and case studies. The resilience handbook and accompanying tools were created to guide GA airports through the resilience-planning process, including identifying shocks, stressors, and mitigation actions.

Featured in this report are a quick-start guide for the Self-Directed Resiliency Toolkit and a resilience handbook. Tools A through N are included as supplements and include a risk-assessment analysis tool; templates for communication and briefing strategies to engage with community stakeholders; and a stress-test exercise that GA airports could conduct to test their emergency plans, policies, and procedures. The tools that do not appear in print within this guide (the PowerPoint slide deck and the "Self-Directed Resiliency Toolkit for GA Airports" flyer) are available on the National Academies Press website (nap.nationalacademies.org) by searching for *ACRP Research Report 263: Creating Self-Directed Resiliency Plans for General Aviation Airports* and then reviewing "Resources at a Glance."

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QUICK-START GUIDE

# Self-Directed Resiliency Toolkit

The Self-Directed Resiliency Toolkit was developed as part of ACRP Project 02-92, "Creating Self-Directed Resiliency Plans at General Aviation Airports" to provide general aviation (GA) airport managers—often limited in resources and staff—with the information, tools, and processes necessary to enhance resilience cost-effectively and efficiently. Resiliency plans provide foundational information for GA airports to begin to develop and mature their resilience planning and risk mitigation. The materials in the Resiliency Toolkit are intended to be scalable and implemented based on available personnel and resources and where an airport is in its resiliency-planning journey.

The Resiliency Toolkit will take users through the basic National Preparedness System process on a step-by-step basis. Its contents are integrated with each step, as depicted in Figure 1.

The toolkit consists of the following files:

- Resilience Handbook: A manual that introduces the concept of resilience, reviews the research team's approach, explains why resilience matters for GA airports, and describes the Resiliency Toolkit.
- Tools: Resources included in the Resiliency Toolkit contain background information, instructions, and suggestions for how each could be used (see Table 1).
- Toolkit Brochure (PDF): A concise and visually pleasing brochure, which can be circulated to airport stakeholders, that will explain the Resiliency Toolkit and the benefits of engaging in resiliency planning for GA airports.
- Toolkit Overview (PowerPoint): A PowerPoint presentation stakeholders may download that will walk through the different tools available in the Resiliency Toolkit, the appropriate situations in which to use them, and how to implement resiliency planning in a cost-effective manner.
- Toolkit Quick-Start Guide: A step-by-step guide for stakeholders interested in jumping straight into resiliency planning, including directions for using all the tools in the Resiliency Toolkit.



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***Figure 1. Self-Directed Resiliency Toolkit integrated with the National Preparedness System process. (LOA = letter of agreement.)***

**Table 1. Contents of toolkit.**

| Step | Tool | Resource | File Type | Description |
|---|---|---|---|---|
| Start | A | Resource Review | Searchable, filterable Excel file | This tool provides more than 70 resources for resilience planning. It includes key takeaways, notes, and key themes to help users narrow their search. |
| 1 | B | Overview of Identified Shocks and Stressors | PDF | This resource provides an overview of relevant shocks and stressors for GA airports based on interviews conducted with GA airports and additional research. |
| 1 | C | Risk-Assessment Analysis Tool | Excel file | This tool is used to identify airport shocks and stressors, prioritize them, and review their impacts. |
| 2 | D | Mitigating Actions to Address Shocks and Stressors | PDF | This resource provides best practices, strategies, and mitigating actions gathered by the research team during the research team's interviews with GA airports to address shocks and stressors. |

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**Table 1. (Continued).**

| Step | Tool | Resource | File Type | Description |
|---|---|---|---|---|
| 2 | E | Case Studies | PDF | The case studies provide more in-depth information from GA airports' best practices to further identify resources needed to address shocks and stressors. |
| 3 | F | Emergency Communications Plan Template | Word file | This tool provides a template for compiling contact information that airport personnel communicate with daily and during emergencies. |
| 3 | G | Airport Emergency Plan Template | Word file | This tool is intended to aid in user methodology and approach to preparing for, responding to, and recovering from shocks and stressors. |
| 3 | H | Incident Mitigation Plan Template | Word file | This tool is intended to aid in user methodology and approach to identifying potential risks and developing strategies to protect staff, tenants, stakeholders, and property from similar events. |
| 3 | I | Stakeholder Engagement Checklist Template | Word file | This tool is meant to aid in user methodology and approach to interacting and communicating with stakeholders. |
| 3 | J | Incident Command System Template | Word file | This resource provides an overview of the Incident Command System and a template to build the structure when an incident occurs. |
| 4 | K | Communications and Collaboration Guidelines | PDF | This resource is meant to aid in user methodology and approach to communicating and coordinating with internal and external stakeholders before, during, and after an incident. |
| 4 | L | Aircraft Rescue and Firefighting Letter of Agreement Template | Word file | This resource is meant to aid in user approach to communicating and coordinating with air rescue and firefighting first-responder personnel during and after an incident. |
| 5 | M | Airport Resiliency Stress-Test Exercise-in-a-Box | Word file | This tool aims to provide resources for GA airports to conduct a resilience stress test of their emergency plans, policies, and procedures. |
| 6 | N | Incident After-Action and Corrective-Actions Template | Word file | This tool provides a template for incident after-action meetings and a corrective-actions template. |

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RESILIENCE HANDBOOK

# Creating Self-Directed Resiliency Plans for General Aviation Airports

This Resilience Handbook introduces a set of self-directed tools, resources, and information based on the latest resilience research, drawing from experience and insights from subject-matter experts, and reflects GA airports' real-world needs and operating conditions. These toolkit contents are meant to be complementary to the processes and procedures currently in place and in no way should override required standards. The Resilience Handbook includes the following:

- An introduction to the concept of resilience;
- A review of the research team's project approach that led to the development of the toolkit contents;
- An explanation of why resilience matters for GA airports;
- An introduction to the Self-Directed Resiliency Toolkit, its benefits, and additional resources; and
- A review of how to integrate resilience into planning and apply the elements of the Self-Directed Resiliency Toolkit to resilience best practices, including how to identify and address shocks and stressors.

## Introduction to Resiliency

As the backbone of the aviation system, whether GA airports are classified as basic, local, regional, national, or reliever airports, or included in the *National Plan of Integrated Airport Systems (NPIAS) 2023–2027* [Federal Aviation Administration (FAA) 2022] or not, they play a key role in their communities by providing relief for major airports, serving as hubs for emergency services (often as bases for police, firefighting services, and more), providing rural communities with access to the national transportation system, and becoming the home base for emergency operations in the event of catastrophic events. The ability of GA airports to be resilient during disruptions to operations is critical to the aviation systems and communities they serve. The research team completed this study to develop tools, resources, and information that GA airports of various categories and sizes can use to enhance their resilience. These toolkit contents guide airports in preparing to respond; adapt; and sustain themselves in the face of various stressors and shocks, including economic, social, political, environmental, and operational or infrastructural.

**Resilience** is "the ability to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions." (National Institute of Standards and Technology 2023)

**Shocks and stressors** can be short-term (shocks) or long-term (stressors) disruptions or pressures that destabilize an airport and threaten safety, security, infrastructure, staff, and continuity of operations.

The National Preparedness System comprises a six-component process that provides a consistent and reliable approach to supporting decision-making, allocating resources, and measuring progress toward the national goal of achieving a secure and resilient nation with the capabilities required across



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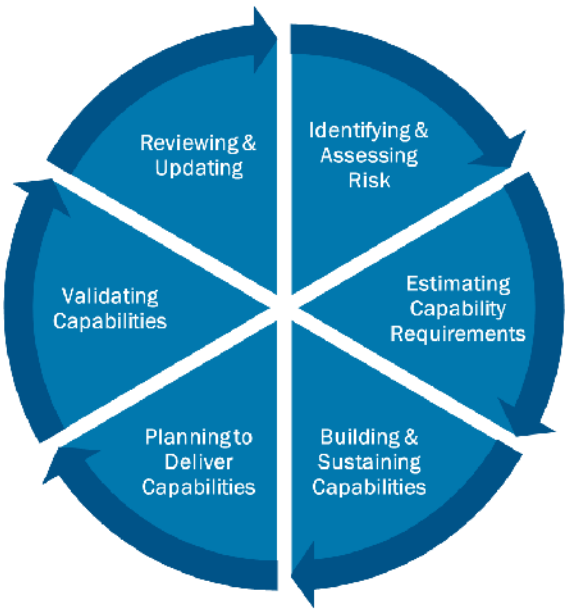



***Figure 2. National Preparedness System process* (FEMA 2011a).**

communities to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk [Federal Emergency Management Agency (FEMA) 2011a]. The components of the system, as outlined in Figure 2, provide a basic and scalable approach to improving individual, organizational, and communal preparedness. The process provides a foundation for resilience and should inform all efforts taken to strengthen resilience for GA airports across the nation.

The key to resilience is comprehensively identifying the shocks and stressors GA airports across the country face by taking the necessary steps to address these impacts with the available industry resources and tools. These shocks include, but are not limited to, airplane accidents; severe weather; utility outages; fuel disruptions; natural disasters; and stressors such as employment challenges, aging infrastructure, climate change impacts, political and economic changes, and resource limitations.

Resilience planning is accomplished and matured by working with relevant stakeholders to reduce risks and continuously improve airport resilience capabilities over time. Effective resilience planning is critical for government, private-sector, and nongovernmental organizations, as each plays a role in saving lives, preserving property, and restoring essential community services and supplies during disaster incidents.

## Project Approach

The objective for this research was to develop tools, resources, and information that GA airports of various categories and sizes can use to reduce their risk of disasters and enhance their resilience. The toolkit contents will guide airports in preparing to respond to, adapt to, and sustain themselves to various stressors or shocks. Throughout this project, the research team met with the ACRP project panel, comprising several experts from the aviation community who served in an advisory role. The first phase of the research process to develop the toolkit began with a thorough literature review of industry articles, reports, webinars, and presentations. This review provided

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a baseline of knowledge and a thorough exploration of the understanding of resilience, shocks and stressors, available tools, resources, and information to minimize risks and impacts on operations. During the next phase, the initial airport outreach, the research team contacted GA airports. To ensure an even geographic distribution of respondents, the research team reached out to all 50 state aviation associations and departments of transportation to solicit interest in participating in targeted interviews that explored the issues, needs, opportunities, and best practices associated with resilience planning.

Following the initial airport outreach, the team completed an analysis of the 206 survey responses received to develop a shortlist of airports for the interview stage. The shortlist consisted of 19 airports, 5 backup airports, and the Alaska Department of Aviation. To provide diversity for this study, airports of varying sizes, locations, maturity in resilience-planning efforts, and resource availability were used to understand key challenges in resilience planning and commonly identified shocks and stressors. The research team made all possible efforts to interview at least one airport from each of the nine FAA regions for the broadest possible regional distribution. These targeted interviews included 18 interviews with representatives from each airport completed via web-conferencing platforms Microsoft Teams or Zoom. In addition to helping to identify which airports would make successful case studies, the interviews also assisted the research team in understanding the airports' resilience gaps, which aided in the development of the toolkit contents.

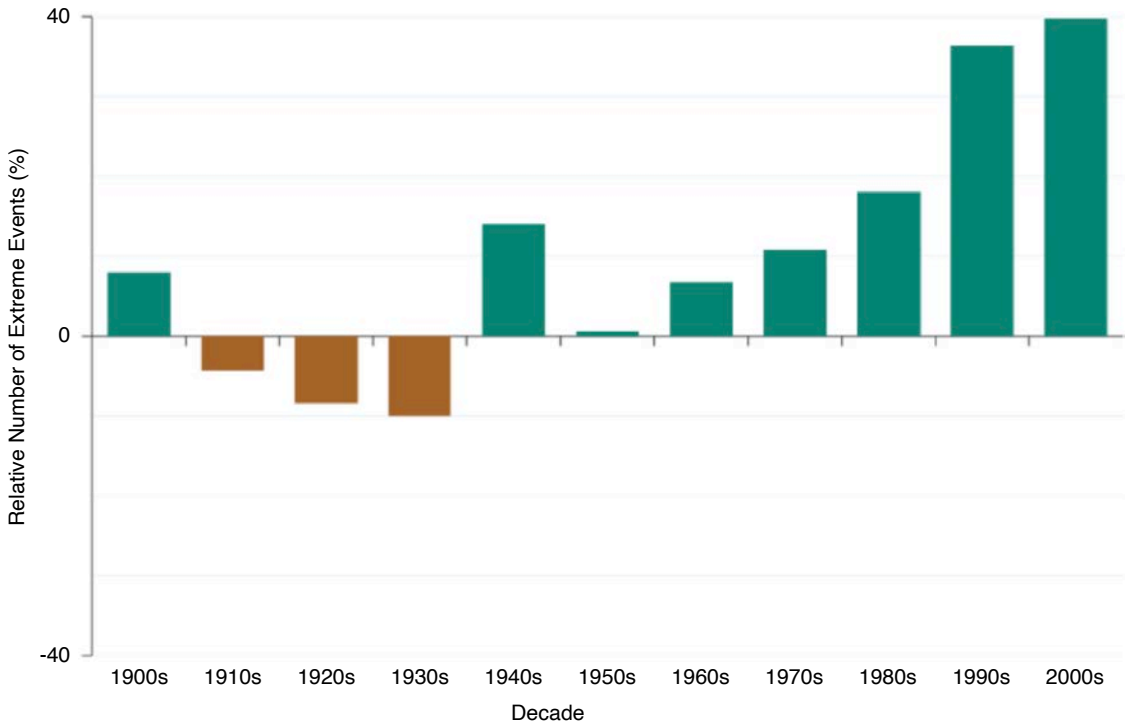
The research team then moved to the third and final phase, case-study development. Using broad selection criteria, the team developed eight detailed case studies that provided critical context to the challenge of resilience planning at GA facilities. Airport case studies were organized to prioritize identifying unique or key data, with a focus on understanding how to develop tools, resources, and information to guide airports in considering and incorporating resilience into their planning, operations, and maintenance activities. The selected airport case studies were also used directly in creating the toolkit contents for the types of tools, resources, and information developed and for scaling the toolkit contents for various GA airport sizes, locations, and uses. At multiple stages throughout the project, the ACRP project panel provided feedback and insight to ensure the research team was thorough and delivered products that would be most helpful for GA airports. In addition, the research team conducted a pilot with six airports that provided feedback to refine the materials further to ensure effectiveness, understanding, and usage.

## Why Should GA Airports Care About Resilience?

Airports in the United States have already begun to experience the impacts of climate crisis. Rare weather events such as 200-year floods, 100-year storms, and other extreme weather events now occur more frequently, as shown in Figure 3, because of climate change impacts. A shock like extreme flooding can cause a chain reaction of delays and cancellations of flights and events. Additional impacts include operational issues such as delays in regularly scheduled airport maintenance, damage to the airport building envelope, water pooling on the runway that impacts takeoff and landing, and water damage to the electrical infrastructure under the runway. As these examples demonstrate, airports cannot afford to wait to prepare for these climate-related events and subsequent vulnerabilities.

As connectors to rural communities, relievers of larger metropolitan airport systems, and providers of critical services, GA airports serve a fundamental role in the transportation system and generate nearly $246.8 billion in annual economic activity. They also serve critical functions before, during, and after disasters, acting as focal locations for distributing disaster relief and as search-and-rescue deployment bases for wildfires, storms, floods, and other natural hazards. Despite their significance, their role is often overlooked—until they cannot fulfill it.

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Source: *Climate Change Impacts in the United States: The Third National Climate Assessment (Melillo, Richmond, and Yohe, eds. 2014).*

***Figure 3. Observed trends in extreme U.S. weather events.***

The current U.S. presidential administration has centered climate resilience within its key goals and a whole-of-government approach to mitigation, adaptation, and hardening of government infrastructure (Alliance for Aviation Across America 2018). The release of the U.S. Department of Transportation's (U.S. DOT's) *Climate Action Plan: Revitalizing Efforts to Bolster Adaptation & Increase Resilience* (2021), the *United States 2021 Aviation Climate Action Plan* (FAA 2021), and the U.S. Environmental Protection Agency's (U.S. EPA's) *Climate Adaptation Action Plan* (2021), among others, have proven that the significance of resilience planning has never been more apparent. Airports intent on hardening their infrastructure and operations and increasing resilience have received financial support through various funding streams to date, including federal, state, and local programs such as the FAA's Airport Zero Emissions Vehicle and Infrastructure Pilot Program. The 2021 passage of the Infrastructure and Jobs Act (H.R. 3684, 117th Congress) will provide funding increases to expand resilience programs. Additional funding is expected to come from federal agencies and at regional and local levels. It will be key for GA airports to understand their needs related to resilience, to better posture themselves, and to take advantage of potential funding opportunities.

Resilience is key to preserving human life and assets, saving money, and planning for clearer engagement with airport stakeholders. However, the current resources for self-directed resilience planning available to GA airports lack the breadth and flexibility to succeed nationwide. Because of the disparity between basic or local and regional or national GA airports, the approach to resilience planning cannot be "one size fits all." The information in this handbook and the Self-Directed Resiliency Toolkit is informed by the issues, needs, and opportunities specific to GA airports to advance the resilience of their facilities to reduce overall risks and impacts to allow airports the flexibility to address their risks and create strategies based on their unique needs and available resources.

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## Introduction to the Self-Directed Resiliency Toolkit

The Self-Directed Resiliency Toolkit, as shown in Figure 4, was developed to provide GA airport managers—often limited in resources and staff—with the information, tools, and processes necessary to enhance resilience cost-effectively and efficiently. It provides foundational information for GA airports to begin to develop and mature their resilience planning and risk mitigation. The materials in the toolkit are intended to be scalable to use and implement based on available personnel and resources. Through engagement with the toolkit contents, GA airport facilities can ensure their continued operational resilience to minimize and address disruptions to operations and continue providing invaluable services to their communities.

The Self-Directed Resiliency Toolkit is a collection of practical tools, resources, and information based on the latest resilience research, drawing from experience and insights from subject-matter experts, and reflects GA airports' real-world needs and operating conditions. The toolkit contents enable the review of the entire resilience process, from evaluating and understanding risks, to developing strategies and plans, designing and conducting exercises, and coordinating and communicating with the community and other stakeholders.

Among its many benefits, this toolkit provides GA airports with tangible benefits, including the following abilities to:

- Identify the shocks and stressors most applicable to their airport and understand how to address them;
- Develop tailored strategies that seek to combine actions to "multi-solve" to gain efficiencies and optimize resources instead of addressing singular shocks and stressors individually;
- Optimize limited financial, staffing, or other resources (e.g., political, social, and environmental capital);
- Leverage lessons learned from similar airports and apply those lessons locally;
- Engage key stakeholders with proven strategies; and
- Communicate the critical functions of GA airports in communities when advocating for resources.

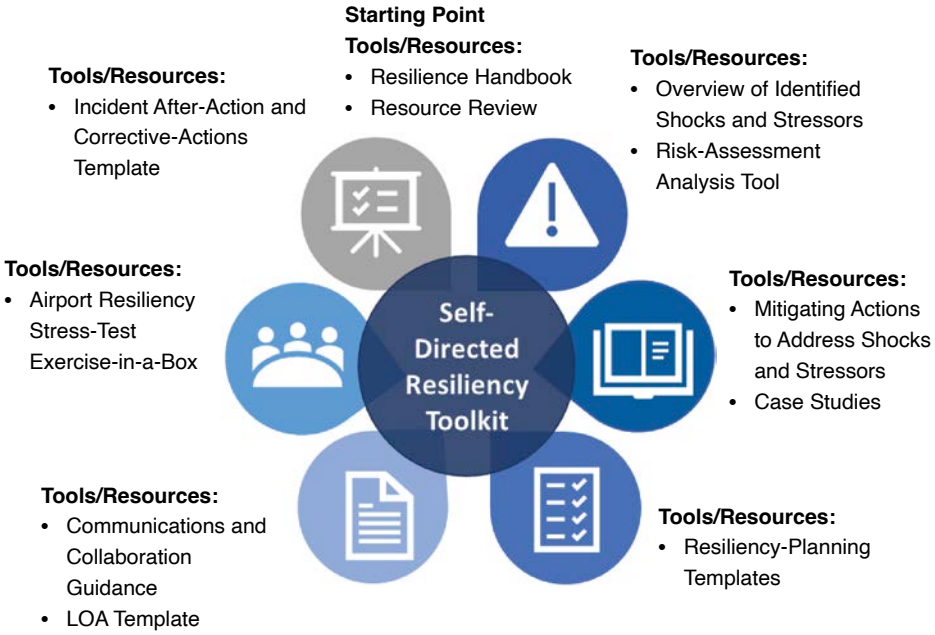



***Figure 4. Self-Directed Resiliency Toolkit.***

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Resiliency efforts can take many forms (based on experience) and continuously improve and adapt. This innovative toolkit will empower GA airports to conduct cost-effective resilience planning and prepare facilities across the country for current and future shocks and stressors. See Tool A for a list of resilience-related resources that provide additional information.

## How to Integrate Resilience into Planning

The tools, resources, and information in this toolkit will take users through the basic National Preparedness System process on a step-by-step basis. The toolkit contents are integrated with each step, as depicted in Figure 5. This toolkit focuses on the development of preparedness tools to build capabilities and support a structured approach to incorporating and implementing resilience. Capabilities are the interdependent elements of preparedness that require the use of existing networks and activities. The tools and resources facilitate the coordination of efforts; improve training and exercise programs; promote innovation; leverage and enhance capacity; and ensure administrative, finance, and logistics systems are in place to support these capabilities. As risks and resources evolve, resilience planning helps to ensure airports are prepared to address shocks and stressors. The key to preparation is that airports start to process and understand their plans in the event of a shock or stressor and begin to formulate strategies to be continued, built on, and improved on for different types of incidents.




***Figure 5. Self-Directed Resiliency Toolkit integrated with the National Preparedness System process.***

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**Table 2. Self-Directed Resiliency Toolkit tools and resources.**

| Step | Tool | Resource |
|---|---|---|
| Start | A | Resource Review |
| 1 | B | Overview of Identified Shocks and Stressors |
| | C | Risk-Assessment Analysis Tool |
| 2 | D | Mitigating Actions to Address Shocks and Stressors |
| | E | Case Studies |
| 3 | F | Emergency Communications Plan Template |
| | G | Airport Emergency Plan Template |
| | H | Incident Mitigation Plan Template |
| | I | Stakeholder Engagement Checklist Template |
| | J | Incident Command System Template |
| 4 | K | Communications and Collaboration Guidelines |
| | L | Aircraft Rescue and Firefighting Letter of Agreement Template |
| 5 | M | Airport Resiliency Stress-Test Exercise-in-a-Box |
| 6 | N | Incident After-Action and Corrective-Actions Template |

Table 2 outlines the associated sections for the tools, resources, and information in the toolkit aligned with each step.

## Starting Point: Resource Review

The resource review contains more than 70 resources available on resilience. This tool, as described in Table 3, should be studied to help think about risk before the planning process begins. It will help to familiarize users with resilience and will be a valuable reference point to use throughout the planning process.

## Step 1: Identifying and Assessing Risk

Developing and maintaining an understanding of the shocks and stressors airports face can be used to build and sustain resilient planning efforts. This step includes a risk assessment to collect the consequences or impacts of the projected shocks and stressors (see Table 4).

Risk assessment creates a foundation for understanding common and historical risks and impacts on airports. Using the risk analysis tool will enable airports to identify which shocks and stressors they should focus on and their corresponding impacts. Once all the shocks and stressors are identified, the airport can then prioritize them to identify which ones to focus on that have a more significant impact and lay out a plan to increase their resilience.

**Table 3. Starting point tool, resource, and description.**

| Tool | Resource | Description |
|---|---|---|
| A | Resource Review | This tool provides more than 70 resources for resilience planning. It includes key takeaways, notes, and key themes to help users narrow their searches. |

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**Table 4. Step 1 tools, resources, and descriptions.**

| Tool | Resource | Description |
|---|---|---|
| B | Overview of Identified Shocks and Stressors | This resource provides an overview of relevant shocks and stressors for GA airports based on interviews conducted with GA airports and additional research. |
| C | Risk-Assessment Analysis Tool | This tool is used to identify shocks and stressors for users' airports, prioritize them, and review their impacts. |

## Step 2: Estimating Capability Requirements

By using the results and desired outcomes from the risk assessment, airports can identify the types and levels of capacity needed to address their shocks and stressors. Estimating the capabilities needed in prevention, protection, mitigation, response, and recovery will enable the airport to identify gaps that need to be closed and requirements to sustain the current capabilities (see Table 5).

Plans should be built on the foundation of identifying and prioritizing shocks and stressors, and the focus should be on looking at common best practices for mitigating risks. Generating this list of best practices will enable the airport to start assessing current measures in place and gaps to identify additional requirements (e.g., staffing and funding) needed to implement different strategies to tackle their shocks and stressors.

## Step 3: Building and Sustaining Capabilities

After estimating capability requirements, existing and needed capabilities can be analyzed to identify gaps. Once the analysis is complete, the airport should determine how to address and build capabilities with limited resources (see Table 6). As capabilities are built, training and education can be used to develop and strengthen the specific knowledge, skills, and abilities required to meet each capability's target.

Looking across the shocks and stressors to identify the interdependencies will enable airports to multi-solve problems. For example, suppose the airport is subject to several weather events. In that case, the airport can identify several related actions and combine and prioritize them to develop long-term strategies and capabilities that continue to improve with resources while reducing several risks over time.

**Table 5. Step 2 tools, resources, and descriptions.**

| Tool | Resource | Description |
|---|---|---|
| D | Mitigating Actions to Address Shocks and Stressors | This resource provides best practices, strategies, and mitigating actions gathered during the interviews with GA airports to address shocks and stressors. |
| E | Case Studies | The case studies provide more in-depth information from GA airports' best practices to further identify resources needed to address shocks and stressors. |

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**Table 6. Step 3 tools, resources, and descriptions.**

| Tool | Resource | Description |
|---|---|---|
| F | Emergency Communications Plan Template | This tool provides a template for compiling contact information for contacts with whom airport personnel communicate daily and during emergencies. |
| G | Airport Emergency Plan Template | This tool is intended to aid in the methodology and approach to preparing for, responding to, and recovering from shocks and stressors. |
| H | Incident Mitigation Plan Template | This tool is intended to aid in the methodology and approach to identifying potential risks and developing strategies to protect staff, tenants, stakeholders, and property from similar events. |
| I | Stakeholder Engagement Checklist Template | This tool is meant to aid in the methodology and approach to interacting and communicating with stakeholders. |
| J | Incident Command System Template | This resource provides an overview of the Incident Command System and a template to build the structure when an incident occurs. |

## Step 4: Planning to Deliver Capabilities

When implementing risk-reduction actions, for example, gathering feedback on a planned security system installation, it is important to create plans for coordinating with stakeholders and communities. The construction of these plans should engage relationships with current community stakeholders and expand to additional stakeholders to encourage a communal approach. The toolkit contents provide advice and templates for the starting point of community engagement. The airport should also incorporate current activities (e.g., events with the community) that have already been implemented to help minimize economic risk. See Table 7 for Step 4 tools and descriptions.

## Step 5: Validating Capabilities

Measuring progress toward delivering capabilities can dictate how and where airports should allocate their resources. This measurement of progress can be done through regular exercises and assessments to test and validate plans, policies, and procedures.

**Table 7. Step 4 tools, resources, and descriptions.**

| Tool | Resource | Description |
|---|---|---|
| K | Communications and Collaboration Guidelines | This resource is meant to aid in the methodology and approach to communicating and coordinating with internal and external stakeholders before, during, and after an incident. |
| L | Aircraft Rescue and Firefighting Letter of Agreement Template | This resource is meant to aid in the approach to communicating and coordinating with air rescue and firefighting first-responder personnel during and after an incident. |

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**Table 8. Step 5 tool, resource, and description.**

| Tool | Resource | Description |
|---|---|---|
| M | Airport Resiliency Stress-Test Exercise-in-a-Box | This tool aims to provide resources for GA airports to conduct a resilience stress test of emergency plans, policies, and procedures. |

**Table 9. Step 6 tool, resource, and description.**

| Tool | Resource | Description |
|---|---|---|
| N | Incident After-Action and Corrective-Actions Template | This tool provides a template for incident after-action meetings and a corrective-actions template. |

It is vital to bring together all stakeholders once a plan, policy, or procedure has been created to help identify any further gaps and address them with courses of action to correct and ensure the plan, policy, or procedure can be implemented successfully. Using the Stress-Test Exercise-in-a-Box allows the airport to walk through various scenarios to test out plans and identify any potential blind spots (see Table 8).

### Step 6: Reviewing and Updating

Last, it is vital to regularly review and update all plans, policies, and procedures. The review should be based on a current risk assessment and use information gathered during the validation process.

Reviewing plans, policies, and procedures after an incident has occurred to identify successes and opportunities to improve is critical. A best practice is to conduct an after-action meeting within 1–2 weeks following an incident to aid in identifying corrective actions (e.g., new training, additional grants, mature stakeholder relationships) to better posture the airport in the face of a similar shock or stressor in the future (see Table 9).

## Resilience Plan Development Checklist

The Resilience Plan Development Checklist (see Figure 6) outlines the tasks required for GA airports to create a thorough and holistic resilience plan to address potential threats and hazards. Additionally, the checklist allows GA airport leadership to assign each task to a staff member and confirm the completion of the task. Each task in the checklist corresponds to a tool provided in the Self-Directed Resiliency Toolkit.

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| Task | Overview | Person Responsible | Complete (Y/N) |
|---|---|---|---|
| Review Resilience Handbook and Resource Review (Tool A) | Obtain an overview of resilience planning and review a list of more than 70 resources for resilience planning. | | |
| Conduct Risk-Assessment Analysis (Tool C) | Identify shocks and stressors for user's airport, prioritize them, and review their impacts. | | |
| Complete Emergency Communication Plan Template (Tool F) | Compile contact information for personnel the airport needs to communicate with daily and during emergencies. | | |
| Complete Airport Emergency Plan Template (Tool G) | Develop a framework for pre-incident, implementation, and post-incident actions for an emergency. | | |
| Complete Incident Mitigation Plan Template (Tool H) | Identify potential risks and develop strategies to protect staff, tenants, stakeholders, and property from similar events. | | |
| Review Communications and Collaboration Guidelines (Tool K), Stakeholder Engagement (Tool I), and Aircraft Rescue and Firefighting Letter of Agreement Template (Tool L) | Develop the methodology and approach to communicate with stakeholders. | | |
| Develop an Incident Command System Chart (Tool J) | Establish an incident command organizational chart customized to the airport. | | |
| Conduct the Stress-Test Exercise-in-a-Box (Tool M) | Conduct a resilience stress test of the emergency plans, policies, and procedures developed. | | |
| Save Incident After-Action and Corrective-Actions Template (Tool N) for future use | Have a template ready for completion and to guide a debrief of incidents. | | |
| Compile resilience plan documentation | Save electronic and hard-copy versions of the plan elements for quick and easy reference. | | |

***Figure 6. Resilience plan development checklist.***

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TOOL A

# Resource Review

As a supplement to this report, Tool A: Resource Review is available on the National Academies Press website (nap.nationalacademies.org) by searching for *ACRP Research Report 263: Creating Self-Directed Resiliency Plans for General Aviation Airports* and then reviewing "Resources at a Glance."



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TOOL B

# Overview of Identified Shocks and Stressors

Preserving GA airport services and capabilities through effective resilience planning first requires identifying the shocks and stressors that may affect the airport based on the geographic, regional, and demographic context in which the airport operates. A shock or stressor is an acute natural or human-made event or phenomenon threatening significant loss or damage to assets. GA airports face an array of internal and external shocks and stressors that can potentially disrupt airport operations. From discrete, sudden shocks to longer-term chronic stressors—which are becoming more unpredictable as the climate changes—the forces impacting GA airports' ability to thrive are numerous and complex.

Effective resilience planning must address various shocks and stressors that organizations may face. This includes routine events—severe storms, floods, or winter weather—as well as catastrophic incidents, such as earthquakes, flooding, widespread wildfires, or major hurricanes. Organizations should also prepare for manufactured and operational shocks and stressors, including cyberattacks, power outages, economic downturns, pilot shortages, personnel issues, transportation accidents, political issues, or industrial disasters.

The research team conducted 20 interviews with GA airports in the country to identify common shocks and stressors. Based on the interviews and additional resources, the research team developed a list that includes 27 shocks and stressors falling into four categories (see Table B-1). This serves as a resource to provide an overview of relevant shocks and stressors for GA airports and a starting point to identify potential shocks and stressors and begin to assess risk.



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**Table B-1. Shocks and stressors.**

| Category | Shock/Stressor |
|---|---|
| Economic | Fuel price increases |
| | Financial stress/Resilience issues |
| | Federal funding opportunities |
| Environmental | Severe weather |
| | Flooding |
| | Winter storms |
| | Hurricanes |
| | Tornadoes |
| | Earthquakes |
| | Drought |
| | Wildfires |
| | Volcanic eruption |
| | Tsunami |
| Operational | Political issues (local, state, national) |
| | Pilot shortages |
| | Border security |
| | Terrorist threats/attacks |
| | Cyberattacks/cyberterrorism |
| | Transportation incidents |
| | Airport security |
| | Power outage |
| | Industrial disasters |
| | Aging infrastructure |
| | Construction projects |
| | VIP visits |
| Social | Human pandemic |
| | Personnel issues |

Source: ACRP Research Team GA airport interviews and Toolkit Pilot, 2022.

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TOOL C

# Risk-Assessment Analysis Tool

As a supplement to this report, Tool C: Risk-Assessment Analysis Tool is available on the National Academies Press website (nap.nationalacademies.org) by searching for *ACRP Research Report 263: Creating Self-Directed Resiliency Plans for General Aviation Airports* and then reviewing "Resources at a Glance."



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TOOL D

# Mitigating Actions to Address Shocks and Stressors

The research team gathered the following shocks and stressors and their associated best practices and mitigating actions during the research team interviews (see Table D-1). This resource is not meant to be an exhaustive list of shocks and stressors airports may encounter, best practices, or mitigating actions; however, it should provide a basic understanding of the challenges GA airports could face with helpful best practices and mitigating actions. Airports are encouraged to consider implementing these associated best practices and mitigating actions in their resilience planning. This will enable the airport to start assessing current measures and gaps and identify additional requirements (e.g., staffing and funding) needed to implement different strategies for tackling their shocks and stressors.

**Table D-1. Shocks and stressors.**

| Economic | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Fuel price increases | Inflation and global political situations have directly resulted in increased fuel prices, which directly affect airport operations. When fuel prices unexpectedly rise, GA airports must manage rising costs to continue operations. | – Pre-purchase fuel to keep prices low for customers for as long as possible (if applicable).<br>– Create a fuel discount program for fuel purchased at a high volume to encourage customers to continue flying even with the high price of fuel.<br>– Privatize fuel service.<br>– Establish minimum standards that moderate fuel costs by fixed-base operator (FBO)/provider. |
| Financial stress/ Resilience issues | While funding can come from various sources, a number of GA airports rely on local taxes and income from airport operations, including fuel sales and tenant and hangar leases. As a result, GA airports are susceptible to economic fluctuations, which can impact the airport's ability to continue its success and uninterrupted operations. | – Diversify airport income sources regularly, including the consideration of nonaeronautical revenue sources.<br>– Coordinate regularly with peer airports to understand alternative methods and best practices for increased revenue.<br>– Maintain regular community outreach to ensure the value of the airport is clear to the local community. Community support of the airport is vital for continued financial success. Consider opportunities for airport-sponsored community events.<br>– Document airport spending and keep a reserve available (recommended six months to a year of airport expenses) to cover critical expenditures in the event of short-term cuts to funding.<br>– Update airport rates and fees on an annual basis to keep pace with market and inflation rates. |
| Federal funding opportunities | Opposite of the issues associated with the lack of funding, the COVID-19 pandemic has shown how the availability of federal relief in the form of stimulus, removal of local fund-matching requirements, or new grant opportunities have strained airports to prioritize eligible projects and initiatives and maximize available funding. | – Stay up-to-date on funding opportunities and understand the processes for procurement.<br>– Understand obligations associated with funding types.<br>– Maintain good relationships with the local FAA Airports District Office and state regulatory agency (DOT).<br>– Develop and maintain an up-to-date Airport Capital Improvement Plan that can be a source of projects to be moved forward if funding became available. |

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**Table D-1. (Continued).**

| Environmental | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Severe weather | Severe weather is highly unpredictable and includes a diversity of effects, such as wind, monsoons, haboobs, and extreme temperatures, that can result in significant disruptions for airports and their stakeholders. Each of these types of weather can cause different challenges to airport operations. | – Install cameras to monitor the airfield remotely, ensuring staff can react quickly to any weather-related damage.<br>– Communicate with all tenants to ensure aircraft are secured, all hangar doors are closed, and equipment has been safely relocated.<br>– Install generators in the event of power outages.<br>– Develop severe weather standard operating procedures that lay out plans to be followed to preserve human life and property and return to regular airport operations.<br>– Develop a notification system for severe weather events in collaboration with the National Weather Service.<br>– Develop and maintain a periodic drainage maintenance plan to minimize airfield drainage system debris. |
| Flooding | Flooding events typically occur when dry land becomes inundated from the overflow of inland or tidal waters or rapid accumulation. Flooding is anticipated to increase dramatically in the coming decades. Airports near water sources or the coast are particularly likely to be affected. | – Rebuild flood-prone buildings with concrete block instead of drywall to minimize infrastructural damage and expedite the cleaning process so operations can resume quickly.<br>– Eliminate all carpeting from flood-prone office buildings to further aid the cleaning process and reduce the chances of mold or water damage to the building.<br>– Make design modifications to T-hangars to allow water to flow through more easily during a flooding event.<br>– Overhaul the runway lighting system to replace LED lights more susceptible to water damage, with older technology that can better withstand flooding.<br>– Design the airfield according to FAA specifications to keep water off paved areas. |
| Winter storms | Winter storms are notice events that bury communities in severe cold, snow, and ice. All three of these impacts can cause significant challenges to airport operations if not properly managed. | – Ensure the runway is grooved, which assists in melting snow and ice [Note: FAA Airport Improvement Program (AIP) funding may not be available for runways less than 5,000 ft].<br>– Develop a snow and ice control plan or have a snow and ice control committee, or both. |
| Hurricanes | Hurricanes are notice events caused by a confluence of warm water, air, and wind and are anticipated to increase because of climate change. Hurricanes also cause flooding and infrastructure damage that can have short- and long-term effects on airports. | – Ensure the runway is grooved to prevent hydroplaning in rain conditions (Note: FAA AIP funding may not be available for runways less than 5,000 ft).<br>– Implement a hurricane preparedness manual. |
| Tornadoes | Tornadoes are short- or no-notice events, short in duration, and develop during severe thunderstorms having winds that can reach 300 miles per hour (mph) or higher and can cause devastating wind damage. GA airports may be directly affected or located in communities impacted by a tornado event. | – Establish operating plans that include the identification of shelters and safe places, given the sudden nature of tornadoes. |
| Earthquakes | Earthquakes are no-notice incidents caused by the movement of tectonic plates and can cause severe damage to infrastructure and buildings. GA airports may have facilities impacted by an earthquake or need to manage airport operations when critical infrastructure has been damaged. | – Participate in the Cascadia Rising exercise, a multistate and multiagency National Level Exercise that focuses on the major rupture along the Cascadia Subduction Zone, or other organized local, state, or national planning and exercise efforts.<br>– Develop a post-incident inspection plan for facilities and runways to authorize them for operations. |

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**Table D-1. (Continued).**

| Environmental | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Drought | Prolonged shortages in the water supply cause droughts. In the event of a drought, airports may be forced to implement water conservation techniques that may cause disruptions to normal operations. | – Prioritize native plantings and foliage, nonpotable water, and water reuse to minimize overall water use at airport facilities.<br>– Implement education and training for airport staff, tenants, contractors, and other stakeholders to improve awareness and capacity development on water conservation strategies.<br>– Implement water-use policies organizationwide to limit facility water use and improve conservation efforts.<br>– Consider and plan for the coexisting impacts of drought, including increased fire risk, workers' safety, pavement softening or melting, and other damage to physical infrastructure.<br>– Coordinate with local and regional government officials to understand existing planning for mitigating drought impacts. |
| Wildfires | In the event of a wildfire, an airport may be impacted by proximity to the fire itself, have visibility impacted by flames and smoke, or may become an emergency response center for firefighting aircraft and personnel. | – Establish operating plans, including the identification of evacuation procedures.<br>– Consider stocking respirators and other personal protection equipment. |
| Volcanic eruption | Volcanic activity, including eruptions, are multihazard events that can include other shocks, such as earthquakes, landsides, floods, fires, and tsunamis. | – Ensure the airport emergency plan includes a warning notification protocol, evacuation plan, and communications protocol.<br>– Compile a disaster supply kit that includes items needed specifically for conditions with volcanic ash (e.g., respirators, goggles, tape to seal windows and doors). |
| Tsunami | Most tsunamis are caused by underwater earthquakes or landsides or volcanic eruptions that displace a huge quantity of water. | – Ensure specific preventive measures and procedures are in place as applicable for airports in tsunami-prone areas. |

| Operational | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Political issues (local, state, and national) | GA airport funding is closely tied to national, state, and local politics and elections. Many GA airports rely heavily on the current political climate toward airport funding, which can easily change after an election. The change in power from one election cycle to the next is of great importance to the resilience of GA airport facilities. This may also include political pressure and impacts from the airport's neighboring communities. | – Plan for the airport's future before political leanings change to remain consistent; this is key to airport solvency.<br>– Consider airport spending and keep a reserve available to cover critical expenditures in the event of short-term cuts to funding.<br>– Keep abreast of the local election cycles to understand the key issues being weighed and possible impacts on airport operations.<br>– Ensure the value of the airport is clear to the local community so community members support the airport no matter the local leadership. |
| Pilot shortages | Training and recruiting new pilots are critical to the continued stability and growth of the aviation industry, as GA airports often rely on private-plane owners and small companies for their business. When there are fewer pilots, fewer people can learn how to fly, fewer hangars are being rented for plane storage, and overall fewer customers are using GA services. | – Stay connected with local educational institutions to ensure the future generation understands the airport's role and that aviation is open to all kinds of community members.<br>– Engage pilots at the airport in programming that offers discovery flights and other opportunities for "learning in action."<br>– Consider partnerships with regional and national organizations (e.g., Black Pilots of America, Inc., Women in Aviation International, etc.) to encourage continued diversity in the pilot profession. |

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**Table D-1. (Continued).**

| Operational | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Border security | Border security is of particular concern near U.S. borders, where airports may be transit points for people entering the country illegally. In addition, GA airports that reside along a border require additional coordination with international law enforcement and are disproportionately affected by incidents that affect the border status (e.g., investigations and border closure). | – Work to regularly coordinate with border patrol and local law enforcement within the United States and the bordering country to understand critical dates for each country and emergency planning and operations for catastrophic events.<br>– Maintain a plan for communications and coordination during and after shock events with an impact on border security. |
| Terrorist threats and attacks | GA airports play an important role in the U.S. economy and in their communities. Because of their importance, they are vulnerable to terrorist threats and attacks whether perpetrated by domestic or international actors. Aircraft at GA airports are smaller and slower than those at commercial airports but can still be used in a terrorist situation in chemical or biological attacks. | – Install cameras on the airfield and in secure areas for increased security surveillance.<br>– Implement airport access restrictions, including fencing and gate access restrictions for the airfield.<br>– Consider implementing background checks for airport employees at a regular interval, approximately every two to three years.<br>– Understand that no organization is too small to fall victim to a terrorist attack and work to implement a policy of "if you see something, say something." |
| Cyberattacks and cyber terrorism | Airports are vulnerable to cyberattacks, whether perpetrated by adversarial actors or hobbyist hackers. Cyberattacks can affect all interconnected airport systems or may impact a system the airport relies on while not targeting the airport directly. There are also possible ramifications for airport tenants whose business operations may make them more likely to become the victim of a cyberattack (e.g., Department of Defense operations or defense contractors). | – Understand that no organization is too small to fall victim to a cyberattack and work to implement a policy of "if you see something, say something."<br>– Coordinate with airport staff and tenants on best practices for personal devices, such as identification and authentication systems.<br>– Consider the implementation of countermeasures like the completion of a risk assessment or implementation of access control measures.<br>– Consider backup systems and system redundancy in the airport IT network.<br>– Ensure software and systems are up-to-date with the latest patches installed. |
| Transportation incidents | Incidents in other areas of the transportation network (e.g., vehicle and rail incidents) can create ripple effects at GA airports. These can include delays in scheduled flights, increases in calls to emergency response centers, and impacts on the regular flow of traffic to and from the airport. | – Coordinate regularly with local emergency response personnel to ensure notification of critical agencies during a transportation incident.<br>– Establish emergency routing for various access points to the airport in the event of road closure.<br>– Establish letters of agreement (LOAs) with applicable local, state, and regional emergency response agencies and the airport tower (if applicable). |
| Airport security | Intentional, adversarial actors may threaten runway security in numerous ways. Airports must maintain runway security and rapidly respond if it is threatened or impacted to maintain operations. | – Install runway lights to provide better visibility to pilots and airport personnel.<br>– Install a security access control system with individualized access that includes complete camera coverage of the airfield and a wireless gate providing 24/7 control of the airfield.<br>– Install security fencing around the airport property or the airfield at a minimum.<br>– Provide airfield access and security training, such as drivers training, to ensure safe access and operations in the airfield. |
| Power outage | Airports and airport systems rely on electricity to function correctly. When the electrical supply is disrupted through a power outage, airports may be partially or fully unable to operate safely until power is restored. | – Establish a plan to back up systems in the event of a power outage (e.g., consider on-site generator).<br>– Ensure there are hard copies of important documents (e.g., communications plan, airport emergency plan) on hand to reference.<br>– Review all assets that require power for both minimal and maximum operations, develop a plan for them in the event of a power outage. |

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**Table D-1. (Continued).**

| Operational | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Industrial disasters | Airports with either on-site industrial companies or properties near industrial sites should be prepared for the potential impacts of an industrial disaster. Even if such a disaster does not occur on airport property, it will likely impact operations for some time. | – Have an established emergency operations plan in place to outline the airport's role in an industrial disaster and the role of each airport staff member and department before, during, and after a catastrophic industrial disaster event.<br>– Communicate and regularly coordinate with local stakeholders and emergency response personnel.<br>– Consider completion of tabletop exercises on a regular interval to practice emergency response protocols. |
| Aging infrastructure | Airports in the United States are, on average, 40 years old. Due mainly to limited funding, airports have focused on immediate needs (maintenance) versus being able to fund larger, much-needed infrastructure projects. | – Document infrastructure inventory and condition to prioritize rehabilitation/reconstruction/replacement/upgrade activities.<br>– Update infrastructure with resilience in mind.<br>– Develop and maintain an airport pavement management program to preserve adequate federal funding for airport pavements. |
| Construction projects | There are potential operational and safety challenges during construction projects on the airfield. While they are planned for and phased in advance, there may be unexpected activity, changes in plans, or accidents that may change or alter impacts to the airport. | – Ensure contract documents include emergency action plans to address potential challenges during construction.<br>– Share contract documents, schedules, daily activity plans, etc., with all airport staff. |
| VIP visits | While special events often provide time for planning for impacts to airports, some special events, like a presidential visit, may not provide enough notice to address impacts to airport operations. | – Review *ACRP Synthesis 57: Airport Response to Special Events* (Kramer and Moore 2014) and use provided suggestions, checklists, and case-study information to prepare. |

| Social | | |
|---|---|---|
| **Shock/Stressor** | **Description** | **Associated Best Practices/Mitigating Actions** |
| Human pandemic | A human pandemic can devastate the workforce across the aviation community and cause travelers to reduce their travel drastically. Airports must help passengers feel safe while working with limited funds and personnel. | – Develop and implement robust resilience plans that address staff and stakeholder health and safety.<br>– Create and maintain a mechanism for authorizing electronic signatures.<br>– Build a drop box outside the terminal to submit paperwork remotely.<br>– Transfer meetings to a virtual space. |
| Personnel issues | Many things can cause airports to experience a lack of personnel, including financial, social, economic, and political causes. Airports need to identify their critical staffing levels and manage the impacts of reduced staffing. A compounding issue is finding sufficiently qualified and experienced personnel. Low wages for airport staff have also led to retention difficulties. | – Prioritize staff viewpoints while solving problems at periodic operations staff meetings (on a regular interval), "all hands" meetings, and other gatherings.<br>– Hire part-time personnel to fill staffing gaps.<br>– Use colleagues from other airports within the airport system to fill staffing gaps.<br>– Develop and post job openings that more specifically outline the desired experience and qualifications.<br>– Advocate for increasing pay, additional benefits, and employee appreciation programs to increase staff retention.<br>– Consider and treat employees as stakeholders to encourage participation in airport activities, incorporating the feedback from those who are most knowledgeable about the airport and ensuring the employees feel like valuable assets. |

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TOOL E

# Case Studies

*The case studies provide more in-depth information from GA airports' best practices to further identify resources needed to address shocks and stressors.*

## Introduction

The following case studies were developed to provide a holistic and accurate picture of nationwide shocks, stressors, and resilience activities. The case studies document some of the best practices airports are employing to mitigate the impacts of shocks and stressors. As part of the toolkit development, the research team conducted interviews with 18 GA airports across all FAA regions. The team then selected seven airports and Alaska's Division of Statewide Aviation (SWA) (see Table E-1) to serve as case studies based on various selection criteria, including airport size and complexity, FAA region, shocks and stressors, and current resilience-planning efforts.

**Table E-1. Overview of case-study airports.**

| Airport Name | Airport Code | FAA Region | Airport Role | Annual Operations* | Longest Runway Length* (FT) | Shocks and Stressors |
|---|---|---|---|---|---|---|
| St. Charles County Smartt Airport | SET | ACE | Regional | 60,720 | 3,800 | Flooding, winter storms, severe weather, human pandemic |
| Pine Bluff Regional Airport | PBF | ASW | Local | 8,900 | 5,998 | Aircraft incidents, fuel price increases, severe weather |
| Rock Hill–York County Airport | UZA | ASO | Regional | 28,100 | 5,500 | Personnel issues |
| Arlington Municipal Airport | AWO | ANM | Regional | 67,080 | 5,332 | Aircraft incidents, severe weather, human pandemic |
| Chennault Airport | CWF | ASW | Regional | 18,914 | 10,702 | Hurricanes |
| Phoenix Deer Valley Airport | DVT | AWP | National | 402,444 | 8,196 | Human pandemic, severe weather |



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**Table E-1. (Continued).**

| Airport Name | Airport Code | FAA Region | Airport Role | Annual Operations* | Longest Runway Length* (FT) | Shocks and Stressors |
|---|---|---|---|---|---|---|
| Madison Municipal Airport | IMS | AGL | Local | 15,650 | 5,000 | Economic, personnel issues |
| Alaska Division of Statewide Aviation | Various | AAL | Various | Various | Various | Severe weather, infrastructure |

*Note: For the purposes of this case-study report, annual operations and length of longest runway at the airport were obtained through the FAA Form 5010-1 Airport Master Record for Existing Public Use Airports for each facility.

## St. Charles County Smartt Airport

### Airport Background

St. Charles County Smartt Airport (SET) is a county-owned airport in St. Charles County, Missouri (FAA Region ACE). The FAA classifies it as a large GA airport; St. Charles County Smartt Airport completed over 60,000 operations in 2018. The airport has two runways, 109 based aircraft, and two flight schools. The airport accommodates single-wheel main landing gear aircraft up to 12,500 lb. It offers many of the services of a larger airport, such as runway lighting, aircraft hangars and tie-downs, an automated weather station, Wi-Fi, and a pilot lounge. The airport serves as an operating base for several organizations and businesses, including the Missouri Wing of the Commemorative Air Force, the St. Charles Flying Service, and Skylink Aviation. Airport staff at St. Charles County Smartt Airport regularly maintain their web page highlighting services and amenities, available aircraft space, development opportunities, and relevant news and photos.

St. Charles County Smartt Airport has focused most of its resilience-planning efforts around potential flooding events. While the airport experiences other weather events, such as snowstorms, the frequency and severity of flooding incidents pose the most severe threats to operational security. While county rules prohibit St. Charles County Smartt Airport staff from using volunteer assistance, airport tenants within the local community are permitted to and often help with activities like moving aircraft to higher ground before a flooding event. In addition, St. Charles County Smartt Airport relies on a strong community network of regional GA airports for assistance during these incidents.

St. Charles County Smartt Airport has built a strong relationship with the local community by conducting several outreach activities and programs. These activities allow residents to engage with their local airport and learn about its mission, operations, and services, building goodwill and trust between St. Charles County Smartt Airport and the surrounding community. Programs and activities conducted by airport staff include the following:

- Annual Airport Open House and Pumpkin Drop
  - The airport is opened to the public with aircraft, military equipment, and fire and emergency services vehicles on display. Food and drink are available. Aircraft can be rented from St. Charles Flying Service with a load of free pumpkins. Aircraft and the renters then fly over a designated ground target attempting to get as close to the target as possible.
- Route 66 Corvette Club Rally
  - A group of local Corvette owners gathers for a two-day event on the west ramp of the airport, where they conduct timed "slalom runs" through a designated course. The slalom runs are one car at a time, not a multicar race. There is a daily fee for using the ramp,

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setting up and tearing down barricades, and using the restrooms and banquet facility in the administration/terminal building.

- Military exercises
  - The airport has been the site of several airport-related military exercises held in conjunction with Scott Air Force Base personnel in St. Clair, Illinois.

In addition, St. Charles County Smartt Airport rents out its banquet room and conference room to local community residents for events such as bridal and baby showers, fundraisers, and corporate meetings.

### *Airport History*

In the early 1940s, the U.S. Navy purchased the grounds from Ruth Neubeiser and constructed an octagonal, eight-runway airfield complete with an outer circular taxiway, hangars, and barracks. They used it as an auxiliary training field during the early years of World War II. Originally named Neubeiser Field, it was renamed Field #34512 by the Navy. At the start of World War II, the name was changed again to Smartt Field in honor of Ensign Joseph Gillespie Smartt, who was killed in the Japanese attack on Pearl Harbor, Kaneohe Bay, Hawaii, on December 7, 1941. He was the first St. Charles County resident to be killed in the conflict. In 1957, the federal government deeded the airport grounds, consisting of 184 acres, to the City of St. Charles and St. Charles County. The city subsequently released its portion in 1976 to the county.

### *Shocks and Stressors*

St. Charles County Smartt Airport experiences the following shocks and stressors:

- Flooding: Because of its proximity to the Mississippi River, the airport experiences recurrent flooding. In the past 8 to 9 years, the airport experienced five floods; four were "regular" floods, while one was classified as extreme.
- Winter storms and severe weather: The airport experiences snowstorms and annual heat-related stress.
- Human pandemic: The COVID-19 pandemic caused an initial decrease in activity at the airport's flight schools; however, that dip was followed by a substantial increase in students that St. Charles continues to experience in the present year.

## Current Practices and Resources Available

When St. Charles County Smartt Airport experiences flooding, the airport manager shuts down service due to floodwater affecting the airport's perpendicular runways. Airport staff use the following additional resilience tools and strategies to manage flood-related issues:

- Keeping a cheat sheet in the main office that displays the height of the river versus location of water on the airport to predict airport closure and warn tenants to move aircraft ahead of a flooding event,
- Developing a procedure to raise T-hangar doors during a flooding event to let the water flow through the hangar,
- Contracting a cleaning company to respond within 72 h after a flooding event to clear silt and debris from the area and to power wash buildings, and
- Maintaining an updated contact list of tenant emails and developing a process to periodically send out alerts with increasing frequency ahead of potential flooding events to notify tenants that they may need to take action.

## Lessons Learned

Based on challenges from previous incidents, airport staff at St. Charles County Smartt Airport implemented the following changes to operations, maintenance, and planning to better prepare for and mitigate the impacts of future flooding incidents:

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- Rebuilding flood-prone buildings with concrete block instead of drywall to minimize infrastructural damage and expedite the cleaning process so operations can resume quickly,
- Eliminating all carpeting from flood-prone office buildings to further aid the cleaning process and reduce the chances of mold or water damage to the building,
- Making design modifications to T-hangars to allow water to flow through more easily during a flooding event, and
- Overhauling the runway lighting system to replace the LED lights more susceptible to water damage with older technology that can better withstand flooding.

## Future Challenges

The effects of global climate change on natural disasters threaten the operational resilience of GA airports across the United States, as weather-related incidents continue to increase in frequency and severity. The primary future shock that airport staff mentioned as an area of concern was the potential for larger, more destructive floods moving forward. St. Charles County Smartt Airport faces the possibility of longer-term airport closures and disruptions to regular service if flooding from the Mississippi River continues to escalate. Airport staff expressed the need to continuously improve flood-related resilience planning and practices to better meet and mitigate this impending threat.

## Desired Future Improvements

Airport staff at St. Charles County Smartt identified pre-incident planning as the primary process to improve resilience planning at the airport and better prepare staff and tenants for future flooding events and other natural disasters. Other processes to improve future incident response include the following:

- Obtaining portable cargo containers and establishing a process to collect and consolidate the equipment and items that must be taken off the airport in the event of a flood; and
- Creating a holistic and consolidated evacuation process (to plan for potential new obstacles, such as destruction of runways due to floodwater) for aircraft and other equipment rather than the current piecemeal process.

In addition to these flood mitigation-related improvements, staff at St. Charles County Smartt Airport listed several potential ideas for increasing engagement with the local community and strengthening relationships with residents:

- Host half-marathons on a track around one of the airfield ramps and taxiway,
- Initiate drone training with flight demonstrations and capability testing,
- Feature remote-controlled scale-model car racing,
- Construct a research-and-development facility, and
- Establish a solar power-generating farm.

## Summary of Findings

- The primary shocks that St. Charles County Smartt Airport experiences are flooding and flood-related damage to infrastructure and aircraft.
- Resilience strategies, such as modifying T-hangars to let water flow through, reinstalling a non-LED runway light system, and replacing building materials, have successfully reduced property damage and allowed St. Charles County Smartt Airport to better maintain operational capacity after flooding events.
- Airport staff identified a need for a more robust and codified pre-incident planning process to better prepare staff and tenants for future incidents and associated potential new obstacles.

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### Applicability to Toolkit

Flooding and water damage are significant concerns for GA airports across the country. This case study represents some of the obstacles flood-prone airports face and the resilience planning and activities airports conduct to respond to these obstacles and keep airport services operational. As a major area of concern for many GA airports across the United States, the tools, strategies, and best practices provided in this case study will directly impact the efficacy of the Self-Directed Resiliency Toolkit.

*Source: St. Charles County Smartt Airport Manager*

## Pine Bluff Regional Airport

### Airport Background

Pine Bluff Regional Airport (PBF or Pine Bluff), also known as Grider Field, is a city-owned airport located in Pine Bluff, Arkansas (FAA Region ASW), at 205 ft elevation. The airport has 35 aircraft and five full-time staff on duty, 8:00 a.m. to 6:00 p.m., 7 days per week. The primary stakeholders are private owners, corporations, and the military. In addition, since it is a city airport, the county government, Jefferson County, is also active in the airfield. Airport amenities include a restaurant, a flight-planning room with Wi-Fi, publicly accessible computers to check current weather conditions, a quiet room, and publicly accessible showers. The airport's fixed-base operator (FBO) services include AvGas and Jet-A fuel, hangars for aircraft storage, and independent avionics and maintenance shops for necessary aircraft repair and maintenance. Airport staff at Pine Bluff regularly maintain their web page, highlighting airport amenities, operations, and updates that may arise. Pine Bluff also maintains a Facebook page for increased communication.

#### *Airport History*

During World War II, Pine Bluff was initially opened as a U.S. Army Air Corps base under Pine Bluff School of Aviation. The airfield covers nearly 900 acres and lies 5 mi south of the City of Pine Bluff. The airport had existed in many iterations, including serving as a military flight instruction school during World War II, with ownership by the City of Pine Bluff from 1947 to 1957, and then as a valuable community asset when it was returned to operation by the community with the establishment of the Pine Bluff Aviation Commission in 1957. Today, the airport features a collection of World War I and World War II aviation artifacts. It is restoring and maintaining its original military barracks as an airport exhibit and museum.

#### *Shocks and Stressors*

Pine Bluff experiences the following shocks and stressors:

- Aircraft incidents: Given the airport's size, aircraft incidents threaten to shut down the airport for a sustained period.
- Economic concerns: Airport staff identified inflation, particularly the fuel price, as a major stressor for the airport.
- Severe weather: Storms threaten this airfield, particularly the resulting damage from floods and high winds.

### Current Practices and Resources Available

Airport staff emphasized building strong relationships with other GA airports similar in size and operational scope to Pine Bluff. Participating in the Arkansas Airport Association allows

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Pine Bluff staff to meet other airport personnel and share information and strategies, strengthening their resilience planning and activities. Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- Aircraft incidents: Pine Bluff staff created an emergency plan that details how staff should react in the event of terrorism, plane crashes, or other incidents and accidents on the airfield.
- Economic concerns: In planning for the rising fuel price, Pine Bluff has prepurchased as much fuel as possible to fill its 12,000-gal tank, allowing them to bank as much fuel as possible to hold their prices on the airfield low for as long as possible.
- Severe weather: Pine Bluff has installed cameras to monitor the airfield remotely, ensuring staff can react quickly to any weather-related damage.
- Public health crises: Pine Bluff is a part of the City of Pine Bluff Continuity of Operations plan and is designated by the State of Arkansas Department of Health as a part of the Point of Dispensing Plan. This designates that the airport can be used as a site for emergency medication dispensing in the event of an emergency or public health crisis. In this way, the airport provides an additional layer of resilience for the community in the event of a shock event. This arrangement was implemented approximately 5 years ago and is reviewed annually by the airport.
- Relationship-building and collaboration: In addition to participating in the Arkansas Airport Association, Pine Bluff staff regularly collaborate with nearby airport managers at Stuttgart Municipal Airport and Hot Springs Memorial Airport.

## Lessons Learned

Based on challenges from previous incidents, airport staff at Pine Bluff identified the following best practices to better prepare for future shocks and stressors:

- Severe weather: Airport management has a long history of managing storms on the airfield, and they rely on this experience to help during these incidents. Because of the surprising nature of tornadoes, it is vital to have planning in place to manage tornado events. Pine Bluff is located within Tornado Alley, the area of the country where tornadoes occur most frequently. The National Weather Service maintains an Automated Surface Observing System at Pine Bluff; this system helps maintain weather data for the airport and its surrounding area.
- Staffing and preparedness: The airport can do a lot with a small staff because of their emergency planning for shock events and stressors, including an on-airfield plan of standard protocols and emergency contacts.
- Staff meetings and feedback: Airport staff at Pine Bluff report that their small-sized staff is knowledgeable about their roles and airport operations. As a result, airport management prioritizes staff viewpoints while solving problems at weekly operations staff meetings. When they occur, these meetings are the site of post-shock debriefs with airport staff to discuss what went well and what staff can do to prepare for future emergencies.
- Emergency services coordination: Pine Bluff staff regularly coordinate with their emergency management stakeholders with special coordination with local police and fire departments. In an emergency, Pine Bluff staff contact the Metropolitan Emergency Community Association (MECA), which serves as the communication hub for the entirety of Jefferson County. The airport maintains a step-by-step plan for staff to follow during airport incidents for communication and coordination with MECA during an emergency. Plans are tailored specifically to Pine Bluff and include valuable information, such as the location of the airport's water taps, the best gates for entrance to the airfield, and the gate access codes. Also included are information on types of aircraft and their fuels and additional details to maintain the safety of persons and property.

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- Airport role: Airport staff at Pine Bluff report that part of the airport's role is educating its local government and community members, whether airport users or not, on the value of the airport to its community and region. The airport serves as a resource in emergencies and contributes to the local economy by selling fuel and collecting taxes for the City of Pine Bluff. The airport also holds events open to the community, such as Operation Skyhook, an annual Memorial Day weekend fly-in and competition sponsored by the Black Pilots Association of America, which welcomes aircraft spectators and children to experience discovery flights at the airport.

## Future Challenges

The primary future stressor Pine Bluff staff mentioned is the volatile economy. Staff expressed concern that high fuel prices threaten the airport's ability to continue normal operations, as prices will drive away potential customers on the airfield. The airport tries to purchase large amounts of fuel when prices are low to provide a fuel reserve and allow the airport to hold prices down for customers for as long as possible. The economic fluctuations cause a chain reaction of price increases: airplane parts are more expensive, so fewer pilots fly their aircraft. As a result, the airport sells less fuel and struggles to fund current operations and future improvements. Airport staff also reported concern with the shortage of fuel for truck drivers. This shortage impacts the fuel price and the fuel's ability to be easily and regularly delivered to remote or rural airports.

## Desired Future Improvements

- Airport staff indicated a desire to continue the development of emergency plans for managing weather events and fluctuations in the economy.
- Pine Bluff staff continue to plan for the rise in fuel prices and develop plans to keep gas prices consistent.

## Summary of Findings

- Inflation and rising fuel prices have become a major concern for airport management at the Pine Bluff Regional Airport.
- The airport's location within Tornado Alley requires an extra level of preparedness for natural disasters and subsequent coordination with emergency services agencies.
- The airport prioritizes communicating its value to its local government and community stakeholders. The airport staff feels this is significant for the airport's continued resilience in terms of funding.

## Applicability to Toolkit

Pine Bluff Regional Airport provides a case study covering a variety of shocks and stressors that can potentially disrupt airport operations, including issues related to the economy and safety and security. Pine Bluff Regional Airport is well situated to manage shocks and stressors because of its foresight in developing plans for shock events and maintaining regular collaboration with emergency services personnel. Airport staff have developed several tools for emergency preparedness, including a step-by-step guide for airport incidents and emergencies and fire department notes for regular collaboration with the local fire department in a fire emergency on the airport. Additionally, an airport emergency plan coordinating with MECA in Jefferson County includes key contacts and phone numbers. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Source: Pine Bluff Regional Airport Manager*

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# Rock Hill–York County Airport

## Airport Background

Rock Hill–York County Airport (UZA) is a city-owned airport in Rock Hill, South Carolina (FAA Region ASO). The airport has one runway, one flight school, 157 based aircraft, and an on-site FBO. According to the FAA, the airport completed 32,000 operations in 2021. Rock Hill–York County Airport operates on a hangar owners' association (HOA) concept; the hangars are individually owned, and a selected board of directors represents the interests of tenants at the airport. When the hangar lease is up, all the properties revert to city property, and owners become direct airport tenants, except for the first group of tenants to ever lease at Rock Hill–York County Airport. A joint City/County Airport Commission advises the city council on operational matters and advises the city and county councils on planning and capital improvements. Airport staff at Rock Hill–York County Airport regularly maintain their web page, highlighting information about the airport facilities, services and programs, and airport master plan.

Rock Hill–York County Airport has engaged the local community by maintaining strong relationships with HOA leadership. In addition, airport staff have built a network of contacts with other GA airports of similar size and scope to exchange information on resilience strategies, best practices, and resources. The airport generates revenue from fuel sales, leases, concessionaire-type payments such as rental cars and parking spots, and taxes generated from aircraft and buildings.

### *Airport History*

Rock Hill–York County Airport first opened on a 364-acre tract of land purchased by the Rock Hill City Council in 1959. Shortly after, an airport commission was formed with six local members interested in advancing the airport's facilities. In 1991, the runway was extended to its current length of 5,500 ft, allowing support for virtually all piston and turboprop aircraft and most short-to-medium range business jets. A 7,200-ft$^2$ terminal, called the John Anderson Hardin Terminal, was built in 1999, refurbished in 2015 to include state-of-the-art facilities for pilots and travelers alike, and expanded in 2021 to a total of 8,400 ft$^2$.

As a design for the future, the FAA adopted an airport master plan developed by UZA airport management on September 26, 2003. This dynamic plan was put in place to occur over 20 years from 2003 to 2022 and included enhancements such as rehabilitating airfield lights (completed in 2010), overlaying the runway (completed in 2012), a full apron rehabilitation (completed in 2014), repaving of taxiways and fillet widening (completed in 2017), and extending the runway by 1,000 ft to accommodate transcontinental flights.

### *Shocks and Stressors*

Rock Hill–York County Airport experiences the following shocks and stressors:

- Aircraft incidents: Even more minor incidents, such as an aircraft sustaining a flat tire when it lands, can disrupt airport service, as Rock Hill–York County Airport conducts all services on a singular runway. More significant incidents, such as a crash or landing-gear malfunction, can potentially shut all airport activity down for extended periods.
- Security concerns: Currently, the airport's vehicle access gates are unlocked using a pin code, which is not trackable. This has led to a lack of accountability and security regarding tenants and guests entering airport grounds.
- Construction-related disruptions: Airport staff identified planned stressors that disrupt regular airport operations, such as improvement projects, as a current and future area of concern. These projects often involve construction equipment and crews, which cause disturbances in day-to-day airport services. Rock Hill–York County Airport currently has hangars under construction and an access improvement project.

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- Personnel issues: The airport's on-site FBO, Skytech, has struggled to find full-time personnel to fill gaps in staffing due to worker shortages.
- Severe weather: The 2021 winter season forced airport staff to close Rock Hill–York County Airport down twice due to ice and snow conditions.

## Current Practices and Resources Available

Airport staff emphasized building strong relationships with other GA airports similar in size and operational scope to Rock Hill–York County Airport. Participating in statewide conferences allows airport staff to meet other personnel and share information and strategies, strengthening their resilience planning and activities. Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- Security concerns: Airport staff plan to upgrade the previous pin code access system to a badge or fob, which will be assigned to a specific tenant and needed to gain access.
- Disruptions in operation: Rock Hill–York County Airport staff send information about airport disruptions to the HOA board of directors to further disseminate among tenants. Staff emphasized the importance of building good relationships with tenants and keeping updated contact information for all current tenants.
- Personnel issues: The airport's on-site FBO, Skytech, addressed line service staffing gaps by mainly hiring part-time workers, with just one or two full-time positions on the team.

## Lessons Learned

Based on challenges from previous incidents, airport staff at Rock Hill–York County Airport identified the following best practices to better prepare for future shocks and stressors:

- Disruptions in operations: Airport management ensures detailed and thorough safety plans are put in place for the contractors and subcontractors to ensure little interference with airport operations and to ensure safety for everyone involved.
- Severe weather: While the airport does not have snow removal equipment, its runway is grooved, which assists in the melting of snow and ice and the prevention of hydroplaning in rain conditions.
- General: Airport staff mentioned reaching out to airports within the same region to share ideas, lessons learned, and best practices for similar shocks and stressors. Staff emphasized the benefit of an open line of communication and an environment conducive to sharing planning documents and discussing potential resilience projects and activities.
  - Rock Hill–York County Airport staff conduct post-event review meetings to discuss what went well, opportunities for improvement, and any lessons learned during the event.
  - Staff also outlined the importance of educating local decision-makers, such as county or city officials, to create the flexibility necessary to address unforeseen shocks and stressors.

## Future Challenges

Rock Hill–York County Airport will implement several future airport improvement projects, including a rehabilitation project for the taxi runway in 2023. These projects have considerable potential to disrupt regular airport operations and create new safety and security hazards. Airport staff emphasized the need to minimize impacts on tenants and keep all tenants, staff, contractors, and other stakeholders safe and secure. These planned shocks and stressors pose the biggest challenge to resilience at Rock Hill–York County Airport. Staff are currently outlining strategies and tools to combat this challenge moving forward to maintain regular operations.

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### Desired Future Improvements

No input was received on desired future improvements for this interview.

### Summary of Findings

- The primary shocks or stressors at Rock Hill–York County Airport have resulted in planned changes or improvements, such as including security and access systems, to airport operations that benefit staff and tenants but strain day-to-day operational service.
- The primary resilience strategies for countering these shocks and stressors are maintaining a constant line of communication to all staff, tenants, and contractors regarding disruptions or changes to service and creating continuity of operations and safety plans for periods of disruption.
- The primary best practice that Rock Hill–York County Airport identified was creating a network of airport staff contacts at similar GA airports across the United States and within the region to share information on resilience strategies and resources.

### Applicability to Toolkit

Issues related to safety and security are an area of concern for GA airports across the country. This case study outlines potential solutions and best practices for improving airport security for staff and tenants while minimizing disruptions to service. Rock Hill–York County Airport provides a case study covering a variety of shocks and stressors that can potentially disrupt airport operations. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Source: Rock Hill–York County Airport*

## Arlington Municipal Airport

### Airport Background

Arlington Municipal Airport (AWO) is a city-owned public airport located in Arlington, Washington (FAA Region ANM). The airfield has two asphalt and three turf runways, including one for gliders and one for ultralight craft. In addition, Arlington Municipal Airport has approximately 400 tenants and 202 based aircraft. According to airport staff, Arlington Municipal Airport completes over 70,000 operations a year. The airport provides numerous services, including flight training, aircraft fueling, charter operations, and aircraft maintenance. Because of the COVID-19 pandemic, the airport also functions as the second largest vaccination site in Washington, allowing thousands of residents to receive vaccinations. Airport staff at Arlington Municipal Airport regularly maintain their web page, highlighting airfield services, airport history, and airport projects.

Arlington Municipal Airport has found great success in its community relations—the airport provides the local community with jobs, within the airport and with the many aerospace manufacturers and suppliers located in its vicinity. Many residents in the surrounding area have jobs in the aerospace field. Additionally, airport staff hold regular events to conduct outreach to the local community, including the following:

- Airport Community Day: Activities include free plane rides for children, flyovers, flight simulators, and helicopter tours.
- Flying Legends of Victory Tour: Residents can ride in rare historical military aircraft, such as the B-17 Flying Fortress *Sentimental Journey* and the B-25 Mitchell *Maid in the Shade*.
- Arlington Skyfest: Events include an air show, a drone show, and a Camp Adams military display.

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### *Airport History*

Arlington Municipal Airport dates to February 13, 1934, when the Arlington Commercial Club leased 200 acres of forestland from Mr. M. Mirckenmeier for $100 per year. Over the next several years, the airport was used by local and itinerant private fliers, aerial circuses, and the Forest Service for ferrying supplies to firefighters battling costly blazes in remote, heavily timbered areas of the rugged Cascades. In February 1939, the lease expired, and the town of Arlington was given the option to purchase. The town could not afford to purchase the land and appealed to the U.S. War Department for assistance. The airport became the U.S. Naval Auxiliary Air Station, Arlington, Washington, in 1940, when the Navy leased the airstrip from the town of Arlington to supplement training facilities in Seattle. Several major projects were undertaken, including runways, aircraft hangars, and roads. After the Air Station, the airport rapidly assumed its caretaker status and was primarily used as an emergency landing field for the Naval Air Station Whidbey.

The city continues to support GA through planning and development. During the 1995 master plan update, the city planned and developed the airport specifically for GA use. Items specific to GA included in the past master plan updates are additional T-hangars and a 100- x 1,000-ft ultralight runway.

### *Shocks and Stressors*

Arlington Municipal Airport experiences the following shocks and stressors:

- Aircraft incidents: Even minor aircraft incidents can shut down a runway, while significant accidents and crashes may shut down the entire airport and suspend operations.
- Severe weather: Arlington Municipal Airport deals with heavy winter rains, winter snowstorms, and high winds. In recent years, the frequency and severity of snowstorms have increased, posing a significant threat to operational capacity. Arlington Municipal Airport does not currently own adequate snow removal equipment to combat these issues.
- Human pandemic: The COVID-19 pandemic negatively impacted many businesses supported by the airport. Arlington Municipal Airport has approximately 190 commercial leases; due to the pandemic, many businesses, including machine shops specializing in aircraft parts, were forced to let go of staff. Despite some businesses applying for economic relief through loans and grants, airport staff noted that the pandemic still impacts business.

## Current Practices and Resources Available

Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- Aircraft incidents: Arlington Municipal Airport benefits from highly experienced and qualified staff. The staff include an airport manager, an operations manager, two operations specialists, and an office manager. Airport staff have implemented an emergency plan that provides continuity of operations and safety planning for aircraft incidents to resume daily operations quickly. In addition to the emergency plan, Arlington Municipal Airport has emergency equipment for any crashes or accidents and fire support across the street from the airport.
- Severe weather: When the airport experiences high winds with the potential to damage or move aircraft, airport staff communicate via email to all tenants to ensure aircraft are secured, all hangar doors are closed, and equipment has been safely relocated.
- Communications: All staff at Arlington Municipal Airport have communications cards that provide them with telephone priority access. Because phone lines will be clogged during an emergency and can impact communication and incident response, staff use these cards to maintain contact. In addition, airport staff keep cards on their person with all relevant emergency phone numbers and contact information for emergency and maintenance personnel.

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- Airport network: The Washington Airport Management Association (WAMA) is a vital resource for staff at Arlington Municipal Airport. Staff use WAMA to obtain information on airport operations, resilience strategies and resources, and other tools.

## Lessons Learned

Based on challenges from previous incidents, airport staff at Arlington Municipal Airport identified the following best practices to better prepare for future shocks and stressors:

- Aircraft incidents: Arlington Municipal Airport conducted its first practical exercise several years ago for a major aircraft incident. The exercise involved a complete mock-up of the aircraft fuselage and volunteers posing as victims who needed triaging. The exercise incorporated the local fire department and police department, and airport staff invited personnel from other regional and local airports to participate and observe the exercise. Following the exercise, airport staff held an after-action meeting to discuss strategies, lessons learned, and best practices. In addition, Arlington Municipal Airport conducts annual tabletop exercises and an annual review of its emergency plan.

## Future Challenges

The primary future shock that staff at Arlington Municipal Airport are preparing for is a major fault line off the coast of Oregon and Washington that is expected to shift drastically; this event is expected to be a nine on the Richter scale, causing massive damage to the West Coast. Experts predict a high number of casualties and significant property and environmental damage. At the time of this interview, Arlington Municipal Airport was preparing for an exercise known as Cascadia Rising. Cascadia Rising is a multistate and multiagency national-level exercise that took place in June 2022 and focused on the major rupture along the Cascadia Subduction Zone. The focus of many GA airports in the region is planning for this potential event because of its projected size and impact; this is likely to be the ultimate pressure test of resilience for Washington State. As part of the planning efforts to combat this potential incident, Arlington Municipal Airport signed a memorandum of understanding with the Washington Department of Defense to use the airport as a staging area and a secondary location to store equipment, FEMA trailers, and base personnel.

## Desired Future Improvements

Airport staff identified a project Arlington Municipal Airport was tracking to develop the first entirely electric airplane. The model is being engineered from the ground up, and Arlington Municipal Airport is currently involved in high-speed testing in preparation for its first flight. Because of its use of lithium batteries, any incident involving this type of plane would necessitate a unique set of firefighting techniques, which airport staff are interested in researching and developing. In addition, Arlington Municipal Airport is interested in obtaining a quick-response rescue firefighting vehicle to keep on the field and potentially training its operations specialists to use the vehicle.

## Summary of Findings

- Arlington Municipal Airport's primary shock experiences currently include aircraft crashes and accidents, both major and minor.
- To improve resilience and preparedness for these potential incidents, airport staff conduct annual tabletop exercises and a practical exercise to train all relevant stakeholders on strategies to mitigate the impact of incidents on airport operations.

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- Arlington Municipal Airport is preparing for the primary future challenge involving the potential shift of a major fault line along the Washington and Oregon coast, severely impacting communities, businesses, and airports throughout the region.
  - Significant planning is underway to prepare for this potential event as effectively as possible.

### Applicability to Toolkit

Issues related to aircraft incidents and weather events have impacted GA airports nationwide. Arlington Municipal Airport provides a case study covering a variety of shocks and stressors that can potentially disrupt airport operations. This case study outlines potential solutions and best practices for improving airport resilience against these shocks and stressors, responding quickly and effectively to emergencies, and maintaining day-to-day operations. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Source: Arlington Municipal Airport Manager, David Ryan*

## Chennault Airport

### Airport Background

Chennault International Airport (CWF) is in Lake Charles, Louisiana (FAA Region ASW). The Chennault International Aviation Authority manages the airport and its seven-member board of commissioners. In addition to private tenants, other stakeholders include the National Guard, the Coast Guard, and any other agencies that would use the airport as a staging ground during a natural disaster. Voted Louisiana Airport of the Year in 2021, Chennault International Airport management embraces change in preparing for shocks and stressors for continued resilience. Since this airport relies on the taxpayer for funding, airport management spends significant time and resources on marketing to ensure the community understands its importance to the area.

#### *Airport History*

Chennault is near the Port of Lake Charles, Port Charles Rail, and the I-10 highway. Named after Lt. General Claire Chennault, a member of the famous Flying Tigers, Chennault International Airport was originally purposed as a World War II military air base and school for U.S. fighter pilots; later, it was also used as a training ground for military bombers. Today, Chennault has been designated a noncommercial airport with GA and military operations. Chennault is a primary employer in Lake Charles, Louisiana, employing nearly 1,500 people directly at the airport and indirectly supporting almost 3,000 jobs. The airport is also home to emergency services, educational programs, maintenance and repair, and several other businesses in the Chennault business park, including the following:

- Aerospace firm Northrup Grumman;
- FBO Million Air;
- Masonite/Louisiana Millwork;
- Aircraft interior completion firm Citadel Completions;
- Aircraft refinishing company Landlocked Aviation Services;
- Construction company Planet Construction;
- Trucking school CDL Mentors; and
- Electric cooperative Jeff Davis Electric, Co-op.

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### *Shocks and Stressors*

Chennault International Airport experiences the following shocks and stressors:

- Weather events: Airport staff reported the primary shocks they manage are tropical storms and hurricanes. The airfield was directly hit by two hurricanes in 2021, resulting in $130 million in damage. After the storms, the airfield was forced to run from generated power for almost 45 days. Every facility on the airfield experienced damage and, as a result, will be rebuilding into 2023. The airport was resilient in response to the hurricanes, reopening airport operations within 1–2 h of each storm's end. During these emergencies, the airport was the home base for emergency services, hosting the U.S. National Guard, FEMA, the Louisiana DOT, the Blue Tarp Program, and more than 1,200 emergency response personnel.

## Current Practices and Resources Available

Airport staff emphasized the importance of building strong relationships with other GA airports similar in size and operational scope to Chennault International. In addition, airport staff mentioned their close working relationship with the Louisiana DOT, which is particularly important to leverage during hurricanes. Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- Severe weather: Airport staff have installed generators in the event of power outages from tropical storms or hurricanes. However, staff have identified the need to replace these generators with units that can run for more extended periods. In addition, airport staff developed a checklist and operating procedure to notify tenants of potentially dangerous weather events and convey to tenants steps the airfield is taking to prepare.
- Airport management: Airport management at Chennault reported the importance of having a vision. The airport manager shared the value of being a cheerleader for the airport, the airport staff, and the voice of the airport in the community. Chennault airport is a success because of its command-and-control system of leadership and organization, and the efforts of airport management to keep the conversation on Chennault and its value to the community are ongoing.
- Community outreach: Chennault International Airport sees itself as the gateway to its community and provides direct and indirect benefits to its community. The airport is the site of several community events, including an annual balloon fiesta, a 2-day air show with a flight demonstration from the Blue Angels, a truck fest, and nightly drive-in movies. The airport also hosts families and their children for aviation career days to expose young community members to the benefits of an aviation career. Chennault airport staff understand that the airport's community connection is valuable—without the support of the community and its tax millage, the airport would cease to exist.
- Branding: The success of Chennault airport is even more apparent because of its strong branding message. The airport website and social media highlight a unified message that the airport is capable, offers low operating costs for new business, supports strong business incentives for Louisiana economic development, and centers the airport as a critical asset for its region. Chennault International has strong and advertised values, mission, and vision statements. Its vision statement is "to maintain a safe and positive work environment for all Chennault personnel, who provide benchmark services and facilities to attract businesses and jobs and become a hub for aerospace operations with a global impact." (Source: Chennault International Airport Director of Maintenance.)
- Security: The airport prioritizes security with complete camera coverage on the airfield and a wireless access gate providing 24/7 control of the airfield.
- Economic development: Chennault International Airport Authority is proud of the economic development it provides for its community and region as the third-largest economic producing

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airport in Louisiana. One of the keys to Chennault's success is its low-lease rates supported by its tax millage, bringing more than $410 million in economic output to its region (*American Press* 2024). The Chennault International Airport web page highlights the many benefits of choosing Chennault as a business location, including tax incentives, foreign trade zone benefits, industrial tax exemption, and more.

## Lessons Learned

Based on challenges from previous incidents, airport staff at Chennault International identified the following best practices to better prepare for future shocks and stressors:

- Severe weather: Airport staff have developed a Tropical Storm and Hurricanes Standard Operating Procedure (SOP). Airport management maintains this SOP that lays out plans to be followed in a hurricane or tropical storm to preserve human life, property, and a return to regular airport operations. It defines the level of a given emergency based on present conditions and lays out airport staff responsibilities in the event of this type of emergency.
- Communication: Chennault International Airport is proud of its robust website and social media presence. The airport communicates with its community and stakeholders via videos on LinkedIn, Facebook, and its web page.
- Emergency services: Airport management reports Chennault's history of working with local agencies and emergency services personnel to develop synergy in planning current operations and future shocks and stressors.
- Financial preparedness: Airport management at Chennault reports their belief in the importance of overcoming a status quo mentality and embracing growth and change. Chennault's airport staff believe in making calculated financial risks to build resilience and plan for the greater good.

## Future Challenges

The primary challenge for Chennault International Airport going forward, given its location, will be its resilience efforts to respond to and recover from significant storm events. This resilience will take the form of airfield improvements and repairs and a continuation of fostering relationships with the local emergency management community. These shocks and stressors threaten resilience at Chennault International, and staff continue to outline strategies and tools to combat this challenge moving forward to maintain regular operations.

## Desired Future Improvements

- As a primary staging area for catastrophic events, the airport is significant in managing hurricanes and natural disasters. Airport staff at Chennault International are currently in the process of building an Emergency Operations Center and a National Guard Readiness Center while continuing their recovery from Hurricanes Laura and Delta in 2021. The airport views the construction of these facilities as significant to their resilience to future disasters.
- Airport management report there are some blighted properties adjacent to the airport. In the continued growth and development of Chennault International, airport management is considering how this area can be cleaned up and redeveloped in the future.
- There are currently no readily available retail, food, or convenience store options to support the operations at Chennault International. The airport is aware of the development needed on Legion Street adjacent to the airport. Additional planned development at the airport, such as a fishery, a golf course, and a National Guard Readiness Center, means continued community development will be needed to support current and future growth.

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### Summary of Findings

- Given the frequency at which Chennault International Airport manages significant storm events, airport staff have developed the best plans and procedures to manage these disruptive events.
- Continued engagement with the local emergency management community remains vital for this airport to manage severe weather incidents.
- Airport managers suggested that a checklist to help inform leaders at various levels on how to prepare, respond, and recover from hurricanes would be helpful to the toolkit.
- The airport continues to welcome change to stay resilient and relevant in its community, state, and region. Airport management at Chennault reports that the willingness of airport staff to embrace change is key to their overall success. A favorite quote that Chennault often connects with the operations at their airport comes from General Eric Shinseki, "If you don't like change, you're going to like irrelevance even less."
- Chennault International Airport is an excellent example of an airport well situated for growth now and into the future. This is due in no small part to the visionary outlook of the airport's present leadership.

### Applicability to Toolkit

Chennault International Airport provides a case study covering shocks and stressors that can potentially disrupt airport operations, mainly from tropical storms and hurricanes. This case study outlines potential solutions and best practices for improving airport security for staff and tenants while minimizing disruptions to service. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Sources: Chennault International Airport Executive Director and Chennault International Airport Director of Maintenance*

## Phoenix Deer Valley Airport

### Airport Background

Phoenix Deer Valley Airport (DVT) is a city-owned public airport in Phoenix, Arizona (FAA Region AWP). It is one of the largest and busiest GA airports in the United States; in 2020, Deer Valley completed over 400,000 operations, making it the fifth busiest airport globally by aircraft movements and the busiest GA airport globally. The airport covers 914 acres and has two runways, 901 based aircraft, one flight school, an FAA control tower, and an on-site FBO. Because of FBO traffic, airport staff are currently planning for the construction of a new 60,000-ft$^2$ hangar. Major tenants include the Arizona Game and Fish Department and the Phoenix Police Department Air Support Unit.

Phoenix Deer Valley has successfully built strong relationships with the local community. Deer Valley has an observation deck that is open to the public free of charge, and educational signage is placed around the airport to inform visitors about Deer Valley's operations and history in aviation. The signage denotes critical landmarks around the airport, for example, the FAA control tower. Airport staff also visit local schools to speak about aviation and Deer Valley operations.

#### *Shocks and Stressors*

Deer Valley experiences the following shocks and stressors:

- Human pandemic: The beginning of the COVID-19 outbreak in 2020 led to a sharp drop in flight school students and an initial drop in overall flight activity, which caused an initial dip in the airport's revenue. Although corporate aircraft numbers have doubled in the last 2 years,

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airport staff had to develop and implement robust resilience plans. These plans have allowed Deer Valley to remain open and staffed at prepandemic levels, while ensuring the health and safety of staff, tenants, and other on-site stakeholders.
- Severe weather: The Phoenix area experiences yearly monsoons coinciding with high winds and significant amounts of dust. The winds have been strong enough to lift airplane hangars several inches off the ground in past years. These weather events can majorly disrupt airport operations and can put the safety of staff, tenants, and equipment at risk.
- Personnel issues: Airport staff noted difficulty filling positions within the airport with sufficiently qualified and experienced personnel.

## Current Practices and Resources Available

Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- Human pandemic: Deer Valley implemented several strategies for maintaining airport operations while accommodating health and safety concerns of tenants and staff, such as authorizing electronic signatures, building a drop box outside the terminal to submit paperwork remotely, and transferring meetings to a virtual space.
- Severe weather: Disruptions to airport operations due to weather events such as high winds and monsoons prompted airport staff to begin drafting and fleshing out the continuity of operations plans.
- Changes in airport service: To accommodate evolving airport service priorities and challenges, Deer Valley will be updating its airport master plan several years ahead of its original schedule. The master plan will include strengthened runways and taxiways and wider taxiways and taxiway connectors.

## Lessons Learned

Based on challenges from previous incidents, airport staff at Deer Valley identified the following best practices to better prepare for future shocks and stressors:

- Human pandemic: In response to the COVID-19 pandemic, Deer Valley staff developed a more formal and thorough continuity of operations plan, including a codified succession plan. The continuity of operations plan outlines measures to keep staff safe, including virtual meetings, social distancing protocols, masking protocols, and cleaning and sanitization protocols. One of the most significant pandemic-related challenges was staffing and staff safety; airport staff outlined the efficacy of using colleagues from other airports within the Phoenix airport system.
- Severe weather: Deer Valley worked closely with the National Weather Service representatives to develop a notification system for weather events. Following a notification from National Weather Service about an impending weather event, airport staff disseminate the information to airport stakeholders through a distribution list. Following a weather event, the airport operations team surveys the airport and notes any areas of concern for further action.
- Personnel issues: In the past, the City of Phoenix bundled Deer Valley–specific job postings with other airports within the Phoenix airport system. To hire staff with the necessary experience, qualifications, and skills more effectively, Deer Valley now customizes job postings to be specific to the airport's needs and preferences.

## Future Challenges

Deer Valley Airport is experiencing a shift in its operational priorities; the airport is moving away from high flight training activity toward increased jet and corporate traffic. As such, airport

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staff are working to determine the best strategies for handling increased jet activity and larger, heavier jets on the runways. Deer Valley may need to modify the current airfield infrastructure in response to this change in traffic. To accommodate evolving airport service priorities and challenges, Deer Valley will be updating its airport master plan several years ahead of its original schedule. The master plan will include strengthened runways and taxiways and wider taxiways and taxiway connectors.

### Desired Future Improvements

Airport staff expressed interest in sharing ideas, best practices, and lessons from other airports to gain regional and national perspectives on resilience efforts and activities. In addition, Deer Valley is interested in leveraging current and future technology, such as unmanned aircraft, to improve resilience against future shocks and stressors.

### Summary of Findings

- The primary shock that impacted Deer Valley Airport was the onset of the COVID-19 pandemic in early 2020. Airport staff identified the pandemic as the catalyst for developing codified continuity of operations plans and investing time and effort into resilience planning.
- To counter this shock, Deer Valley Airport created thorough and robust resilience plans to maintain operational capacity while prioritizing the health and safety of airport staff, tenants, and other stakeholders.
- In addition, airport staff modified day-to-day operations to comply with social distancing requirements, such as moving in-person meetings to a virtual space and implementing strict sanitizing policies.
- Deer Valley Airport identified planning checklists as a vital addition to the Self-Directed Resiliency Toolkit.

### Applicability to Toolkit

Phoenix Deer Valley Airport provides a case study covering a variety of shocks and stressors that can potentially disrupt airport operations. Issues related to health and safety, severe weather events, and changes in airport operations have impacted GA airports across the country. This case study outlines potential solutions and best practices for improving airport resilience against these shocks and stressors, protecting staff and tenants, and maintaining day-to-day operations. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Source: Phoenix Deer Valley Airport Manager*

## Madison Municipal Airport

### Airport Background

Madison Municipal Airport (KIMS) is a city-owned airport in Madison, Indiana (FAA Region AGL). This field has 38 hangers—37 private and one owned by the City of Madison, Indiana. There are around 50 tenants and 10 businesses on-site. The airfield recently purchased a medical helicopter, making it a vital piece of the local emergency management community. The airport features an updated terminal building, a pilot lounge, a conference room, a courtesy car for in-town errands, and complimentary Wi-Fi. Madison Municipal sells Jet-A and AvGas fuel types with a discount program for fuel purchases at a high volume. Madison Municipal is home to several businesses and services that provide everything from flight instruction and

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aircraft rental to aircraft maintenance and repair services and restoration; these include (but are not limited to) the following:

- The Kentucky Flight Training Center,
- Madison Aeroclub,
- Aircraft maintenance companies,
- Over and Under Flying Services, and
- Bishop Airservice and Madison Aeronautical, LLC.

### *Airport History*

The Madison Board of Aviation Commissioners opened the Madison Municipal Airport in the early 1950s along the Ohio River. The airport was operated as a military airfield until it was transitioned into a public facility in 1964 with an updated runway, an administration building, new T-hangars, and a paved parking lot. Improvements to the airport were made to help attract new business to the Madison area. A parallel taxiway was installed in 1968 as a safety measure for increased resilience, with runway extensions and an apron expansion in 1992 and 1998, respectively. Today, the airport serves as an important connector of this agricultural center of Madison to its community, state, and region. History is of great importance to Madison airport staff, who have connected with the local historical society to preserve the airport's knowledge that exists to date and catalog the airport's history into the future.

### *Shocks and Stressors*

Madison Municipal experiences the following shocks and stressors:

- Economic concerns: Madison Municipal experienced severe financial vulnerability at the pandemic's beginning, almost having to shut its doors. However, the airport has bounced back as the pandemic started to recede.
- Personnel issues: Low wages for airport staff have led to retention difficulties for Madison Municipal.
- Severe weather: Airport staff are adjusting to changing weather patterns in the area. The airfield used to get a lot of snow, but now gets an increased number of ice storms, which are more challenging to manage.

## Current Practices and Resources Available

Airport staff emphasized the importance of building strong relationships with other GA airports similar in size and operational scope to Madison Municipal. Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- General: Rather than completing bare-minimum repairs to the airfield, airport management looks to install utilities and systems that will be long-term solutions to ongoing issues.
- Hiring and personnel: Airport management has advocated increasing pay to increase staff retention.
- Community outreach: The airport helps expose its community to aviation by offering airplane rides in a World War II vintage Boeing Super Steerman, including the opportunity for scenic flights and time to take control of the airplane. Madison Municipal prioritizes community events and views the airport as a gateway to the community. The airport holds a donation-only annual air show with rides, food, and air-show performances. The airport also uses its web page to advertise events for the City of Madison, bringing additional traffic (and revenue) to the airport itself. Additionally, Madison Municipal Airport serves as a community service venue for individuals who need community service hours.
- Collaboration: The airport uses collaboration with nearby airports for increased resilience. Airport management has collaborated with North Vernon when fuel issues have arisen. Madison

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Municipal staff have also participated in a "GA Airport Roundtable" that included Madison Municipal Airport and Anderson Municipal–Darlington Field.

## Lessons Learned

Based on challenges from previous incidents, airport staff at Madison Municipal Airport identified the following best practices to better prepare for future shocks and stressors:

- General: Airport management has developed scenario-based templates and how-to guides for everyday tasks around the airfield to ensure continuity of operations and to better manage turnover in employees.
- Technology: Airport management uses drone technology for mapping airport how-to guides. This allows airport staff to map airport layouts, air-show layouts, utility layouts, and more, and then send them to an engineer for further use. Willingness to use new technology enhances Madison Municipal Airport's resilience.
- Transfer of knowledge: Airport management is aware of the great deal of institutional knowledge that more experienced airport employees, managers, and pilots bring to the airport. The airport staff is committed to documenting this knowledge and airport history by documenting everything possible on paper.
- Communication: The airport has learned the value of increased communication with its stakeholders and community. By explaining its history, why it exists, and its value as a public service, the airport helps maintain its future. The airport has increased its social media presence and reaches out to the tourism board in Madison and local businesses. Madison Municipal Airport staff use a digital media program called Yodeck to post pictures and event notices on in-terminal television screens. This software is also used to post Automated Weather Observing System updates and important need-to-know information for pilots. The airport also uses text messaging and Facebook social media to stay in communication with stakeholders. The airport keeps a record of emergency contact information for all tenants and updates this information annually.
- Self-sufficiency: Airport management has set the airport up for resilience through self-sufficiency. The airport is set up for 24/7 self-serve refueling and security systems that can be monitored from a distance day and night.
- Financing and loans: Madison Municipal staff have developed a financing program for airplane hangars. Airport staff have capitalized on staff knowledge of banking to develop a lease-holder improvement loan program with a local bank to help plane owners to purchase hangars that they otherwise may not have been able to. A guide on this process was developed for current and future airport staff.
- Emergency services: The airport has learned from previous incidents that understanding emergency contacts is key before, during, and after a critical incident. Airport management makes it a point to educate local emergency services personnel on emergency management, giving presentations to local stakeholders on what not to do during and after an emergency. Airport management has cultivated relationships with local emergency management personnel, including holding a fish fry event to bring these critical first responders to the airport to discuss landing zones and formal emergency training.
- Media relations: Airport staff have learned from previous incidents that understanding how the local media may respond is key in an emergency. The airport has installed fencing to control access points at the airport, keeps and maintains updated SOPs on what to do in the event of an emergency, and has plans in place to have an officer at the airport gate when an incident arises to limit media access to the airfield.
- Leadership: The key to Madison Municipal's success is leadership from above. Airport staff stated that a solid airport director is a key to the success of an airport. The right airport director

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can make a difference with passion and wanting to see things go right. According to airport staff, the "great resignation" is due to a lack of appreciation. The right airport manager can help limit attrition and turnover by helping staff feel supported.

### Future Challenges

Madison Municipal Airport staff emphasized the need for additional grant funding to lower staff turnover, which causes instability on the airfield. In addition, as there becomes a push for more sustainable airfield operations going forward, staff also noted grant funding would be vital to ensure they can accommodate electrical plans. Airport staff also discussed the lack of federal guidance on hangar leases at GA airports. Madison Municipal has 37 private hangars; they own the land but not the hangars themselves. Airport staff stated that the FAA came up with a clarification on hangar use, but this does not include rules for non-flying aircraft. Many airports have pilots using hangar space to store non-flying aircraft, limiting the number of new and flying pilots the airport can bring in as a source of revenue. Airport staff voiced that they would like the FAA to take a clearer position on hanger use as it would help GA airports enforce rules and keep hangar revenue and the resulting profit of flying aircraft.

### Desired Future Improvements

Airport management stated that the airport is hoping for a longer runway in the future to meet continued growth alongside the restructuring of airport utilities for both future growth and redundancy. Many airports put utilities in for just the project they are working on. Unfortunately, no future vision is associated, and the extra costs do not allow the utility installation. Airport management stated that Madison Municipal Airport is a perfect example of years of placing utilities only when needed rather than for growth. This does not allow for cheaper growth, redundancy such as centralized backup power, or easy infrastructure upgrades.

### Summary of Findings

- Madison Municipal Airport faces economic instability, leading to hiring and personnel challenges. As a result, airport management continues to work with the community to ensure it is adequately funded with the resources to manage any disruptions, including inclement weather, safely.
- Airport management suggested that instruction for enforcing non-flying aircraft policies and hanger lease guidelines would be helpful additions to the toolkit.

### Applicability to Toolkit

Madison Municipal Airport provides a case study covering a variety of shocks and stressors that can potentially disrupt airport operations, including economic instability, hiring and personnel concerns, and disruptive weather events. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Source: Madison Municipal Airport Manager*

## Alaska Division of Statewide Aviation

### Airport Background

SWA falls under the Alaska DOT and Public Facilities and is responsible for the policies and programs that develop, manage, and operate the 235 airports within the rural aviation system. Alaska's geography and terrain have rendered many communities inaccessible via the road and

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highway system; as a result, approximately 402 communities within the state depend on aviation for year-round access. SWA oversees the implementation of regulations and laws about aviation and Alaskan airspace, coordinates with aviation stakeholders like the Aviation Advisory Board to promote the aviation industry throughout the state, and implements the Alaska Aviation System Plan (AASP). The AASP identifies necessary airport improvements, sets funding priorities, and addresses infrastructure and policy needs throughout the system.

SWA's planning department works with municipalities and focuses on successfully engaging local communities. Public information officers hold public meetings for all upcoming projects to inform community members about potential changes to airport service. SWA also conducts a messaging campaign promoting safety around rural airports among community members. All messaging is coordinated through the Division's Tribal Liaison to ensure that communications are translated into local languages and are effectively pushed out to tribal populations.

### *Shocks and Stressors*

Airports within the Alaskan rural aviation system experience the following shocks and stressors:

- Human pandemic: One of the primary shocks in the last 2 years was the COVID-19 pandemic. Communities voiced concerns over airports remaining open and active, despite the rural aviation system playing a vital role in transporting necessary goods to their jurisdictions. SWA also had to contend with fears among indigenous communities regarding pandemics and distrust of government institutions. In addition, Alaska lost several regional operators, impacting ease of movement into and out of rural communities.
- Severe weather: Alaska experiences diverse and unique weather phenomena, such as ash from volcanic eruptions closing airspace, regular and periodic earthquakes, tremors, massive storm surges, and snow and ice from winter storms. As a result, GA airports throughout the state have developed a strong sense of resilience and persistence in combating weather-related shocks and stressors.
- Climate change: Climate change plays a significant role in resilience in Alaska. SWA is potentially relocating communities from at-risk areas due to coastal erosion and melting permafrost. These issues have made it challenging to find suitable locations for new airports. In addition, rising water levels in Western Alaska threaten communities on the coast. These indigenous communities are reluctant to leave the land they occupy, so SWA is working toward solutions that allow communities to safely remain in their jurisdiction while maintaining airports in those locations.
- Personnel issues: While roughly 85% of airports within Alaska's rural aviation system are staffed through local contractors in the community, SWA has encountered trouble keeping the remaining 15% of airports staffed. This could have negative impacts on airport maintenance and safety.

## Current Practices and Resources Available

Airport staff use the following additional resilience tools and strategies to manage shocks and stressors:

- Severe weather: Before an event, airport staff analyze the potential threats and hazards, conduct a risk assessment, and determine if conditions are safe enough to put air traffic on the runway. If conditions are not adequate for traditional air traffic, airport operators will implement the most optimal workaround, such as helicopter operations. Because of the uniquely dynamic environmental conditions throughout the state, airport operators exhibit resilience and flexibility daily.

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- Personnel issues: Following union negotiations, SWA staff recently authorized raises for airport staff throughout the rural aviation system to retain experienced and qualified personnel.

## Lessons Learned

Based on challenges from previous incidents, airports within the Alaskan rural aviation system identified the following best practices to better prepare for future shocks and stressors:

- Climate change: Understanding the climate challenges in a given area and obtaining the correct equipment to deal with those challenges is the most important tool for countering the constantly evolving threats presented by climate change. When planning for new airports or changes to existing airfields, SWA staff noted that the most crucial consideration is the foundation for the airport. Building the airport foundation correctly the first time to counteract the best potential climate change challenges is crucial to the success of that airport's operating capability.
- Communication: The most crucial best practice to improve resilience against shocks and stressors is strong communication and relationship-building among airport staff and the local community. SWA leadership meets with aviation planning staff within the division biweekly to discuss significant events and upcoming planning challenges. SWA staff emphasized mentoring younger, less experienced airport operators and passing down institutional knowledge gained from real-world experience.
- Airport inspections: To increase the efficacy and ease of airport and equipment inspections, SWA staff easily put digitized inspection programs on tablets for any inspector to execute. This increased the number of staff that could correctly perform a full or partial inspection of SWA assets, which improved those assets' maintenance, upkeep, and performance.

## Future Challenges

The primary challenge for GA airports in Alaska is climate change's dynamic and evolving threat. The effects of climate change can further complicate and increase the obstacles presented by Alaska's weather and geography. Issues such as melting permafrost and rising sea levels threaten the existence of GA airports throughout the rural aviation system. At the same time, local communities have expressed their desire to remain in those threatened areas. As they continue to develop and expand, these challenges can majorly and drastically impact the entire aviation system, impacting hundreds of communities that depend on aviation to sustain their livelihood.

## Desired Future Improvements

SWA staff identified the continued development of a resilience plan as a primary goal to be more proactive about countering emerging threats rather than adopting a day-by-day approach to shocks and stressors. Although airport staff throughout Alaska's rural aviation system demonstrate a high level of resilience daily, the complex and constantly evolving challenges presented by the state's environment necessitate more formal, codified resilience planning. In addition, SWA staff expressed interest in further research and development of electrical and vertical takeoff and landing systems, information-collecting drone technology, and more evolved imagery and data to support future planning efforts.

## Summary of Findings

- Airports throughout the rural aviation system exhibit high levels of resilience and flexibility, particularly against weather- and climate-related incidents.

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- Airport operators are trained and experienced in adapting to sudden shocks and stressors and modifying flight operations to continue to serve local communities when these shocks and stressors impact standard service.
- While day-to-day resilience is strong throughout GA airports in Alaska, developing formal resilience plans to counter future threats and improve the system's overall efficacy is a priority for SWA staff and leadership.
- Relationships and strong communication among airport staff and local communities are crucial for resilience planning. Adapting communications to fit the needs of specific communities is a vital best practice, particularly in an environment where communities rely on GA daily.

## Applicability to Toolkit

Alaska's rural aviation system provides a uniquely complex case study covering a variety of shocks and stressors that can potentially disrupt airport operations. Issues related to severe weather events have impacted GA airports across the country. This case study outlines potential solutions and best practices for improving airport resilience against dynamic weather and environmental threats while maintaining day-to-day operations. The tools, strategies, and best practices provided in this case study directly impacted the efficacy of the Self-Directed Resiliency Toolkit.

*Source: Operations Manager for the Division of Statewide Aviation*

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TOOL F

# Emergency Communications Plan Template

*This Emergency Communications Plan template is meant to be complementary to plans already in place and is meant only to provide supplemental information that may be missing. It should in no way override any required standards or templates currently in place. Please review the Communications and Collaboration Guidelines document for best practices and resources for communicating and collaborating with stakeholders before, during, and after an incident.*

**Date of Last Update**: mm/dd/yyyy

## Introduction

This Emergency Communications Plan is separated into sections based on the different stakeholders' airport personnel will coordinate with regularly and during emergencies. Each section includes a table for airports to fill in relevant personnel titles, names, responsibilities, and contact information. It is recommended that the contacts are reviewed and updated at a minimum, quarterly or as needed. The communications plan should be accessible to all staff, and a copy should be kept with the airport sponsor. If possible, publish a digital copy of the plan on a private website that staff can access.

*Review the following sections and list any additional stakeholder groups that may apply to your airport.*



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## Airport Management

Airport management should be notified of an incident/event to ensure a unified and timely response.

*Key Personnel Title/Name/Responsibility/Contact Information*

| Title | Name | Responsibility | Contact Information |
|---|---|---|---|
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## Government Officials, First Responders, Regulators, and Utility Providers

County and state emergency management, Homeland Security, state and local police and fire departments, regulators, and utility providers should be notified of an incident or event to ensure all possible resources are used during response efforts.

*Key Personnel Title/Name/Responsibility/Contact Information*

| Title | Name | Responsibility | Contact Information |
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## Tenants

Tenants should be notified of an incident or event to ensure their immediate safety and make sure they are aware of the potential for extended delays or disruptions.

*Key Personnel Title/Name/Responsibility/Contact Information*

| Title | Name | Responsibility | Contact Information |
|---|---|---|---|
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## Employees and Their Families

Employees and their families should be notified of an incident or event to ensure these relevant parties have proper situational awareness as events unfold.

*Key Personnel Title/Name/Responsibility/Contact Information*

| Title | Name | Responsibility | Contact Information |
|---|---|---|---|
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## News Media

Airport management should notify the media of an incident or event to ensure the community is informed of the ongoing situation.

*Key Personnel Title/Name/Responsibility/Contact Information*

| Title | Name | Responsibility | Contact Information |
|---|---|---|---|
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*The following summary of changes table is intended to list all updates and revisions to the Emergency Communications Plan. Complete this table with all updates and revisions made to the Emergency Communications Plan, where the change was made, and the date of the change.*

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TOOL G

# Airport Emergency Plan Template

*This Airport Emergency Plan template is intended to aid in the user's methodology and approach to preparing for, responding to, and recovering from shocks and stressors. The template is meant to be complementary to emergency plans already in place and is only meant to provide supplemental information that may be missing. It should in no way override any required standards or templates currently in place. Refer to the Resilience Handbook for links to additional airport-specific plan templates and guidelines.*

**Date of Last Update**: mm/dd/yyyy

## Introduction

Creating, implementing, and maintaining a holistic and thorough emergency plan is a vital component of resilience for GA airports. As the types of shocks and stressors that impact GA airports continue to evolve and present new challenges to staff, tenants, and stakeholders, the value of emergency planning continues to increase. During an incident, it is essential to have an established set of roles, responsibilities, procedures, and resources to respond to the issue quickly and resume normal airport operations as quickly as possible.

This Airport Emergency Plan template is designed to provide a framework for emergency planning for all GA airports. The template will encompass pre-incident planning, implementation of the plan during an incident, and post-incident updates and maintenance to the plan. Refer to the callout boxes within the template to assist in filling out each section and ensuring that the template best fits your airport and the specific types of incidents your airport may experience. This template can be modified to fit a specific type of shock or stressor or be used as a general concept of operations for any given incident type.

| |
|---|
| Airport Name: |
| Airport Type: |
| Airport Code: |
| FAA Region: |

*Complete the table with the relevant information for this airport.*



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## Types of Emergencies

The types of shocks and stressors that impact GA airports across the nation are diverse and highly variable based on several factors, such as geography and climate. Table G-1 outlines several types of shocks and stressors with examples. Note that this table is not meant to be a comprehensive or exclusive list of all potential shocks and stressors.

**Table G-1. Shocks and stressors.**

| Type | Shock/Stressor |
|---|---|
| Economic | Fuel price increases |
| | Financial stress/resilience issues |
| | Federal funding opportunities |
| Environmental | Severe weather |
| | Flooding |
| | Winter storms |
| | Hurricanes |
| | Tornadoes |
| | Earthquakes |
| | Drought |
| | Wildfires |
| | Volcanic eruption |
| | Tsunami |
| Operational | Political issues (local, state, national) |
| | Pilot shortages |
| | Border security |
| | Terrorist threats/attacks |
| | Cyberattacks/cyberterrorism |
| | Transportation incidents |
| | Airport security |
| | Power outage |
| | Industrial disasters |
| | Aging infrastructure |
| | Construction projects |
| | VIP visits |
| Social | Human pandemic |
| | Personnel issues |

Source: ACRP Research Team GA airport interviews and Toolkit Pilot, 2022

*Review this section and modify the preceding table to outline any shocks and stressors specific to this airport. Refer to the Resilience Handbook for further information and guidelines on shocks and stressors.*

## Guiding Principles

The following resources provide information on emergency planning that can be used to build out, strengthen, and update the Airport Emergency Plan template:

- *National Response Framework* (FEMA 2019);
- *National Incident Management System* (FEMA 2017a);
- State and Local Guide (SLG 101), *Guide for All-Hazard Emergency Operations Planning* (FEMA 1996);
- Incident Command System;

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- FAA Advisory Circular 150/5200-31C, *Airport Emergency Plan* (FAA 2009); and
- *ACRP Research Report 147: Climate Change Adaptation Planning: Risk Assessment for Airports* (Dewberry et al. 2015).

*Review the resources cited in this section and list any specific airport or regional plans, guidelines, or policies that apply to your airport.*

## Pre-Incident Planning

Creating an airport emergency plan and conducting pre-incident planning activities are vital components of resilience against potential shocks and stressors. The more comprehensive the pre-incident planning is, the more prepared and resilient an airport can be during an incident. It is important to establish roles and responsibilities for airport staff and relevant stakeholders, procedures to follow during and after an incident, and resources for responding to different types of shocks and stressors before the onset of an incident.

### Roles and Responsibilities

The following table can be completed with the relevant emergency roles for airport staff, any relevant external stakeholders, and the corresponding responsibilities assigned to each role.

| Role | Responsibility |
|---|---|
| | |
| | |
| | |
| | |

*Complete the table with all relevant roles and responsibilities for each role. Potential roles include airport manager, operations manager/specialist, and FBO.*

This could be shown as a matrix of organizations and areas of responsibility that indicates primary and supporting roles. FAA Advisory Circular 150/5200-31C, *Airport Emergency Plan* (2009) provides an example of such a matrix (see the Emergency Response Organization Responsibility Matrix). As the advisory circular notes, not every airport will have the personnel resources to fill each position, but it is important that each functional area is addressed.

### Communication and Collaboration

Maintaining strong lines of communication and collaboration with all airport personnel, tenants, private-sector and public-sector partners, and first responders is a central component of resilience against shocks and stressors. The airport emergency plan should reflect this priority

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by including contact information for all relevant stakeholders and strategies for communication and collaboration before, during, and after an incident. This section can be supplemented by the Communications and Collaboration Guidelines document within the Resilience Toolkit and the Emergency Communications Plan template in this document.

> *Potential components to include may be a list of stakeholders to contact before, during, and after an incident and the corresponding contact information for each stakeholder; a strategy for communicating imminent incidents with tenants and other on-site stakeholders; and a checklist for establishing emergency communications during an incident.*

## Application of Plan During an Incident

### Emergency Timeline

Outline the time frame for any given emergency, potentially as a graphic.

### Checklist of Emergency Plan Steps

Immediately after an incident, using a checklist of the next steps required to respond to the incident and move toward the resumption of regular operations allows airport staff to quickly and efficiently carry out the necessary emergency operations. Establishing the steps and requirements before the inception of the incident mitigates uncertainty and delays in response. It ensures that all airport personnel are equally prepared to respond to and recover from any potential shock or stressor.

> *Create a list of steps that airport personnel must follow immediately following an incident. Steps may include contacting tenants and stakeholders, requesting assistance from first responders and/or government entities, and evacuating the airfield. This checklist can be formatted to apply to any type of shock or stressor, or it can be split into different lists for each type of shock or stressor your airport faces.*

## Post-Incident Review and Planning

### After-Action Report

After-action reports (AARs) are intended to analyze the response to an incident and outline best practices, lessons learned, and other key takeaways from the incident response. AARs allow all involved entities to learn from an incident to strengthen their strategies and concept of operations for the following potential incident and are a valuable tool for building resilience against all types of shocks and stressors.

### Emergency Plan Maintenance

To be as practical and helpful as possible, the airport emergency plan must be able to evolve. This plan should be considered a living document and undergo regular periods of review, updates,

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and maintenance. Airport staff should establish a schedule and process flow for reviewing and updating the airport emergency plan. The airport should consider involving external stakeholders in addition to airport personnel in this process.

The following summary of changes table is intended to list all updates and revisions to the emergency plan. The table outlines each change made, the section of the document in which the change was made, and the date of the change.

| Change Made | Section | Date of Change | Change Made By |
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*Complete this table with all updates and revisions made to the emergency plan, the section in the document in which each change was made, the date of the change, and who made the change.*

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TOOL H

# Incident Mitigation Plan Template

*This Incident Mitigation Plan template is intended to aid in the methodology and approach to identifying potential risks and developing strategies to protect staff, tenants, stakeholders, and property from similar events.*

## Introduction

Incident mitigation planning is a valuable tool for strengthening resilience in GA airports and potentially reducing the frequency of disruptions to airport operations. While emergency planning allows airport staff to respond to incidents more efficiently and effectively once the incident has occurred, mitigation planning allows staff to minimize economic and infrastructural loss. By identifying potential risks and developing strategies to protect staff, tenants, stakeholders, and property from similar events, airport personnel can disrupt the cycle of damage and reconstruction caused by shocks and stressors. As the frequency and severity of the shocks and stressors impacting GA airports continue to increase, mitigation planning has become a more urgent necessity for airport staff.

This Incident Mitigation Plan template provides a framework for creating a unique plan best suited for each airport's needs and priorities. The template will encompass risk-assessment strategies, training and exercise plans, communication and stakeholder engagement, and pre-incident planning. The template can be generalized to fit several different shocks and stressors or adapted to each type of shock or stressor.

## Mitigation Strategies and Resources

### Risk Assessment

The risk assessment, which identifies the potential financial, infrastructural, and human impacts of incidents on the airport, as well as their overall severity and likelihood, is the foundation for the mitigation planning process. To understand how to prevent damage and disruption of airport operations, airport staff must first analyze and understand the nature of the threats that impact them.



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*Complete the following table with all potential shocks and stressors that affect your airport, as well as with the impacts and overall likelihood or frequency of each shock or stressor.*

| Shock/Stressor | Impact to Operations | Likelihood |
|---|---|---|
| | | |
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## Training and Exercises

Regular training for all airport staff better prepares personnel to effectively respond to potential incidents at the standard required by the airport and assists in creating a standardized and consistent approach to emergency operations. Regular exercises involving internal staff and relevant external stakeholders allow airports to assess and improve the response to potential incidents in a low-risk environment while allowing participants to experience potential shocks and stressors without the real-world dangers and impacts. ACRP Project 02-92, "Creating Self-Directed Resiliency Plans at GA Airports" includes a Self-Directed Resiliency Toolkit, which contains the Stress-Test Exercise-in-a-Box tool (see Tool M in this report) that GA airport staff can use to conduct internal resilience trainings.

## Communication and Stakeholder Engagement

Establishing, maintaining, and strengthening relationships and communication with stakeholders, such as tenants, private-sector partners, and local government entities, is a critical element of incident mitigation that improves the whole community's response to potential shocks and stressors. There are several resources for building a communications plan within the Resiliency Toolkit, including an Emergency Communication Plan template and a Communications and Collaboration Guidelines document.

## Pre-Incident Planning

Creating plans that clearly outline the process for immediate and long-term disaster response and recovery and detail each component and step of the response process is a vital part of mitigation planning. It is essential to ensure that all staff and stakeholders are familiar with their roles, responsibilities, and required actions in the event of an incident. There are several resources for pre-incident planning, including the Airport Emergency Plan template within this document, FEMA's *Incident Management Handbook* (2017b), and FEMA's *Incident Action Planning Guide* (2015b).

## Existing Resources

Several existing resources for incident mitigation planning are available for airport staff to use. The following list provides examples of publicly available information that staff can use to inform their incident mitigation plans and strategies.

- FEMA *State Mitigation Planning Policy Guide* (2022a) and *Local Mitigation Planning Policy Guide* (2023a);

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- FEMA *State Mitigation Plan Review Guide* (2015a) and *Local Mitigation Plan Review Guide* (2011b);
- FEMA *Guide to Expanding Mitigation: Making the Connection to the Coast* (2022b);
- FEMA Fact Sheet, "Mitigation Planning Program Resource List" (2021a);
- National Hazard Mitigation Planning Program, Mitigation Planning Training; and
- FAA AC 150/5200-31C, *Airport Emergency Plan* (2009).

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TOOL I

# Stakeholder Engagement Checklist Template

*This Stakeholder Engagement Checklist template is meant to aid in users' methodology and approach to interact and communicate with stakeholders. This checklist is intended to be complementary to plans already in place and is only meant to provide supplemental information that may be missing. It should in no way override any required standards or templates currently in place. Airports are encouraged to tailor this checklist to their needs by either adding or removing steps.*

## Stakeholder Engagement Checklist

### Plan

#### *Initiate Planning*

☐ Assemble internal organizers
☐ Conduct initial planning meetings
☐ Obtain leadership support

#### *Identify Partners*

☐ Identify and develop a list of jurisdiction stakeholders
☐ Maximize representation and equity

#### *Plan Stakeholder Engagement*

☐ Establish a communications point of contact
☐ Develop an initial outreach plan
☐ Establish communications tools
  – Designated email address
  – Phone/web meeting platform
  – Email distribution lists

### Engage

#### *Initiate Planning*

☐ Define the initial activity list
  – Conduct outreach to the stakeholder list
  – Convene vision and planning meetings with stakeholders



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☐ Define sustained activity list
  – Conduct weekly, monthly, quarterly, and annual meetings
  – Identify resilience, response, and recovery activities
☐ Establish a stakeholder meeting approach, including the following:
  – Purpose, outcomes, agenda, schedule, location, invite list
  – Meeting etiquette, terms of engagement (e.g., Roberts Rules)
  – A plan for standing meetings, working groups, and operational task forces
  – A plan for an annual summit

## Assess and Refine

### *Conduct Stakeholder Analysis*

☐ Review stakeholder member and participation lists
☐ Measure stakeholder participation rates
☐ Align existing and new partners with relevant activities

### *Measure Progress*

☐ Measure progress based on success factors, including the following:
  – Results-oriented leadership and participation
  – Harmonized risk assessments
  – Outcome-oriented objectives and action plans
  – Integration of resilience and response efforts
  – Stabilization targets supported
☐ Measure progress based on outcomes, including the following:
  – Short periods of disruption following a disaster
  – Efficient delivery of lifesaving and life-sustaining services
  – Restored, modernized, hardened, and resilient infrastructure systems
  – Lifelines and supply chains
  – Resilient recovery of jurisdictions with stronger core capabilities
  – Inclusion and equity in jurisdictional resilience and response efforts
  – Individual loss avoidance, such as lives, livelihoods, and property
  – Adequate, resilient, and affordable housing
  – Economic losses avoided to include business sales, investment, and tax losses
  – Improve community health and safety
  – Sustainable and resilient health, education, and social services systems
  – Increased property values and improved property tax base
  – Sustainable, diversified, and resilient economy with new opportunities to create economic activity
  – Restored, preserved, risk-resistant, and resilient natural or cultural resources

The following summary of changes table is intended to list all updates and revisions to the Stakeholder Engagement Checklist. The table outlines each change made, where in the document the change was made, and the date of the change.

*Complete this table with all updates and revisions made to the Stakeholder Engagement Checklist, where the change was made, and the date of the change.*

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TOOL J

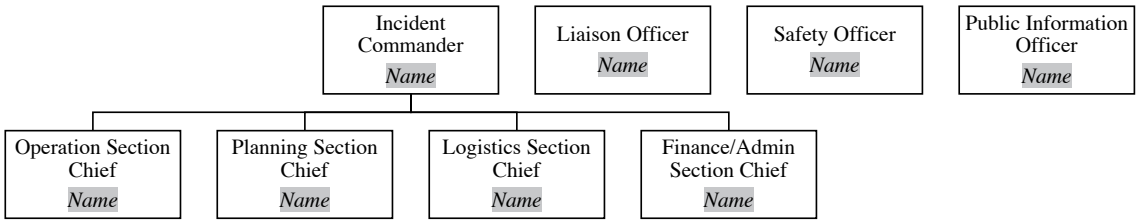
# Incident Command System Template

*This Incident Command System template provides an overview of the incident command system and a template to build the structure when an incident occurs.*

## Incident Command System Roles and Responsibilities

### Incident Organization Chart

This Incident Organization Chart is intended to be customizable for a given airport or incident. Given the diversity in the size of airports, it is possible that one person or a government body, such as an airport authority or county, may fill several of these positions. As such, airports can customize the chart by clicking into one of the chart boxes and selecting SmartArt Design.






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*Key Personnel Title/Name/Responsibility/Contact Information*

| Title | Name | Responsibility | Contact Information |
|---|---|---|---|
| Incident Commander | | Sets incident objectives and priorities and has overall responsibility at the incident or event | |
| Liaison Officer | | Serves as the primary contact for supporting agencies assigned to an incident | |
| Safety Officer | | Monitors safety conditions and develops measures for assuring the safety of all assigned personnel | |
| Public Information Officer | | Serves as the conduit for information to internal and external stakeholders, including the media or other organizations seeking information directly from the incident or event | |
| Operations Section Chief | | Conducts tactical operations to carry out the plan. Develops the tactical assignments and organization and directs all tactical resources | |
| Planning Section Chief | | Prepares and documents the Incident Action Plan to accomplish the incident objectives, collects and evaluates information, maintains resource status, and maintains documentation for incident records | |
| Logistics Section Chief | | Provides support, resources, and all other services needed to meet the incident objectives | |
| Finance/Admin Section Chief | | Monitors costs related to the incident. Provides accounting, procurement, time recording, and cost analyses | |

The following summary of changes table is intended to list all updates and revisions to the Incident Command System. The table outlines each change made, where in the document the change was made, and the date of the change.

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*Complete the table with all updates and revisions made to the Incident Command System, where in the document the change was made, and the date of the change.*

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TOOL K

# Communications and Collaboration Guidelines

*This Communications and Collaboration Guidelines information is meant to aid in your methodology and approach to communicate and coordinate with internal and external stakeholders before, during, and after an incident. This tool is intended to be complementary to any communication and coordination plans already in place and is only meant to provide supplemental information you may be missing. It should in no way override any required standards or templates you currently have in place. Airports are encouraged to tailor these guidelines to their needs.*

## Introduction

Communication and coordination with stakeholders are central components of resilience for GA airports. To prepare for potential shocks and stressors, effectively and efficiently respond to their impacts, and strengthen response and recovery following those impacts, airports must be able to build and maintain relationships with internal stakeholders (e.g., airport staff and tenants) and external stakeholders (e.g., local emergency responders, nearby neighbors and communities, and government agencies). Effective communication and collaboration with relevant entities is the primary vehicle for establishing these relationships and ensuring a consistent and coordinated incident response.

This document provides best practices and resources for communicating and collaborating with stakeholders before, during, and after an incident and suggestions for documenting lessons learned after an incident. This advice is not comprehensive—it is intended to provide a foundation for building a detailed and holistic stakeholder outreach plan and is supplemented by the Emergency Communications Plan template found within the Resiliency Toolkit. Many GA airports have existing communication and coordination plans and procedures; this plan is intended to provide additional ideas and resources to supplement any existing guidelines. Airports can apply these suggestions generally to fit numerous types of shocks and stressors or adapt to fit a specific shock or stressor.

### Types of Stakeholders

When creating a plan for communication and coordination, it is essential to identify the types of stakeholders who need to be involved during pre-incident planning and activities; incident response; and post-incident recovery, review, and documentation. Stakeholders should be



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identified before an incident, during a steady-state or "blue skies" period. Creating and maintaining a database of external partners who are required for disaster response during pre-incident planning allows airport staff to respond to any given shock or stressor more efficiently and effectively. Understanding the internal and external entities who must communicate and collaborate before, during, and after an incident eliminates confusion, redundancy, and delays that could impact airport operations. This applies not only to external partners, such as first responders and local government officials, but to stakeholders impacted by the incident, such as tenants and on-field businesses. Airport staff must maintain a line of communication with airfield tenants and businesses and, when necessary, coordinate with those entities to mitigate the loss of life and damage to property or equipment.

### *Best Practices*

Building and updating a physical database of stakeholders is an excellent tool for airport staff to establish communication and collaboration procedures before, during, and after an incident. In addition to simply listing out all stakeholders and their corresponding contact information, airports should consider adding an optimal communication and collaboration strategy for each entity in the database. This strategy should outline procedures for stakeholder outreach during steady-state or "blue skies" operations and during pre-incident preparations, incident response, and after-action recovery and review. Strategies can be specific to each shock or stressor or applicable to various shocks and stressors.

The following table provides an example framework that airport staff can use as a foundation for creating their stakeholder outreach strategy database. The table outlines the types of stakeholders and their respective communication and collaboration strategy for each phase of the incident life cycle. The types of stakeholders listed in the table do not comprise an exhaustive list and are merely a starting point for airports to use and adapt to fit their needs.

| | Communication and Collaboration Strategy | | | |
|---|---|---|---|---|
| **Stakeholder** | **Steady-State** | **Pre-Incident** | **Incident** | **Post-Incident** |
| **Airport staff** | | | | |
| **Airport tenants** | | | | |
| **Local government entities** | | | | |
| **State government entities** | | | | |
| **First responders** | | | | |
| **Private-sector partners** | | | | |
| **Local community** | | | | |

## Stakeholder Engagement

Effective stakeholder engagement is the cornerstone for building, maintaining, and strengthening communication and collaboration to improve incident preparedness and response. GA airports can use several strategies to maximize engagement with tenants, the local community, and private- and public-sector partners. This section provides best practices and resources for stakeholder outreach and relationship-building.

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### Best Practices

- Create and maintain a database of all tenants, on-site businesses, and vendors with corresponding contact information and procedures for communication and coordination through the incident life cycle.
- Create and maintain a database of all local government, first responders, and private-sector stakeholders with corresponding contact information and procedures for communication and coordination through the incident life cycle.
- Maintain an online profile, primarily through an airport website, that provides information on airport background, available services and operations, contact information, and airport events.
  - Update this profile as frequently as possible.
  - Use social media profiles as a secondary source of information.
- Conduct events and activities that are open to the local community, such as the following:
  - Airport Open House offerings,
  - Flyover days,
  - Local tours, and
  - Presentations at local schools.
- Ensure that all communications and messaging are accessible to all stakeholders and community members.
  - Translate communications, signage, and social media/online content into local languages as needed.
  - Provide accessible versions of communications, signage, and social media/online content (e.g., screen reader-friendly content, alternate text for images, braille lettering on signs).
- Reach out to local first responders to conduct joint training and, as resources allow, tabletop or full-scale response exercises to establish and strengthen coordination before, during, and after an incident.
  - Some first-responder departments may conduct exercises independently—it may be possible to discuss allowing airport personnel to participate in some exercises.

### Resources

- ACRP 02-92 resiliency case studies, found in the Resiliency Toolkit:
  - St. Charles County Smartt Airport
  - Pine Bluff Regional Airport
  - Arlington Municipal Airport
  - Alaska Division of Statewide Aviation
- *ACRP Synthesis 73: Emergency Communications Planning for Airports* (Smith et al. 2016)
- FEMA *Local Mitigation Planning Handbook* (2023b)
- *ACRP Research Report 201: Airport Emergency Communications for People with Disabilities and Others with Access and Functional Needs* (IEM 2019)

## Before a Shock or Stressor

This section provides best practices and resources for pre-incident communications.

### Best Practices

- Send updates on potential or impending incidents that may disrupt airport operations to all relevant authorities and airport tenants, as well as any businesses, vendors, or contractors with on-field infrastructure or equipment.

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- Communicate any anticipated requests or needs for governmental assistance (e.g., surge staff) before the impending incident, if possible.
- Communicate any emergency response needs to local or on-site first responders before the impending incident, if possible.
- Coordinate with local or on-site first responders as well as tenants and on-site businesses to evacuate people, property, or equipment if necessary.
- Coordinate with all external partners on rendezvous points, paths of entry and exit, and safety hazards on-site.
- Keep a reference sheet correlating the severity of the incident with the level and frequency of communication and coordination necessary for each relevant stakeholder.
- Create and maintain a step-by-step plan for staff to follow during airport incidents for communication and coordination.

### Resources

- Database of all airfield tenants and on-site businesses
- Database of local first responders, relevant government entities, and private-sector partners (e.g., contractors needed for repairing damaged buildings)
- Emergency Communications Plan template, found in the Resiliency Toolkit

## During a Shock or Stressor

This section provides best practices and resources for communications during an incident.

### Best Practices

- Keep a physical reference sheet or card with relevant current emergency contact information in the event of a power outage or damage to digital files and update it at regular intervals.
- Maintain a constant line of communication with staff, tenants, and other external stakeholders regarding changes or disruptions to airport operations, damages to infrastructure and property, and potential relocation or movement of aircraft and equipment.
  - Ensure that all partners working with airport staff are made aware of changes or updates to pre-existing plans to coordinate the response, evacuation, and other procedures.
- As necessary, coordinate with other GA airports in the region to temporarily house aircraft that must be evacuated or to accept redirected flights, or both.
- Keep communication cards that provide the airport with telephone priority access during an emergency, when phone lines may be clogged or overwhelmed.
- Maintain control over news media presence by controlling access points to the airport and keeping an SOP for media communications.

### Resources

- Airport Emergency Plan template, found in the Resiliency Toolkit
- FEMA Incident Command System
- *National Incident Management System* (FEMA 2017a)
- FEMA IS-242.C: Effective Communication (FEMA 2021b)
- *ACRP Synthesis 73: Emergency Communications Planning for Airports* (Smith et al. 2016)
- *ACRP Report 160: Addressing Significant Weather Impacts on Airports: Quick Start Guide and Toolkit* (ICF International et al. 2016)

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## After a Shock or Stressor

This section provides best practices and resources for communications following an incident.

### Best Practices

- Conduct an after-action review of the incident response with airport staff, as well as external responders, if possible.
- Create an AAR that includes lessons learned and best practices for emergency communications to strengthen communications strategies moving forward.
- Maintain communication and coordination with tenants and on-site businesses regarding resumption of airport operations, post-incident cleanup and repairs, and movement of aircraft and equipment.
- Coordinate with all relevant partners, such as state and local government entities, to conduct long-term recovery operations.
  - These operations may include major structural repairs and updates to existing infrastructure.
- As necessary, coordinate with other GA airports in the region to redirect flights back to the airfield once operations are resumed.
- Trigger existing contracts for airfield cleanup and reconstruction, if applicable.
- Confirm and update tenant and external stakeholder contact information if necessary.

### Resources

- *ACRP Synthesis 73: Emergency Communications Planning for Airports* (Smith et al. 2016)
- FEMA National Disaster Recovery Framework
- FEMA Case Study Library
- Local, Regional, and State Emergency Management Agencies
- Local, Regional, and State DOT Agencies

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TOOL L

# Aircraft Rescue and Firefighting Letter of Agreement Template

## Aircraft Rescue and Firefighting Letter of Agreement Between [Airport Name] and [Organization Name]

*This Letter of Agreement template is intended to aid your approach to communicating and coordinating with Air Rescue and Firefighting first-responder personnel during and after an incident. This template provides language and strategies for coordinating Aircraft Rescue and Firefighting response activities and can be modified to fit the procedures, requirements, and needs of your airport. This template is not intended to be exhaustive or all-inclusive.*

**Effective: [Date]**

### Purpose

- This letter of agreement establishes definitions, responsibilities, and guidelines for handling aircraft emergencies at [Airport Name]. These procedures provide for the most anticipated situations; however, the best judgment of Airport Operations Staff and Air Traffic Controllers on duty dictate the appropriate response in any given situation.

### Definitions

**Accident**: An aircraft mishap occurring before, during, or after any aircraft movement or maneuver, including takeoff or landing, in which the aircraft is damaged.
**ARFF**: Aircraft rescue and firefighting
**CTAF**: Common traffic advisory frequency [Frequency]
**FIRE DEPARTMENT**: [Fire Department Name]
**FOD**: Foreign object debris
**FSS**: Flight service station
**INCIDENT**: An occurrence other than an accident, associated with the operation of an aircraft. (Prop Strike) (runway excursion with no damage) (Gear up landing)
**OPS ONE**: Airport first-response vehicle
**OPS TWO**: Airport first-response vehicle
**OPS THREE**: Airport first-response vehicle



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**OPERATIONS**: [Airport Name] operations
**NTSB**: National Transportation Safety Board
**TOWER**: Federal Aviation Administration (FAA)–operated control tower

## Emergency Categories and Definitions

**ALERT ONE**: An aircraft having a minor difficulty (e.g., feathered propeller, minor oil leak)
**ALERT TWO**: An aircraft having a major difficulty (e.g., rough running engine, engine fire, control problems, landing-gear problems)
**ALERT THREE**: An aircraft involved in an accident on airport
**ALERT FOUR**: Bomb threat aboard an aircraft
**ALERT FIVE**: Aircraft crash off airport

## Responsibilities

Any of the following may declare an emergency:

- Pilot in command of aircraft
- **TOWER**
- **OPERATIONS**
- The aircraft owner/operator or representative

### *Tower Shall:*

- Determine alert type and notify **OPERATIONS** when an emergency condition exists.
- Notify the **FIRE DEPARTMENT** when an emergency condition exists or when deemed appropriate.
- Cancel the **FIRE DEPARTMENT** notification when requested to do so by **OPERATIONS** or when deemed appropriate.
- Control nonessential air and ground traffic to avoid conflicts in emergency alert areas.
- Notify the appropriate **FAA/NTSB** authorities and, if possible, the aircraft operator.

### *Operations Shall:*

- Notify the **TOWER** when an emergency exists.
- Close or partially close the airport as appropriate and notify the **TOWER**, except when closure is automatic.
- Respond to the emergency as follows:
  - **ALERT ONE**: Respond with **OPS ONE–OPS THREE** to staging area as soon as possible.
  - **ALERT TWO**: Respond with **OPS ONE–OPS THREE** to staging area within 3 minutes of notification [unless estimated time of arrival (ETA) of the aircraft allows additional time].
  - **ALERT THREE**: Proceed to crash scene with **OPS ONE–OPS THREE** within 3 minutes of notification. Assess situation, update tower, coordinate appropriate emergency and support equipment.
  - **ALERT FOUR**: Respond as needed.
  - **ALERT FIVE**: Respond as needed.
- Notify the **TOWER** when emergency no longer exists.
- Notify the **TOWER** when closed portions of the airport are reopened.
- Coordinate police assistance as needed for crowd and media control.

### *Fire Department Shall:*

- Dispatch **ARFF** equipment and crew as appropriate to the emergency.
- Arrive at the airport as soon as practicable.
- Communicate with the **TOWER** [Frequency].

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- Respond to the emergency as appropriate to the situation.
- Abort the response when the emergency condition no longer exists.
- If the **TOWER** is closed and **OPERATIONS** is not on duty, the **FIRE DEPARTMENT** shall make radio calls on CTAF [Frequency], advising local traffic of the emergency and applicable closures.
- Close or partially close the airport as appropriate (if **OPERATIONS** is not on duty) and notify the **TOWER** of the closure, except when closure is automatic.

## Procedures

### *Tower Shall:*

- Alert **OPERATIONS** using the direct line or ground-control frequency as appropriate and provide the available details, in order of priority.
  1. Type of alert: one, two, three, or four
  2. Type of aircraft
  3. Nature of difficulty
  4. Location of aircraft or ETA
  5. Runway of intended landing
  6. Fuel quantity remaining
  7. Number of souls onboard
- If on-duty **OPERATIONS** personnel cannot be contacted on either direct telephone line or radio, then call the airport manager's cell phone.
- Notify the **FIRE DEPARTMENT** dispatch of emergency alert and direct the **FIRE DEPARTMENT** units to alert site on ground-control frequency [Frequency] or by light signals.
- Expedite the clearance of **OPS ONE–OPS THREE** and other emergency vehicles to staging area during **ALERT ONE** and **ALERT TWO** emergencies.

### *Operations Shall:*

- Close or partially close the airport as appropriate to the situation and notify the **TOWER** about closures.
- Dispatch **OPS ONE–OPS THREE**.
- Provide first-response emergency service as appropriate to the nature of the emergency.
- Advise the **TOWER** of any additional **FIRE DEPARTMENT** or emergency equipment needed.
- Advise the **FIRE DEPARTMENT** of the status of the emergency and hand over command of the authority to the on-site fire chief on arrival.
- Upon termination of the emergency condition, arrange for the expeditious clearing and inspection of the aircraft operating areas affected by the emergency. Arrange for hazmat cleanup and removal if necessary.
- Reopen or partially reopen the airport as appropriate.

### *Fire Department Shall:*

- Dispatch **ARFF** equipment.
- Close or partially close the airport (if **OPERATIONS** is not on duty).
- Provide emergency service appropriate to the nature of the situation.
- Communicate with the **TOWER** [Frequency]. If unable to communicate by radio, try calling by telephone [Telephone Number], or look for green light signal from the **TOWER** before proceeding on taxiways or runways in the movement area.
- For **ALERT ONE** and **ALERT TWO**, proceed to the staging area.
- For **ALERT THREE**, contact **TOWER** by VHF radio [Frequency] or telephone [Telephone Number]. Once clearance from the **TOWER** is obtained, proceed directly to crash site.

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- Contact **OPERATIONS** for briefing and hand over command authority.
- Keep **OPERATIONS** informed of the status of the emergency and when it is terminated.
- Contact **OPERATIONS** for a debriefing and return of command authority on completion of emergency action.
- If **OPERATIONS** is not available:
  - Close or partially close the airport as necessary to respond to the alert and advise the **TOWER**.
  - If the **TOWER** is closed, notify approaching aircraft that the airport is closed by using CTAF [Frequency].
  - Inspect the affected runway/taxiways and remove any **FOD** before reopening the airport.
  - Maintain control of the airport and reopen or partially reopen the airport as conditions permit.

## Appendix 1

### Closure and Reopening of the Airport

- After an alert notification, **OPERATIONS** will partially or wholly close the airport as soon as possible to ensure rapid **ARFF** response and communicate these closures to the **TOWER**.
- The airport is **automatically** closed when an **ALERT THREE** exists.
- The runway is **automatically** closed when an aircraft is unable to clear the runway or when an **ALERT TWO** aircraft crosses the threshold on final approach.
- **OPERATIONS** will partially or wholly reopen the airport and advise the **TOWER** as soon as practical.
- When **OPERATIONS** is not available, the **FIRE DEPARTMENT** will partially or wholly reopen the airport by notifying the **TOWER**.

### General

- The **FIRE DEPARTMENT** shall provide the **TOWER** with a written description of the **ARFF** equipment available to respond to incidents and accidents on airport, updated as needed to reflect the current status.
- The **FIRE DEPARTMENT** shall keep the **TOWER** informed when **ARFF** is not available (such as for maintenance or refueling) with an estimated time of return to service.

## Signatures

X_____

[Airport Manager]

X_____

[Airport Leadership]

X_____

[Organization Leadership]

X_____

[Organization Leadership]

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TOOL M

# Airport Resiliency Stress-Test Exercise-in-a-Box

*The Airport Resiliency Stress-Test Exercise-in-a-Box provides resources for GA airports to conduct a resilience stress test of emergency plans, policies, and procedures across various shocks and stressors.*

## Introduction

This document aims to provide resources for GA airports to conduct a resilience stress test of their emergency plans, policies, and procedures. This packet contains all the information GA airports will need to examine realistic ways in which shocks and stressors may impact their daily operations and business continuity. There are three objectives for this exercise stress test:

1. Examine how effectively your airport can respond to and recover from a variety of shocks and stressors.
2. Identify potential consequences your airport may face as the result of shocks and stressors.
3. Determine effective strategies to mitigate the consequences of shocks and stressors and improve operational continuity.

To perform an exercise stress test, GA airports should follow the steps in order as outlined in Table M-1. Please note that these steps incorporate other elements of the Self-Directed Resiliency Toolkit, available for free download on the National Academies Press website (nap.nationalacademies.org) by searching for *ACRP Research Report 263: Creating Self-Directed Resiliency Plans for General Aviation Airports* and then reviewing "Resources at a Glance." This exercise is designed to evaluate existing plans, policies, and procedures; if you need assistance crafting these plans, please refer to the Resilience Handbook in the Self-Directed Resiliency Toolkit.

## List of Shocks and Stressors

To begin your exercise, select the shock or stressor you would like to analyze. Shocks and stressors are divided into four categories:

1. Economic
2. Environmental
3. Operational
4. Social

This tool is meant to be flexible based on the highest priority needs and areas you want to explore. If you are unsure where to begin, look at selecting the most common shocks and stressors



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**Table M-1. Steps to conduct an exercise stress test.**

| STEP | DESCRIPTION | PAGE # |
|---|---|---|
| 1 | *Identify the shock or stressor you want to test*. Test one shock or stressor at a time to isolate the distinct consequences and challenges associated with the response. If you are unsure where to start, look at selecting the most common shocks and stressors you face. | – |
| 2 | *Read the scenario for that shock or stressor*. If your airport has experienced this shock or stressor before, feel free to add information based on that experience to enhance the realism of the scenario. Scenarios are written to be general and not region-specific. | – |
| 3 | *Complete the exercise questions*. The exercise questions will direct you to think critically about the challenges you face from this shock or stressor. You will also use the Risk-Assessment Analysis Tool to identify the potential infrastructure, aircraft, and operational consequences of the shock or stressor to your airport. | – |
| 4 | *Determine corrective actions*. After you have completed the exercise questions, you will fill out the Corrective-Actions template to document concrete steps you can take to enhance the resilience of your airport. This list of corrective actions will serve as a reference for your ongoing efforts to improve operational continuity. | – |

you face. When you begin working through the scenario, these shocks and stressors will be easier to conceptualize and discuss. Once you are comfortable with the scenario format, you can easily shift to discussing less common but no less important topics.

Once you have selected a shock or stressor, navigate to the designated page in the righthand column in Table M-2. The designated page for the shock/stressor will contain all the scenario information you need. Once you (and any partners) have reviewed the scenario, turn to the section of exercise questions. Discuss each question based on the scenario you have reviewed. Best practice is to designate one person to take notes for the exercise and to document any discussions, conclusions, or findings you reach. Finally, once you have reviewed all the questions, turn to the Corrective-Actions template (Table M-3). In this template, you will identify clear steps you and your stakeholders can take to enhance resilience based on the discussions you had for the scenario.

You may find that as you work through different scenarios, there is overlap between discussion and the necessary corrective action. That is not a fault in the exercise nor your discussions; rather, you have identified high-benefit actions that, if taken, will enhance your resilience to multiple hazards simultaneously. These often indicate where you will receive the most significant benefit for your investment.

**Table M-2. Select which shock or stressor you would like to test from the following table.**

| SHOCK/STRESSOR | CATEGORY | DESCRIPTION | PAGE # |
|---|---|---|---|
| **FUEL PRICE INCREASES** | Economic | Inflation and the global political situation have directly resulted in increased fuel prices, which directly affect airport operations. When fuel prices unexpectedly rise, GA airports must manage rising costs to continue operations. | – |
| **FINANCIAL STRESS/ RESILIENCE ISSUES** | Economic | While funding can come from various sources, GA airports generally rely on local taxes and income from airport operations, including fuel sales and tenant and hangar leases. As a result, GA airports are susceptible to economic fluctuations, which can impact the airport's ability to continue its successful and uninterrupted operations. | – |

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**Table M-2. (Continued).**

| SHOCK/STRESSOR | CATEGORY | DESCRIPTION | PAGE # |
|---|---|---|---|
| **FEDERAL FUNDING OPPORTUNITIES** | Economic | The COVID-19 pandemic has shown how the availability of federal relief in the form of stimulus, removal of local fund-matching requirements, and new grant opportunities have strained airports to prioritize eligible projects/initiatives and maximize available funding. | – |
| **SEVERE WEATHER** | Environmental | Severe weather is highly unpredictable and includes a diversity of effects, such as wind, monsoons, dust storms, and extreme temperatures, which can result in significant disruptions for airports and their stakeholders. Each of these types of weather can cause different challenges to airport operations. | – |
| **FLOODING** | Environmental | Flooding incidents typically occur when dry land becomes inundated from the overflow of inland or tidal waters or rapid accumulation. Flooding is anticipated to increase dramatically in the coming decades. Airports near water sources or the coast are particularly likely to be affected. | – |
| **WINTER STORMS** | Environmental | Winter storms are notice incidents that bury communities in severe cold, snow, and ice. All three of these impacts can cause significant challenges to airport operations if not properly managed. | – |
| **HURRICANES** | Environmental | Hurricanes are notice incidents caused by a confluence of warm water, air, and wind and are anticipated to increase because of climate change. Hurricanes also cause flooding and infrastructure damage that can have short- and long-term effects on airports. | – |
| **TORNADOES** | Environmental | Tornadoes are short-/no-notice incidents, are short in duration, and develop during severe thunderstorms having winds that can reach 300 mph or higher and can cause devastating wind damage. GA airports may be directly affected or located in communities impacted by tornado incidents. | – |
| **EARTHQUAKES** | Environmental | Earthquakes are no-notice incidents caused by the movement of tectonic plates and can cause severe damage to infrastructure and buildings. GA airports may have facilities impacted by an earthquake or need to manage airport operations when a quake has damaged critical infrastructure. | – |
| **DROUGHTS** | Environmental | Prolonged shortages in the water supply cause droughts. In the event of a drought, airports may be forced to implement water conservation techniques which may cause disruptions to normal operations. | – |
| **WILDFIRES** | Environmental | In the event of a wildfire, an airport may be impacted by proximity to the fire itself, have visibility impacted by flames and smoke, or may become an emergency response center for firefighting aircraft and personnel. | – |
| **VOLCANIC ACTIVITY** | Environmental | Volcanic activity, including eruptions, are multihazard incidents that can include other shocks such as earthquakes, landsides, floods, fires, and tsunamis. | – |

*(continued on next page)*

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**Table M-2. (Continued).**

| SHOCK/STRESSOR | CATEGORY | DESCRIPTION | PAGE # |
|---|---|---|---|
| **TSUNAMIS** | Environmental | Most tsunamis are caused by underwater earthquakes, landsides, or volcanic eruptions that displace a huge quantity of water. | – |
| **POLITICAL ISSUES (LOCAL, STATE, NATIONAL)** | Operational | GA airport funding is closely tied to state and local politics and elections. Many GA airports rely heavily on the current political climate toward airport funding, which can change easily after an election. The change in power from one election cycle to the next is of great importance to the resilience of GA airport facilities. | – |
| **PILOT SHORTAGES** | Operational | Training and recruiting new pilots are critical to the continued stability and growth of the aviation industry, as GA airports often rely on private-plane owners and small companies for their business. When there are fewer pilots, fewer people can learn how to fly; fewer hangars are being rented for plane storage, and overall fewer customers are using GA services. | – |
| **BORDER SECURITY** | Operational | Border security is of particular concern near U.S. borders, where airports may be transit points for people entering the country illegally. In addition, GA airports that reside along a border require additional coordination with international law enforcement and are disproportionately affected by incidents that affect the border status (e.g., investigations and border closure). | – |
| **TERRORIST THREATS/ATTACKS** | Operational | GA airports play an important role in the U.S. economy and in their communities. Because of their importance, they are vulnerable to terrorist threats and attacks whether perpetrated by domestic or international actors. Aircraft at GA airports are smaller and slower than those at commercial airports, but they can still be used in a terrorist situation in chemical or biological attacks. | – |
| **CYBERATTACKS/ CYBERTERRORISM** | Operational | Airports are vulnerable to cyberattacks, whether perpetrated by adversarial actors or hobbyist hackers. Cyberattacks can affect all interconnected airport systems or may impact a system the airport relies on while not targeting the airport directly. There are also possible ramifications for airport tenants, whose business operations may make them more likely to become the victim of a cyberattack (e.g., Department of Defense operations or defense contractors). | – |
| **TRANSPORTATION INCIDENTS** | Operational | Incidents in other areas of the transportation network (e.g., vehicle and rail incidents) can cause ripple effects at GA airports. These can include delays in scheduled flights, increases in calls to emergency response centers, and impacts on the regular flow of traffic to and from the airport. | – |
| **AIRPORT SECURITY** | Operational | Intentional, adversarial actors may threaten runway security in numerous ways. Airports must maintain airport security to maintain operations and rapidly respond if security is threatened or impacted. | – |

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**Table M-2. (Continued).**

| SHOCK/STRESSOR | CATEGORY | DESCRIPTION | PAGE # |
|---|---|---|---|
| **POWER OUTAGE** | Operational | Airports and airport systems rely on electricity to function correctly. When electrical supply is disrupted through a power outage, airports may be partially or fully unable to operate safely until power is restored. | – |
| **INDUSTRIAL DISASTERS** | Operational | Airports with either on-site industrial companies or properties near industrial sites should be prepared for the potential impacts of an industrial disaster. Even if such a disaster does not occur on airport property, it will likely impact operations for some time. | – |
| **AGING INFRASTRUCTURE** | Operational | Airports in the United States are, on average, 40 years old. Due mainly to limited funding, airports have focused on immediate needs (maintenance) versus being able to fund larger, much-needed infrastructure projects. | – |
| **CONSTRUCTION PROJECTS** | Operational | There are potential operational and safety challenges during construction projects on the airfield. Although they are planned for and phased in advance, there may be unexpected activity, changes in plans, or accidents that may change or alter impacts to the airport. | – |
| **VIP VISITS** | Operational | While special events often provide time for planning for impacts to airports, some special events like a presidential visit, may not provide enough notice to address impacts to airport operations. | – |
| **HUMAN PANDEMIC** | Social | A human pandemic can devastate the workforce across the aviation community and cause travelers to reduce their travel drastically. Airports must help passengers feel safe while working with limited funds and personnel. | – |
| **PERSONNEL ISSUES** | Social | Many things can cause airports to experience a lack of personnel, including economic, social, and political causes. Airports need to identify their critical staffing levels and manage the impacts of reduced staffing. A compounding issue is finding sufficiently qualified and experienced personnel. Low wages for airport personnel have also led to retention difficulties. | – |

## Scenarios

### Scenario: Fuel Price Increase

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Economic | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

#### *Scenario Overview*

Over the past 3 months, the price of aviation fuel per gallon has risen by $0.31 on average in your region. In the first few months, you did not notice much of a direct impact on the number of pilots and customers using your services; consequently, there was little-to-no disruption to operations. However, current market forecasts indicate that fuel prices per gallon are likely to continue rising over the next 6 months. In a worst-case scenario, the Bureau of Labor Statistics and FAA predict that the price per gallon for aviation fuel could rise by an additional $0.54 by the end of the year—putting the total fuel cost increase $0.85 higher per gallon than the preceding year.

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Recently, some of your tenants have begun to express concerns. While the number of hangar rentals has remained steady over the past 3 years, two leases have not been renewed within the past month. Coupled with this slight drop in rentals, some of your contractors have noted that pilots are flying fewer flights and, therefore, are consuming fewer services. Last week, the local paper ran a story highlighting the challenges rising fuel prices have placed on residents and quoted a pilot who stated they were considering selling their personal plane rather than paying the maintenance and fueling fees.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Fuel prices fall—**Despite government projections, fuel prices begin to fall in late summer and are on track for a total year increase of $0.59/gal rather than $0.85/gal. As the fuel price goes down, a local flight school announces it intends to increase daily operations within the next few weeks to the same levels as the preceding year. Similarly, your office receives a new inquiry about hangar rentals and the associated maintenance fees.
- **Fuel prices soar—**Fuel prices rise to unexpected heights and, by the end of the year, are projected to have increased by $1.01/gal despite previous projections. Your primary fuel vendor notifies you the price increase is primarily due to fuel shortages; even if you purchase additional fuel now, supply-chain challenges may delay how quickly it can be shipped to your facility. With this news, several pilots begin to explore options to break the leases on their hangar space and sell their planes because of the untenable costs associated with maintenance.
- **Government grant program announced—**To address the rapidly rising fuel prices, the federal government announces that it is instituting a grant program that GA airports may apply for to offset the additional operational costs they are accruing. To be considered for funds, airports must fill out an online grant application, gather and submit paperwork documenting the challenges they face, and demonstrate how they will use the awarded funds.

### *Potential Consequences*

A fuel price increase may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Supply-chain issues
- Changes in seasonal tourism
- Impacts on airport level of service
- Interruption of economic stability/solvency

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Operations and maintenance personnel
- **Airport tenants—**Contractors, supply managers, business partners

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- **Local community**—Chamber of commerce or equivalent, transportation managers, local environmental agencies
- **Regional community**—Other airports, aviation schools, the state transportation organization, state environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Financial Stress/Resilience Issues

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Economic | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

Many factors can influence economic resilience. Choose from the following list based on what you are most concerned about and begin sparking conversation among stakeholders:

- **Economic recession**—Because of economic factors far beyond your control, your airport did not bring in the expected revenue last year. As a result, you have a much smaller budget that you must work within this year, and you need to find ways to reduce your operating costs.
- **Regulatory burdens**—The federal government recently passed a new airport regulation that you know will be costly to comply with. You have been given 2 years to do so, or you will no longer be eligible to apply for federal funding programs.
- **Supply-chain disruption**—As a result of global events, you have been experiencing a supply-chain disruption, which has resulted in you both paying higher prices and waiting longer for necessary supplies, like fuel, to arrive. You know this rate of spending is unsustainable, particularly given delivery delays.
- **Reduction in travel**—Across the travel industry, businesses are seeing record low numbers of travelers for the time of year. As a result, the expected boost in revenue you were hoping for from tourism and business travel no longer seems within reach.

### *Potential Consequences*

Financial stress may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Takeoff delays
- Reduced throughput capacity
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Impacts on airport level of service
- Interruption of economic stability/solvency
- Staffing issues
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may

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wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Leadership, administrative staff, FBO, maintenance, repair, overhaul services
- **Airport tenants—**Business partners
- **Local community—**Chamber of commerce (or equivalent)

## Scenario: Federal Funding Opportunities and Aging Infrastructure

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Economic | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

**Please note**: Aging infrastructure has been combined with this scenario as the scenario includes identifying projects throughout your facility that need improvement/maintenance, which ties into the aging infrastructure stressor.

### *Scenario Overview*

You perform an overview of your facility and identify all the improvement/maintenance projects needed over the next 5 years and prioritize the list. You then identify your current funding sources and the obligations to receive funding. Once funding sources are identified, you begin matching up the estimated cost of the projects with your funding sources to identify the gaps in funding. If these projects are not complete, think about how this will affect operations and what actions you would take to minimize the operational impacts if the projects are not completed.

### *Potential Consequences*

Lack of funding has two main impacts. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Impacts to airport level of service
- Interruption of financial stability/solvency

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions.

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Business partners
- **Local community—**Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

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## Scenario: Severe Weather

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | West, Northwest, South, Central Regions | ANM, AWP, ACE, ASW |

### *Scenario Overview*

As this scenario covers many types of severe weather incidents, please select from the following list the incident(s) in which you are interested in exploring based on your geographic location and natural hazards.

- **Severe wind**—Severe wind gusts can occur as part of a larger storm system or as a separate incident. This scenario is meant to refer to extreme wind gusts or wind incidents, such as derechos.
  - A high-wind warning has been issued for your region by the National Weather Service, which means the best-available forecasting is predicting either sustained winds of more than 40 miles per hour (mph) for an hour or more or wind gusts of 58 mph or higher.
- **Monsoon**—The North American Monsoon is a seasonal change in atmospheric circulation that affects Arizona and New Mexico. This change in circulation over the summer brings thunderstorms and rainfall to these states, providing much of their annual rainfall in a few short summer months.
  - The National Weather Service is forecasting a string of severe thunderstorms expected to affect your area starting around 2:30 p.m. today. These storms are expected to bring strong wind gusts and heavy rain to your area for at least 3 hours.
- **Haboob**—A haboob is a type of intense dust storm during which winds along the edges of a desert area churn dust and sand into the air and create a hazardous environment. Haboobs typically last around 3 hours and may be accompanied by thunderstorms.
  - Your local National Weather Service office has issued a dust storm warning, forecasting visibility of one-half mile or less and wind speeds of 30 mph or more for the next 2 hours.
- **Extreme heat**—Extreme heat occurs when temperatures, particularly in the summer, are much hotter or more humid than average. This type of heat can cause infrastructure damage, greatly increase fuel consumption for cooling facilities, and pose a threat to human life.
  - The National Weather Service has issued an excessive heat warning for your region, which means forecasts expect the heat index to reach 105°F or greater for more than 2 hours. In this case, the hot weather is expected to last for at least 3 days, and temperatures in the evening are not expected to fall much, offering little relief.
- **Extreme cold**—Extreme cold happens across the United States, typically during the winter, when arctic air coupled with freezing wind results in cold temperatures that are dangerous to humans and infrastructure. Extreme cold, like extreme heat, can last for an extended period.
  - After several days of cold weather, the National Weather Service has issued a wind-chill warning for your region, anticipating extended cold weather and high winds. Current predictions expect this weather to last for at least 4 days.

### *Potential Consequences*

Severe weather may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Foundation heave/damage
- Hail damage
- Building water damage, long term (moisture, mildew, mold)
- Failure of HVAC system

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- Increased demand on HVAC system
- External facility flooding damage (runways, taxiways, etc.)
- On-airfield debris
- Roof failure
- Facility damage from lightning strikes
- Overheating of IT equipment
- Increase in calls to emergency response center
- Wind damage
- Runway damage
- Increased fire risk
- Power loss
- Damage to integrity of surfaces and pavements
- Electrical failure
- Damage to airport transportation vehicles
- Reduced vegetation and increased erosion
- Lightning strikes causing fires
- Increased weathering on facilities and equipment
- Reduced aircraft capacity
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of flights
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Increase/decrease in fuel consumption
- Increased air turbulence, changing wind patterns, optimum orientation changes, microbursts
- Impact on aircraft performance (reduced braking, hydroplaning, etc.)
- Interruption of traffic flows to/from airport
- Supply-chain issues
- Extreme-heat exposure
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Increase in noise complaints
- Decreased air quality
- Impacts on airport level of service
- Increased insect populations
- Non-attainment of EPA air quality standards
- Increase in aviation fire risk
- Interruption in communications systems
- Potential for wildfire and smoke
- Changing wind patterns
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts
- Insurance issues (increase in cost of coverage, issues with insurability)
- Fuel shortage

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Contractors, pilots, business partners
- **Local community—**Emergency response organizations, utilities, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Flooding

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

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### *Scenario Overview*

In recent years, what used to be considered 100-year floods seem more like 10-year floods. Recent projections released by the National Oceanic and Atmospheric Administration indicate that this pattern, if anything, will increase. FEMA has just released new flood maps, which indicate that flood zones are much larger than previously established. Based on these new projections, it is likely that your facility will flood more frequently and more widely than previously. Infrastructure, equipment and chemical storage, runways, and other areas that used to be on a high-enough ground to be unaffected by flooding are now in danger.

After a line of severe thunderstorms drop more than 9 in. of rain in 1 hour, deluging your region, your facility is affected by severe flooding. (Consider here what would happen to your facility if flooding increased by approximately 25%. What buildings and areas would be affected? Are you prepared for such a flood? Would it affect how you can access part or all of your facility?)

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Unable to access facility—**The flooding washes out the roads leading to and from your facility, making it impossible to access via foot or car until the waters recede. Based on the level of inundation, it will likely take at least 3 days before the roads are safely passable again—longer if more rain falls.
- **Tainted water—**The regional flooding caused a sewer overflow in your area, and your local government has informed you that your facility does not have access to clean potable water. Due to the extent of the contamination, the local water utility is dealing with many competing priorities. It may not be able to test and confirm your water is once again safe for human consumption for a few days.
- **Power outage—**The flooding in your area has caused widespread damage to power lines; as a result, there is a widespread power outage that is expected to last at least 2 days. The electric utility has also informed customers (including you) that the outage could last longer; they are still surveying the extent of the damage.

### *Potential Consequences*

A flooding rise may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Building water damage, long term (moisture, mildew, mold)
- Failure of HVAC system
- External facility flooding damage (runways, taxiways, etc.)
- On-airfield debris
- Increase in calls to emergency response center
- Runway damage
- Power loss
- Damage/corrosion to underground infrastructure
- Damage to integrity of surfaces and pavements
- Sewer overflow
- Damage to airport transportation vehicles
- Increased weathering on facilities and equipment
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs

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- Decreased visibility
- Impact on aircraft performance (reduced braking, hydroplaning, etc.)
- Contagious disease/viral outbreaks
- Reduced availability of clean water
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain issues
- Human migration
- Risk of harm to human life
- Delay of emergency services
- Impacts on airport level of service
- Increased insect populations
- Attraction of wildlife
- Interruption of economic stability/solvency
- Storm surge
- Changing wind patterns
- Increased media/press presence
- Insurance issues (increase in cost of coverage, issues with insurability)

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Contractors, pilots, business partners
- **Local community—**Emergency response organizations, utilities, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Winter Storms

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | Pacific Northwest, Midwest, East, Northeast, Great Lakes, and Parts of the Central United States | ANM, AGL, ACE, ANE, AEA |

### *Scenario Overview*

The National Weather Service forecasts a winter storm that will likely affect your area over the next 3 days. Based on current models, the storm will bring higher-than-average precipitation (snow and ice) to the area, and the wind chill will be severe. The forecast predicts a period of heavy precipitation on the first day of the storm, followed by lighter but lingering flurries and sleet.

After the storm, the morning dawns clear and cold. The roads in your region are very slippery and dangerous to travel on. The state and local transportation agencies are focused on clearing the roads so emergency services can travel and provide assistance. Heavy ice has brought down some power lines in the area, and the local electric utility reports that they have crews ready to begin repairs as soon as the roads are safe to travel. Your tenants have already begun reaching out asking when your facility will resume flight operations.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described in the Scenario Overview to deepen discussion and enhance preparedness.

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- **Storm lasts 4 days**—When the storm reaches your region, it settles. Instead of heavy snow and sleet over a shorter period, the flurries are lighter but last for several days. Luckily, even though the weather is poor, the wind is not particularly severe.
- **Runway(s) inaccessible**—The storm leaves 2 in. of ice on your runway(s), covered by another few inches of snow. Even as the state roads are cleared, and service is restored, it will take significant effort and resources to restore operations in and out of your facility.
- **Hail damage**—The storm brought severe hail to your region; after it clears, there are piles of ice everywhere. Further complicating matters, your inspection reveals fairly significant hail damage to several buildings at your facility, including your terminal, maintenance area, and at least two hangars.

### *Potential Consequences*

A winter storm may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Hail damage
- Building water damage, long term (moisture, mildew, mold)
- External facility flooding damage (runways, taxiways, etc.)
- Roof failure
- Increase in calls to emergency response center
- Wind damage
- Runway damage
- Power loss
- Damage/corrosion to underground infrastructure
- Sewer overflow
- Increased weathering on facilities and equipment
- Reduced aircraft capacity
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Increased air turbulence, changing wind patterns, optimum orientation changes, microbursts
- Aircraft damage
- Impact on aircraft performance (reduced braking, hydroplaning, etc.)
- Interruption of traffic flows to/from airport
- Supply-chain issues
- Interruption of regularly scheduled maintenance
- Risk of harm to human life
- Delay of emergency services
- Impacts on airport level of service
- Interruption in communications systems
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Contractors, pilots, food and beverage vendors, other business partners
- **Local community**—Emergency response organizations, utilities, transportation organizations, local environmental agencies
- **Regional community**—State environmental agencies
- **Federal government**—Federal environmental agencies

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## Scenario: Hurricanes

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | Coastal States in the East, South, and West | AWP, ASW, ASO, AEA |

### *Scenario Overview*

Over the past week, you have been closely monitoring the path of Hurricane Katia. While initial projections were more general, as time has passed, it has become clear that your facility will be directly affected by the storm. Currently, a Category 2, the National Weather Service has forecasted that the hurricane will likely strengthen to Category 3 before it reaches your region.

After the storm hits, the damage is substantial and widespread, affecting your facility and your entire region. Trees are downed, buildings are damaged, there is flooding, and debris is strewn everywhere. During the storm, the power briefly failed, but the electric utility was able to restore it to your location and the surrounding town quickly. Now, you need to survey your facility for damage and determine how long you will need to return to aviation operations.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Category 4 hurricane—**Hurricane Katia strengthens to a Category 4 hurricane unexpectedly, resulting in much more extensive damage to your facility and the surrounding region. Experts suspect this unexpected strengthening is partially due to rising sea surface temperatures, which "supercharged" the hurricane before it made landfall.
- **Extended power outage—**The hurricane caused more extensive damage to power lines; as a result, there is a widespread power outage that is expected to last at least 3 days. The electric utility has also informed customers (including you) that the outage could last longer; they are still surveying the extent of the damage.
- **Building devastation—**The hurricane-force winds caused a partial collapse of two buildings at your facility. (Consider how your operations would be affected depending on which buildings were affected. What building damage would force you to cease normal operations completely? What building damage would allow partial or full operations to continue?)

### *Potential Consequences*

A hurricane may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Foundation heave/damage
- Building water damage, long term (moisture, mildew, mold)
- Failure of HVAC System
- Increased demand on HVAC system
- External facility flooding damage (runways, taxiways, etc.)
- On-airfield debris
- Roof failure
- Overheating of IT equipment
- Increase in calls to emergency response center
- Wind damage
- Runway damage
- Power loss
- Damage/corrosion to underground infrastructure
- Damage to integrity of surfaces and pavements

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- Electrical failure
- Electrical fire
- Sewer overflow
- Damage to airport transportation vehicles
- Increased weathering on facilities and equipment
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Increased air turbulence, changing wind patterns, optimum orientation changes, microbursts
- Impact on aircraft performance (reduced braking, hydroplaning, etc.)
- Contagious disease/viral outbreaks
- Reduced availability of clean water
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain issues
- Human migration
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Decreased air quality
- Impacts on airport level of service
- Increased insect populations
- Increase in aviation fire risk
- Attraction of wildlife
- Interruption in communications systems
- Interruption of economic stability/ solvency
- Staffing issues
- Changing wind patterns
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts
- Insurance issues (increase in cost of coverage, issues with insurability)
- Fuel shortage

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Contractors, pilots, business partners
- **Local community—**Emergency response organizations, utilities, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Tornadoes

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | Central and Southern Regions | ACE, ASW, ASO |

### *Scenario Overview*

This morning, the National Weather Service announced a cell of severe thunderstorms that are anticipated to affect your area; this afternoon has the potential for rotation, meaning they may result in one or more tornadoes forming. Your area is placed under a tornado watch.

Shortly after the storms begin, the tornado watch is updated to a tornado warning, which means either a tornado has been sighted or indicated by radar. Hail, wind, and heavy rain lash

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the airport facility, causing substantial damage to hangars, buildings, and runway infrastructure. When the storm passes, heaps of hail remain and begin to melt in the heat, compounding the flooding challenges. It appears that the storm has also caused a power outage in the region, and the local utility anticipates at least 8 hours before power can be fully restored to all customers.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Tornado affects local community—**In addition to the effects on your facility, the tornado devastated your community. Storm debris is everywhere, rendering several roads difficult, if not impossible, to use. Similarly, emergency services in the area are tied up trying to rescue residents, extinguish fires, and treat the wounded. If possible, there is a need for your runway to be serviceable to support medical evacuation flights to regional trauma centers.
- **Lightning strikes cause fire—**During the storm, a lightning strike ignited part of a building at your facility, starting a small building fire. While it was successfully extinguished, part of the building is now unusable and will need to be evaluated by the local fire department to determine necessary repairs.
- **Full building collapse—**One of the major buildings in your facility was destroyed and is unusable following the tornado. Luckily, there were no personnel or customers in the building at the time of the collapse, but you will need several months to rebuild fully, if you even have the funding to do so immediately.

### *Potential Consequences*

A tornado may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Foundation heave/damage
- Hail damage
- On-airfield debris
- Roof failure
- Facility damage from lightning strikes
- Increase in calls to emergency response center
- Wind damage
- Runway damage
- Increased fire risk
- Power loss
- Damage/corrosion to underground infrastructure
- Damage to integrity of surfaces and pavements
- Electrical failure
- Electrical fire
- Damage to airport transportation vehicles
- Lightning strikes causing fires
- Increased weathering on facilities and equipment
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Increased air turbulence, changing wind patterns, optimum orientation changes, microbursts
- Aircraft damage
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain issues
- Interruption of regularly scheduled maintenance

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- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Decreased air quality
- Impacts on airport level of service
- Increase in aviation fire risk
- Interruption in communications systems
- Interruption of economic stability/solvency
- Staffing issues
- Changing wind patterns
- Increased media/press presence
- Insurance issues (increase in cost of coverage, issues with insurability)
- Fuel shortage

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Contractors, pilots, business partners
- **Local community**—Emergency response organizations, utilities, local environmental agencies
- **Regional community**—State environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Earthquakes

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | Pacific Northwest (Washington, Oregon, Idaho), California, Hawaii, Alaska, Central/South Regions (Missouri, Arkansas, Tennessee, Illinois, Kentucky) | ANM, ACE, ASO, AWP, AAL |

### *Scenario Overview*

An hour ago, an earthquake struck a tectonic boundary near your airport facilities. Early reports describe the magnitude as between 5.8 and 6.1, though the exact number remains unclear. What is clear is that the devastation is widespread, impacting road networks, electrical and water utilities, and your airport and operations. Based on the extent of the damage across the region, it is clear that your airport is one of many that will need immediate and long-term assistance.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Aftershocks**—Over the 2 days following the initial quake, aftershocks rock the region and your facility. While the aftershocks are smaller in magnitude—ranging from roughly 2.1 to 3.4 on the Richter scale—they are still devastating. Structures that the larger earthquake had weakened are further degraded by these aftershocks, complicating any response efforts.

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- **Degraded critical infrastructure—**After structural surveys, it is evident that your facility escaped the worst effects of the earthquake. However, the critical infrastructure providers who provide power (electric and natural gas) and clean water to the region are facing more complicated challenges. Current estimates are that it could take up to 2 more weeks to fully restore power to the region, delaying your return to normal operations.

### *Potential Consequences*

An earthquake may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Foundation heave/damage
- External facility flooding damage (runways, taxiways, etc.)
- On-airfield debris
- Roof failure
- Increase in calls to emergency response center
- Runway damage
- Increased fire risk
- Power loss
- Damage/corrosion to underground infrastructure
- Damage to integrity of surfaces and pavements
- Electrical failure
- Electrical fire
- Damage to airport transportation vehicles
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Increased air turbulence, changing wind patterns, optimum orientation changes, and microbursts
- Aircraft damage
- Contagious disease/viral outbreaks
- Reduced availability of clean water
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain Issues
- Human migration
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Decreased air quality
- Impacts on airport level of service
- Increase in aviation fire risk
- Interruption in communications systems
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts
- Insurance issues (increase in costs of coverage, issues with insurability)

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Contractors, pilots, business partners
- **Local community—**Emergency response organizations, utilities, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

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## Scenario: Drought

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | Pacific Northwest (Washington, Oregon, Idaho), California, Hawaii, Central/South Regions (Missouri, Arkansas, Tennessee, Illinois, Kentucky) | ANM, ACE, ASO, AWP |

### *Scenario Overview*

Your region has been in a moderate drought (as defined by the U.S. Drought Monitor) for the past several months. This summer, state authorities and the U.S. Forest Service have declared a particularly high risk of wildfires in the area near your facility due to the lack of ground moisture and plentiful dry fuels. Authorities warn residents to be careful with any activities that could spark a fire.

Unfortunately, despite precautions, a wildfire starts in a rural area a few counties away from your facility. Although the fire does not pose an immediate threat to your facility or operations, it does continue to grow, and the billowing smoke plume reaches the airspace above your facility. The National Weather Service expects the smoke to last in the area for several weeks and to grow in intensity if firefighters cannot rapidly contain the flames.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Fire threatens your facility—**The fire unexpectedly grows in size and intensity, outpacing the ability of firefighters to contain it safely. The most recent projections predict that the fire will reach your airport's property line within 2 days. Authorities recommend that the facility be evacuated.
- **Fire threatens other aviation facilities—**While the fire is of no current threat to your facility, it has forced temporary closures of several airports in the region. As long as those facilities are nonoperational, flights are being diverted to your airport, increasing daily traffic dramatically. Your facility is also being used by firefighting aircraft daily.

### *Potential Consequences*

A drought may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Wildfire and smoke

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Air traffic controllers (if applicable), administrative staff
- **Airport tenants—**Business partners

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- **Local community**—Emergency services, local environmental agencies
- **Regional community**—State and federal fire management organizations, state environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Wildfires

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

Your facility is alerted that there will be a controlled wildfire nearby that should not adversely affect your operations. However, you get word that the controlled fire has now gotten out of hand and is rapidly growing. The plumes of smoke begin to increase, making the visibility extremely low. You have no idea how long this will last and now need to pivot your operations to mitigate the risk.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Wildfire on property**—Instead of being affected by only smoke, the wildfire has now grown and is encroaching on airport property, particularly near the tenants' hanger. Your airport tenants are frantically calling you to know what you plan to do to ensure their property is safe.

### *Potential Consequences*

Wildfires may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Building water damage, long term (moisture, mildew, mold)
- Failure of HVAC system
- Increased demand on HVAC system
- Overheating of IT equipment
- Increase in calls to emergency response center
- Intake of smoke into facility
- Increased fire risk
- Power loss
- Reduced vegetation and increased erosion
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Aircraft damage
- Interruption of traffic flows to/from airport
- Supply-chain issues
- Extreme-heat exposure
- Risk of harm to human life
- Delay of emergency services
- Decreased air quality
- Non-attainment of EPA air quality standards
- Increase in aviation fire risk (flashpoint for aviation fuels is 100°F)
- Potential for wildfire and smoke
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts (public health and safety)
- Insurance issues (increase in cost of coverage, issues with insurability)

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### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Business partners
- **Local community—**Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Volcanic Eruptions

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | National | ANM, AWP, AAL |

### *Scenario Overview*

Over the past week, you have been closely monitoring the impending eruption of a volcano in your region. Within the next few days, it is likely that the volcano will erupt and impact your airport. After the volcano erupts, it is evident that operations will be affected due to the ash in air. Now, you need to survey your facility for damage and determine how long you will need to return to aviation operations. Based on the volcanic activity, it is clear that it will impact flights in the immediate airspace.

Additionally, there are damages to the tenants' aircrafts. As time continues, it is uncertain how long the ash will remain in the atmosphere. Your personnel are looking to you to decide how the airport should change operations and what needs to be done due to the damage from the volcanic activity.

### *Potential Consequences*

Volcano eruptions may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Foundation heave/damage
- Failure of HVAC system
- Increased demand on HVAC system
- On-airfield debris
- Increase in calls to emergency response center
- Intake of smoke into facility
- Increased fire risk
- Power loss
- Damage to airport transportation vehicles
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft
- Decreased visibility
- Increase/decrease in fuel consumption
- Increased air turbulence/changing wind patterns/optimum orientation changes/microbursts
- Reduced availability of clean water
- Interruption of traffic flows to/from airport
- Supply-chain issues
- Human migration

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- Extreme-heat exposure
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Decreased air quality
- Impacts to airport level of service
- Non-attainment of EPA air quality standards
- Increase in aviation fire risk (flashpoint for aviation fuels is 100°F)
- Interruption in communications systems
- Interruption of financial stability/ solvency
- Staffing issues
- Potential for wildfire and smoke
- Changing wind patterns
- Increased media/press presence
- Necessitating the centering of the airport in emergency responses efforts (public health and safety)
- Insurance issues (increase in cost of coverage, issues with insurability)
- Fuel shortage

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Business partners
- **Local community—**Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Tsunami

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Environmental | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

You have just heard reports from the National Earthquake Information Center that an offshore earthquake has occurred. Immediately after the National Weather Service issues a tsunami warning for low-lying coastal regions, and your facility is within the warning area. It is evident that your local emergency response personnel are busy and will not be able to aid your facility in the immediate future.

Your staff begin to get frantic calls from the tenants, worried about their aircraft and want to know what you are going to do. Your personnel are looking to you to decide how the airport needs to prepare for the impending tsunami.

### *Potential Consequences*

Tsunamis may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

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- Failure of the building envelope
- Foundation heave/damage
- Building water damage, long term (moisture, mildew, mold)
- Failure of HVAC system
- Increased demand on HVAC system
- External facility flooding damage (runways, taxiways, etc.)
- On-airfield debris
- Roof failure
- Increase in calls to emergency response center
- Wind damage
- Runway damage
- Power loss
- Damage/corrosion to underground infrastructure
- Damage to integrity of surfaces and pavements
- Electrical failure
- Sewer overflow
- Damage to airport transportation vehicles
- Reduced vegetation and increased erosion
- Increased weathering on facilities and equipment
- Reduced aircraft capacity
- Delays to construction
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Decreased visibility
- Increase/decrease in fuel consumption
- Increased air turbulence/changing wind patterns/optimum orientation changes/microbursts
- Aircraft damage
- Impact to aircraft performance (reduced braking/hydroplaning, etc.)
- Contagious disease/viral outbreaks
- Reduced availability of clean water
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain issues
- Human migration
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Decreased air quality
- Impacts to airport level of service
- Increased insect populations
- Non-attainment of EPA air quality standards
- Attraction of wildlife
- Interruption in communications systems
- Interruption of financial stability/solvency
- Staffing issues
- Potential for wildfire and smoke
- Storm surge
- Changing wind patterns
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts (public health and safety)
- Insurance issues (increase in cost of coverage, issues with insurability)
- Fuel shortage

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Business partners

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- **Local community**—Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community**—State environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Political Issues

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

One of the hot topics in this year's state elections has been transportation funding and support. The public has been clamoring for the state legislature to provide funds to repave roads, stabilize bridges, and ensure road infrastructure across the state is resilient. However, public officials have stressed that funding would have to be repurposed from other budgets—including that for aviation and air transportation.

You know if state funding is reduced, you will likely need to adjust your operations and schedule to account for a smaller budget. After the election, the new representatives choose to do just that, reducing the overall funding available for aviation and airport-related projects to support road infrastructure. These changes are planned to take effect during the next fiscal year's budget, starting in a few months.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **All transportation funding decreased**—Instead of merely restructuring the state transportation funding, the new legislature has decided to decrease transportation funding across the board and reallocate those funds to different government entities.
- **Local attitudes change**—With the most recent local election, one of the issues that has emerged is the pollution and noise caused by your facility. The candidates for election have pledged to consider measures that would affect your airport, including imposing new curfews for flights (dictating when aircraft can operate) and adjusting the amount of funding available to support your facility.

### *Potential Consequences*

Political issues may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Supply-chain issues
- Human migration
- Impacts on the airport level of service
- Interruption of economic stability/solvency
- Staffing issues
- Increased media/press presence
- Fuel shortage

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### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions.

- **Airport—**Administrative staff, leadership
- **Local community—**Transportation organizations, local government (e.g., city council), community committee

## Scenario: Pilot Shortages

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Social | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

You have witnessed a concerning demographic trend in recent years—fewer people have been obtaining their pilot licenses and pursuing plane ownership. You know very well that this issue is a destructive cycle: when there are fewer pilots, fewer people can learn how to fly. As a GA airport, you depend on independent pilots and small businesses to fund your operations by renting hangars, conducting flights, purchasing fuel, and using your maintenance services.

This trend is, unfortunately, showing no signs of slowing. While you have not seen a dramatic year-over-year drop in the number of pilots, when you compare your numbers to those from one, two, or three decades previously, they have dropped precipitously. You know that economic solvency for your airport relies heavily on a healthy base of private pilots to provide revenue; if you cannot find an alternate funding source, your business will be in trouble.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Small business closes—**One of your most loyal customers announces they are shutting their doors after more than 30 years in business; their last flights will be conducted at the end of the month, and their hangar space is paid through the end of the year.

### *Potential Consequences*

Pilot shortages may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Takeoff delays
- Impacts on airport level of service
- Interruption of economic stability/solvency
- Staffing issues

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies,

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and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Leadership, administrative staff
- **Airport tenants**—Contractors, pilots
- **Local community**—Chamber of commerce (or equivalent), small business partners

## Scenario: Border Security

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | West, Southern Regions | AWP, ASW, ASO |

### *Scenario Overview*

It is an average day, and your facility is operating normally. Outside, a government vehicle pulls up, and two armed agents exit, looking to speak with you. When they find you, they notify you that they are hunting a fugitive attempting to flee the area and who, they suspect, may try to use your airport to cross the border and evade capture.

The agents request your and your personnel's assistance in identifying and locating the suspect. They also notify you that they will conduct a walkthrough of your facility to ensure that the suspect is not hiding somewhere on the property already. You know that, even if they do not find the suspect at your facility, they will likely be on property investigating for the next few hours—at a minimum.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Immigration officers from neighboring country**—You receive a bulletin from the country across the border from your airport, notifying you they believe a fugitive transited through your facility. They, in collaboration with Customs and Border Protection agents, will be coming to your property as part of their investigation.
- **Temporary border closure**—As a result of federal policy, the border between the United States and the country your facility neighbors have been temporarily closed, and no individuals are permitted to transit over it on land, sea, or air.

### *Potential Consequences*

Impacts on border security may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Interruption of traffic flows to/from airport
- Human migration
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Impacts on airport level of service
- Interruption of economic stability/solvency

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### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Emergency response, security personnel, administrative staff
- **Airport tenants**—Pilots, facility owners, business partners
- **Local community**—Emergency response organizations, law enforcement organizations, immigration authorities

## Scenario: Terrorist Threats/Attacks

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

You receive a call stating that there is a bomb located at the airport and to prevent the bomb from going off, the airport must meet the demands of the caller. You are told that you must not involve law enforcement and they will call you back with their demands and instructions in the next 2 hours. You must decide what your next steps are for the safety of your staff, your tenants, and the public.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Fundraiser event**—Instead of your normal operations, it is a very busy day at the airport as there is an event happening at the airport that will have at least 250 people in attendance. You must now think about what you need to do with an increased public presence at your facility.

### *Potential Consequences*

Terrorist threats/attacks may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of the building envelope
- Increase in calls to emergency response center
- Runway damage
- Power loss
- Damage to integrity of surfaces and pavements
- Damage to airport transportation vehicles
- Failure of local utilities
- Loss of field lighting
- Takeoff delays
- Re-routing of aircraft
- Damage to planes in hangars and on tie-downs
- Aircraft damage
- Risk of harm to human life
- Delay of emergency services
- Impacts to airport level of service
- Interruption in communications systems
- Necessitating the centering of the airport in emergency response efforts (public health and safety)
- Insurance issues (increase in cost of coverage, issues with insurability)

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### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Business partners
- **Local community**—Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community**—State environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Cyberattacks/Cyberterrorism

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

There are many types of cyberattacks, which vary based on the goal of the actor and sophistication of the attack. The following list includes several types of attacks which could impact your facility; select the scenarios which are most pertinent for your context to explore in this exercise.

- **Ransomware attack**—When your personnel try to sign into the airport's computer system, they find themselves locked out. A black screen declares that your system has been hacked, and if you want to regain access to your files, you will need to pay a ransom in bitcoin. If you fail to do so, the message states that all the data saved on your computer network will be permanently erased. (Consider what systems you have networked, and what you rely on computers for. Are there certain systems which, if targeted, would be more catastrophic than others?)
- **Attacks against operational technology**—One of your mechanics reports that they noticed something odd when running a routine diagnostic on the automatic fueling system you use. On further inspection, it appears that the digital system has suffered some sort of hack, resulting in a change to the fuel composition. Planes that have this altered fuel may be susceptible to spontaneous explosion during their flight.
- **Hack of personally identifiable information**—One of your personnel notifies you that an independent identity protection service they use had alerted them that their personal information (including full name, date of birth, social security number, and address) was compromised. It appears that someone accessed this information from your personnel files, and it has been posted on the internet. (Consider how your calculus would change if passengers, as well as personnel, information had been accessed.)
- **Attacks to circumvent security and screening**—You receive a Federal Bureau of Investigation (FBI) bulletin warning that some smuggling groups have been using a cyberattack to evade bag security screening by re-routing the automated bag transfer system. In doing so, they can smuggle illicit goods across borders much more easily. The FBI warns that airports located near borders need to be particularly vigilant for this type of attack.

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- **Distributed Denial of Service (DDOS) attack—**You receive an alert from your IT department warning that a DDOS attack appears to be occurring against your airport's website and web services. Thousands of automated users are visiting the site, causing it to slow and crash. Your IT department does not know where the attack is coming from or when it might end.

### *Potential Consequences*

Cyberattacks/cyberterrorism may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Increase in calls to emergency response center
- Electrical failure
- Failure of local utilities
- Loss of field lighting
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain issues
- Human migration
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Impacts to airport level of service
- Interruption in communications systems
- Interruption of economic stability/ solvency
- Staffing issues
- Increased media press/presence
- Necessitating the centering of the airport in emergency response efforts (public health and safety)
- Insurance issues (increase in cost of coverage, issues with insurability)

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, security personnel, administrative staff
- **Airport tenants—**Contractors, vendors, business partners
- **Local community—**Emergency response organizations, utilities, transportation organizations, law enforcement organizations

## Scenario: Transportation Incidents

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

It is an unusually foggy day at your facility, and everything is operating normally. Your air traffic control (or equivalent) gives clearance for a skydiving flight to takeoff. The flight takes off safely, but moments later you received a panicked call—something has gone wrong, and there appears to have been a mid-air collision between the skydiving flight and a different aircraft that was beginning to approach the facility.

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Upon investigation and working with local authorities, you quickly locate the crash site. Of the estimated 11 passengers and four crew members between the two flights, there are four people rushed to the hospital in critical condition; all others are declared dead on-site.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Mid-air near miss—**Instead of the scenario provided in the overview, consider how your actions, challenges, and priorities would change if the two aircraft nearly collided but managed to avoid one another.
- **Runway near miss—**An aircraft is on final approach into your facility when it identifies another aircraft on the runway, preparing to takeoff. The aircraft on approach manages to pull up and circle around again, avoiding a crash.
- **Incident at nearby airport—**An airport in your general region suffers a transportation accident and, as a result, is unable to accept incoming flights for a short period. Several of the flights are diverted to your facility for emergency landing.

### *Potential Consequences*

Transportation incidents may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Increase in calls to emergency response center
- Damage to airport transportation vehicles
- Takeoff delays
- Interruption of traffic flows to/from airport
- Supply-chain issues
- Risk of harm to human life
- Delay of emergency services
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, air traffic control, administrative staff
- **Airport tenants—**Contractors, pilots
- **Local community—**Emergency response organizations, transportation organizations

## Scenario: Airport Security

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

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### *Scenario Overview*

It is a sunny afternoon, and your facility is operating on a normal schedule. One plane is on approach to land, and you know there is one more you are expecting to land in the next hour. There is a private plane that has been fueled and is idling outside its hangar; the owner is inside the hangar, taking care of some last details before taking off.

Suddenly, your phone rings; the aircraft owner is calling you, claiming that a man he had never seen before has boarded his plane and was attempting to move it. Looking out the window, you see someone sitting in the plane's cockpit, and it looks as though they are trying to determine how the controls function. You also see the pilot who called you standing outside the hangar, waving his arms.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Intruder on runway**—You see someone on the runway who has gained unauthorized access to your facility. It appears they are taking photos of different airport areas, though they also have a backpack.
- **Accidental incursion**—After dropping off some materials for one of your contractors, a delivery driver gets turned around and accidentally drives onto the runway. A plane is on its final descent when you notice the truck; based on where it is, it could pose a collision risk to the aircraft.
- **Media presence**—After the incident at your airport, several media outlets (including both local and regional news) have been publishing regular stories on the state of your airport's security. These reporters are spending lots of time in the public areas of your facility; their vehicles are parked on your property, and one reporter even booked a chartered flight that landed at your facility to get more footage.

### *Potential Consequences*

Disruptions to airport security may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Risk of harm to human life
- Impacts on airport level of service
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions.

- **Airport**—Engineers, operational personnel, air traffic control, emergency response, security personnel, administrative staff, director, public information officer
- **Airport tenants**—Contractors, pilots, business partners
- **Local community**—Emergency response organizations, law enforcement organizations

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## Scenario: Power Outage

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

A severe storm in your region knocked the power out to your facility and the surrounding community. Though the local utility is working hard to restore power, their resources are limited; there are other repairs that are just as pressing, and crews are helping support hurricane season outages elsewhere. Preliminary estimates suggest that the power will be out for at least 3 days, and potentially longer as the utility conducts a systematic survey to determine the extent of damage.

Two days into the power outage, you receive a warning from your fuel vendor: due to increased demand, prices are rising to purchase fuel for your on-site generators. If the blackout lasts much longer, you know that you will have burned through your generator fuel supply and will need more to keep the generators operational.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Rolling brownouts—**Rather than a days-long outage precipitated by a specific event, consider how your operations would be affected if the utility in your region instituted rolling brownouts to combat energy demand and the potential for wildfires.
- **Extended outage—**On day two of the outage, the utility provides an update: unfortunately, despite their efforts, the outage will likely last up to a week due to the extent and severity of the damage on the transmission and distribution lines.

### *Potential Consequences*

Power outages may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Overheating of IT equipment
- Increase in calls to emergency response center
- Power loss
- Electrical failure
- Failure of local utilities
- Loss of field lighting
- Takeoff delays
- Re-routing of aircraft
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Interruption of regularly scheduled maintenance
- Risk of harm to human life
- Delay of emergency services
- Interruption in communications systems
- Interruption of economic stability/ solvency
- Staffing issues
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to

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invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Contractors, food and beverage vendors, retail vendors, other business partners
- **Local community**—Emergency response organizations, utilities, transportation organizations, local environmental agencies
- **Regional community**—State environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Industrial Disasters

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

Your facility is located near a large industrial plant. During your normal operations, you notice an unusual plume of some sort of gas or smoke emitting from the plant and drifting toward your facility. When you call local law enforcement, you are notified that there has been some sort of incident at the neighboring industrial plant and that an evacuation is underway.

Based on the gas plume you can see, it is clear that it will impact flights in the immediate airspace. It is also evident that your local law enforcement partners are preoccupied responding to the industrial plant and will not be able to spare any aid for your facility in the immediate future. Your personnel are looking to you to decide how the airport should change operations, if at all, during this incident.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

- **Fuel or chemical spill on-site**—Instead of an accident at a neighboring facility, consider how your actions change if there is a spill of aviation fuel or other chemicals at your airport.

### *Potential Consequences*

Industrial disasters may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- On-airfield debris
- Increase in calls to emergency response center
- Intake of smoke into facility
- Increased fire risk
- Power loss
- Electrical failure
- Electrical fire
- Sewer overflow
- Damage to airport transportation vehicles
- Failure of local utilities
- Loss of air traffic control (if applicable)
- Takeoff delays
- Re-routing of aircraft

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- Damage to planes in hangars and on tie-downs
- Increase/decrease in fuel consumption
- Aircraft damage
- Interruption of traffic flows to/from airport
- Reduced throughout capacity
- Interruption of regularly scheduled maintenance
- Risk of harm to human life
- Delay of emergency services
- Violation of regulations as a result of irregular operations
- Impacts to airport level of service
- Non-attainment of EPA air quality standards
- Increase in aviation fire risk
- Interruption in communications systems
- Interruption of economic stability/ solvency
- Staffing issues
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts (public health and safety)
- Insurance issues (increase in cost of coverage, issues with insurability)
- Fuel shortage

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Business partners
- **Local community—**Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Construction Projects

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

Your facility has been undergoing construction as a hanger is being added. One day a piece of equipment malfunctions and causes damage to the neighboring building. The neighboring building is occupied by airport personnel and the public, and several people are severely injured. The construction workers immediately contact you to let you know of the situation. The construction workers and your personnel are looking to you for the next steps.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

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- **Runway damage**—Instead of a piece of equipment damaging a neighboring building, construction damages a large portion of the runway, and many flights are planned to come in.
- **Delays**—Instead of runway damage, there is a large delay in the schedule construction of a new hanger extending the timeline by several months. You had several new tenants lined up to move into the new hanger, and now they are in an uproar about the delay.

### *Potential Consequences*

Construction projects may cause many interruptions to operations as they can last several months or even years. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- On-airfield debris
- Delays to construction
- Takeoff delays
- Re-routing of aircraft
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Interruption of regularly scheduled maintenance
- Impacts to airport level of service

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Business partners
- **Local community**—Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies

## Scenario: VIP Visits

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Operational | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

You have been planning for a VIP visit for the last several weeks and have prepared all your staff for their arrival. This VIP visit will require you to shut down various parts of your facility for security reasons. However, there is a change in plans, and they will be arriving 2 days later than originally planned. The day they are now arriving happens to be when you have an event planned to fundraise for the neighboring school. You know how valuable this VIP is to you, and it is important that they are still able to make their visit. This is an extremely important opportunity for the airport that you do not want to miss.

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### *Potential Consequences*

VIP visits may cause many interruptions. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Interruption of traffic flows to/from airport
- Interruption of regularly scheduled maintenance
- Impacts to airport level of service
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport—**Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants—**Business partners
- **Local community—**Emergency response organizations, utilities, transportation organizations, industrial companies, local environmental agencies
- **Regional community—**State environmental agencies
- **Federal government—**Federal environmental agencies

## Scenario: Human Pandemic

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Social | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

### *Scenario Overview*

Six months ago, scientists and doctors began warning the public that this year's flu season was likely to be particularly dangerous given the viruses expected to propagate. Unfortunately, those concerns were proven accurate as influenza began to spread virulently throughout the global population, killing thousands.

Early in the pandemic, authorities identified air travel as one of the major vectors responsible for helping spread the respiratory disease—sick people boarded planes, infected passengers, and brought the virus to new destinations. In an effort to contain the virus, a patchwork of policies has been put in place across the United States. Some states require passengers to show a negative flu test; others require that masks be worn indoors and on flights. Overall, travel has fallen rapidly, as people have been quarantined and generally stayed home. The best forecasts predict it will be months—if not years—before the aviation sector resumes business as usual.

### *Scenario Extension*

This section contains possible ways the scenario could change to deepen the discussion. Based on your unique context, resources, experience, and concerns, you may choose to add any of the following elements to the scenario described previously to deepen discussion and enhance preparedness.

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- **Staffing issues**—To try and stop the spread of disease among your personnel, you have reduced the overall staffing footprint at the airport. However, you find that even with fewer people there, your personnel are still getting sick, and some are too scared to come to work.
- **Supply-chain challenges**—After the first few months of the pandemic, you notice that supplies like aviation fuel and repair parts are in short supply. Due to the pandemic's impact on the global workforce, it may be several weeks, if not months, before you can get the shipments you need to be delivered.
- **New Regulations**—The DOT has passed a regulation that requires all airports to install state-of-the-art air filtration systems to protect passengers. Depending on the state of your facility, these air purifiers will likely be expensive. They may even require that parts of the building be retrofitted.

### *Potential Consequences*

A human pandemic may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Failure of HVAC system
- Increased demand on HVAC system
- Increase in calls to emergency response center
- Contagious disease/viral outbreaks
- Reduced availability of clean water
- Interruption of traffic flows to/from airport
- Reduced throughput capacity
- Supply-chain issues
- Human migration
- Interruption of regularly scheduled maintenance
- Changes in seasonal tourism
- Risk of harm to human life
- Delay of emergency services
- Decreased air quality
- Impacts on airport level of service
- Interruption of economic stability/ solvency
- Staffing issues
- Increased media/press presence
- Necessitating the centering of the airport in emergency response efforts

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—Engineers, operational personnel, emergency response personnel, administrative staff
- **Airport tenants**—Contractors, pilots, business partners
- **Local community**—Emergency response organizations, public health organizations, hospitals, local environmental agencies
- **Regional community**—State environmental agencies
- **Federal government**—Federal environmental agencies

## Scenario: Personnel Issues

| Category | Geographic Location(s) | FAA Region(s) Affected |
|---|---|---|
| Social | National | AEA, ANM, ASW, ASO, AGL, AWP, ANE, AAL, ACE |

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### *Scenario Overview*

Many factors can influence staffing levels. Choose from the following list based on what you are most concerned about and begin sparking conversation among stakeholders:

- **Economic recession**—Due to economic factors far beyond your control, your airport did not bring in the expected revenue last year. However, you know that your personnel are already at minimum levels, and these further losses will likely worsen burnout. As a result, you are faced with the difficult responsibility of letting personnel go to balance the books.
- **Strike or organized labor**—A labor union has presented you with a list of demands for their workers, including raising pay and reducing the number of double shifts personnel need to work. They have threatened a walk-out or strike if you cannot comply with the demands.
- **Labor shortage**—Though you have open positions to fill and the funding to hire, you have had very few applicants over the past few months (and even fewer qualified applicants). Your current personnel are already feeling the strain of working multiple shifts or performing work meant for more people, but you also know this isn't an issue that can be resolved overnight.
- **Illness**—A respiratory illness has affected many of your personnel who have called in sick. A few have even been hospitalized due to the severity of their sickness. The local public health department recommends that you ensure personnel can socially distance while at work until the virus has run its course.
- **Perception of safety**—Your airport recently experienced a violent crime that left many visitors and personnel shaken and concerned that your facility is unsafe to use. Since then, you have seen personnel quit and begin using their sick leave to avoid coming in.

### *Potential Consequences*

Personnel issues may cause many consequences. The Risk-Assessment Analysis Tool in the Self-Directed Resiliency Toolkit highlights several consequences of particular concern for each shock or stressor. In this case, potential consequences include the following:

- Takeoff delays
- Supply-chain issues
- Interruption of regularly scheduled maintenance
- Impacts on airport level of service
- Interruption of economic stability/solvency
- Increased media/press presence

### *Potential Partners*

Exercises are enhanced when multiple people from different agencies who would respond to the shock or stressor can come together and discuss how to implement emergency plans, policies, and procedures. Following is a non-exhaustive list of potential organizations you may wish to invite to participate in this exercise stress test to improve your outcomes and identify additional corrective actions:

- **Airport**—All staff, administrative staff
- **Airport tenants**—Contractors, pilots, business partners
- **Local community**—Unions

## Exercise Questions

If you are conducting this exercise stress test with multiple people, designate one person to take notes on the answer to each question. You will use your answers to identify corrective actions to improve overall resilience and your response to shocks and stressors. For the scenario you selected, discuss the following questions.

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### *Understanding Consequences*

1. How could [shock/stressor] affect your airport economically?
2. How could [shock/stressor] affect your airport environmentally?
3. How could [shock/stressor] affect your airport personnel?
4. How could [shock/stressor] affect your airport's reputation?
5. How could [shock/stressor] affect your airport's operations?
6. How could [shock/stressor] affect your airport infrastructure?
7. Which of these consequences are you most concerned about? Why?
8. Which of these consequences are you least concerned about? Why?
9. Which of these consequences is most time-sensitive to address?
10. Which of these consequences are longer-term challenges?

### *Understanding Response Capabilities*

1. What economic resources does your airport have available to respond to [shock/stressor]?
2. What human resource personnel does your airport have available to respond to [shock/stressor]?
3. What other resources does your airport have available to respond to [shock/stressor]?
4. What plans, policies, or procedures does your airport have prepared to respond to [shock/stressor]?
5. Given the scenario, do you have the resources you need to respond to [shock/stressor]? If so, at what point would the [shock/stressor] exceed your ability to respond? If not, what resources do you lack?

### *Understanding Partnerships*

1. What local or state partners might help you respond to [shock/stressor]?
2. What private-sector partners might help you respond to [shock/stressor]?
3. What aviation partners or organizations might help you respond to [shock/stressor]?
4. What tenants might help you respond to [shock/stressor]?
5. What airport business partners, such as utilities, ports, local law enforcement, firefighters, and local health organizations might help you respond to [shock/stressor]?
6. Of the organizations you identified, who do you have strong relationships/points of contact with? With whom do you need to build relationships or identify a new point of contact?

## Corrective-Actions Template

Once you have completed the questions for your scenario, use the following template (see Table M-3) to identify corrective actions you can take to address the challenges you uncovered. You should add or remove rows as needed until you have documented all the necessary corrective actions.

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**Table M-3. Improvement plan template.**

| # | Problem | Corrective Action | Responsible Party |
|---|---|---|---|
| 1 | [Briefly describe the problem you uncovered—this may be something that affects your ability to respond to the incident effectively, a lack of resources, or a different challenge that should be addressed to enhance your capabilities.] | [Describe the action(s) that need to be taken to address the problem you identified. Be as specific as possible to improve the likelihood these actions will be taken.] | [Identify the office(s) or individual(s) responsible for implementing the corrective action.] |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

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TOOL N

# Incident After-Action and Corrective-Actions Template

## Incident After-Action and Corrective Actions

*This Incident After-Action and Corrective-Actions template is meant to aid in post-event documentation and track corrective actions.*

Airports are encouraged to conduct post-incident meetings and use the Incident After-Action template after an incident occurs. Documenting incidents for historical purposes and identifying opportunities for improvement with corrective actions will help better posture airports in similar incidents.

### Incident After-Action

Date of Incident Review Meeting:

Date of Incident:

Incident Name:

Summary of Incident

Assets/Persons Impacted



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What went well?

Opportunities for Improvement

### Corrective Actions

Identify corrective actions for each opportunity for improvement.

| # | Problem | Corrective Action | Responsible Party |
|---|---|---|---|
| 1 | [Describe the opportunity for improvement.] | [Describe the action(s) that need to be taken to address the opportunity for improvement identified. Be as specific as possible to improve the likelihood these actions will be taken.] | [Identify the office(s) or individual(s) responsible for implementing the corrective action.] |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

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*Abbreviations and acronyms 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 |
| FAST | Fixing America's Surface Transportation Act (2015) |
| FHWA | Federal Highway Administration |
| FMCSA | Federal Motor Carrier Safety Administration |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| GHSA | Governors Highway Safety Association |
| 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 |

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