Planning for Shock Events in Aviation Demand Forecasting

July 23, 2025
1-2 p.m. EST

NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

ACRP AIRPORT COOPERATIVE RESEARCH PROGRAM

Today's Learning Objectives

(1) **Use a methodology to identify potential shock events and model ways to withstand and respond to them**

(2) **Develop scenario forecasts**

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Questions and Answers

Please type your questions into your webinar control panel

We will read your questions out loud, and answer as many as time allows

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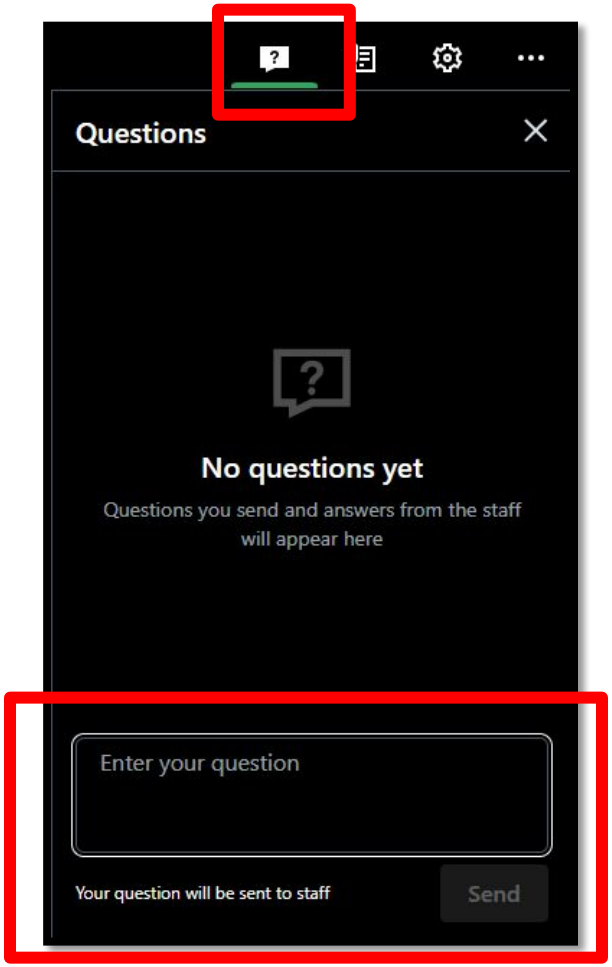

Today's Moderator

- David Ballard

Christopher Greer
Senior Researcher, Project Manager

- 10+ years of aviation forecasting and risk analysis
- Advisor to Transport Canada on forecasting and aviation sector
- Principal Investigator, Ian Kincaid
- Research partners:
  - Hubpoint Strategic Advisors
  - KRAMER Aerotek
  - Lumina Decision Systems
  - RSA Archer

ACRP Report 272

Planning for Shock Events in Aviation Demand Forecasting

Christopher Greer
Ian Kincaid

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ACRP Project 03-60 Panel

Stephen P. Gordon, Oakland International Airport, Moraga, CA (Chair)
David Ballard, Jenkintown, PA
Elisa J. Grey, Ontario International Airport Authority, Ontario, CA
Greg Kaldahl, Chicago, IL
Joni Steigerwald, C&S Engineers, Syracuse, NY
Michael Lawrance, FAA Liaison
Liying Gu, Airports Council International–North America Liaison
Matthew J. Griffin, CRP Senior Program Officer

Introduction to Research

Objectives of this project

- Examine the impacts of and response to the COVID-19 pandemic.
- Drawing on experience and lessons learnt from past shock events as well as best practice from a range of industries, conduct research to identify and adapt appropriate methods for airports to better identify, understand, and manage shock events.
- A general approach and methodology to assist airports, which is scalable to all airport types and sizes and practical in application.
- Develop and provide real-world examples of a systematic methodology to help airports understand and account for potential shock events.
- Help airports preparing for the possibility of shock events by developing response and mitigation strategies using the methodology described by the guidebook to create more resilient and agile airport organizations.

Approach to Addressing the Problem

1. Review traffic and financial impacts of COVID-19 pandemic on US aviation system
2. Analyze other past shock events and research existing methods to predict and respond
3. Devise a practical methodology for airports to plan for and respond to shock events
4. Provide case study examples to demonstrate how the methodology can be implemented
5. Develop research and case studies into a Guidebook for airport users

Defining a Shock Event

Shock events may be known by many names: black swan events, grey swan events, rare events, disrupters, and high impact, low probability events.

Research has shown that shock events have the following characteristics:

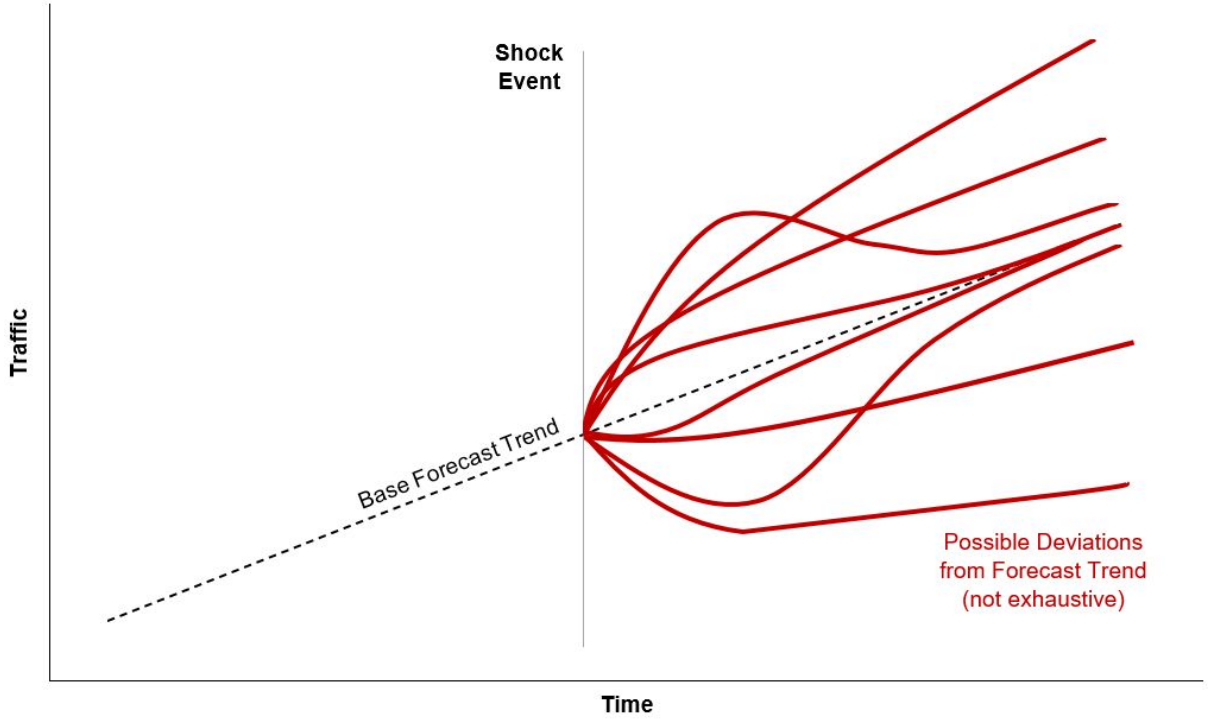
1. Uncertainty around if and when the event will occur
   Probability of event is low, but is not a certainty either

2. When the event does occur, has potential to have a significant impact
   Major impact on operations, finances, or strategy

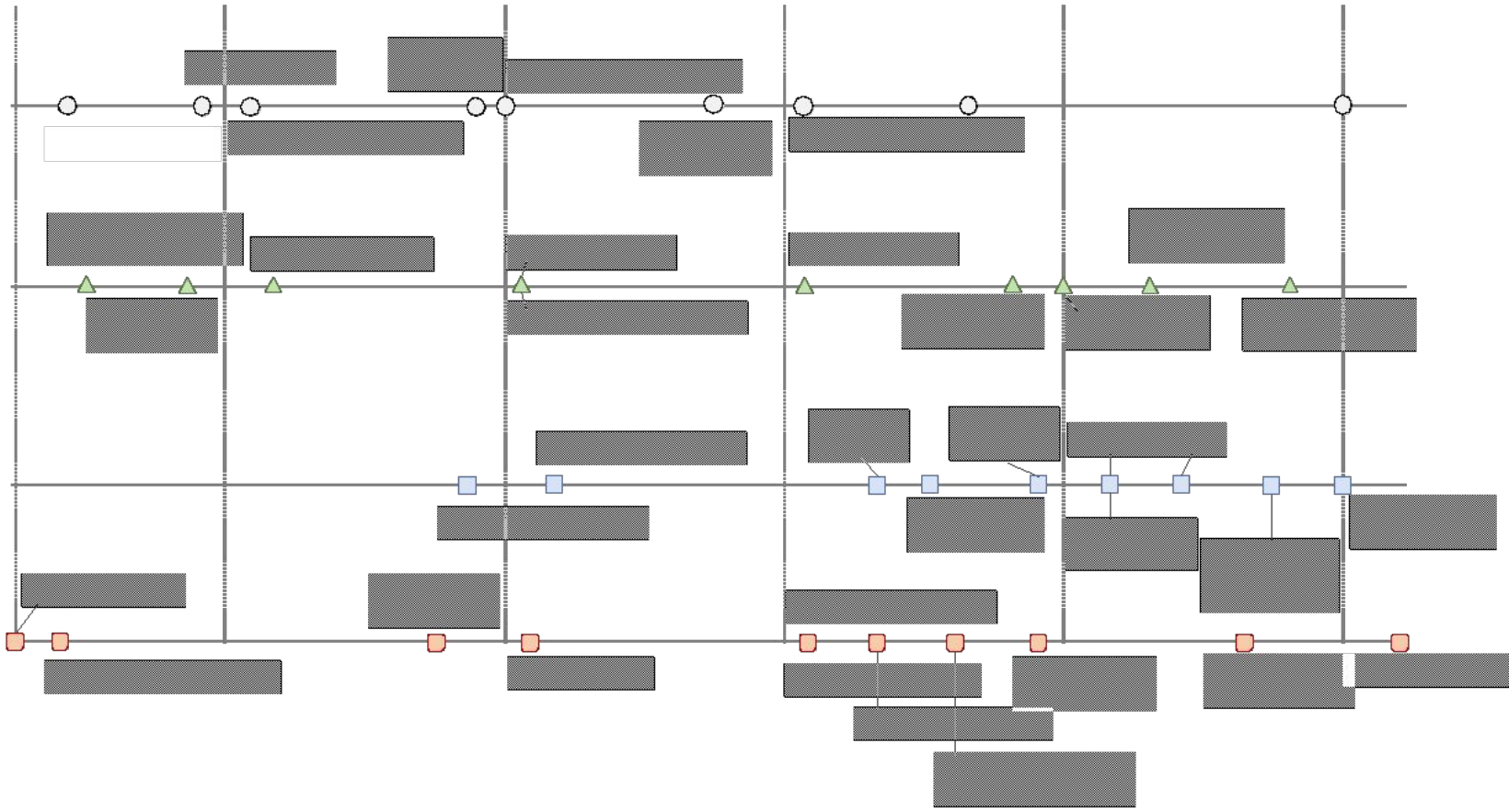
3. The event can vary in its timeline
   Some may be very rapid transitory events, others can stretch on for years

Defining a Shock Event

Shock events could cause traffic development to diverge considerably from long-term trends, possibly permanently



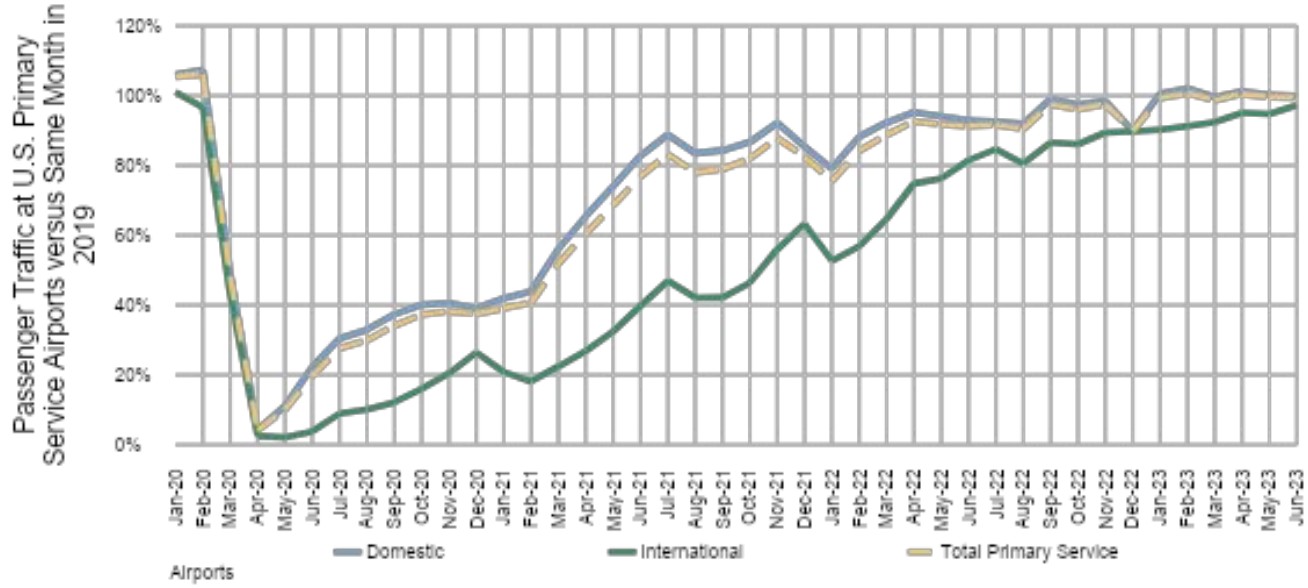
Aviation Shock Events are Frequent



Impacts of the COVID-19 Pandemic

- The COVID-19 pandemic was the largest shock to the aviation sector in the post-war aviation era.
- The shock was global in nature with differing local results
- Airport finances and planning activities were heavily impacted

US Aviation System Passenger Traffic vs Same Month in 2019

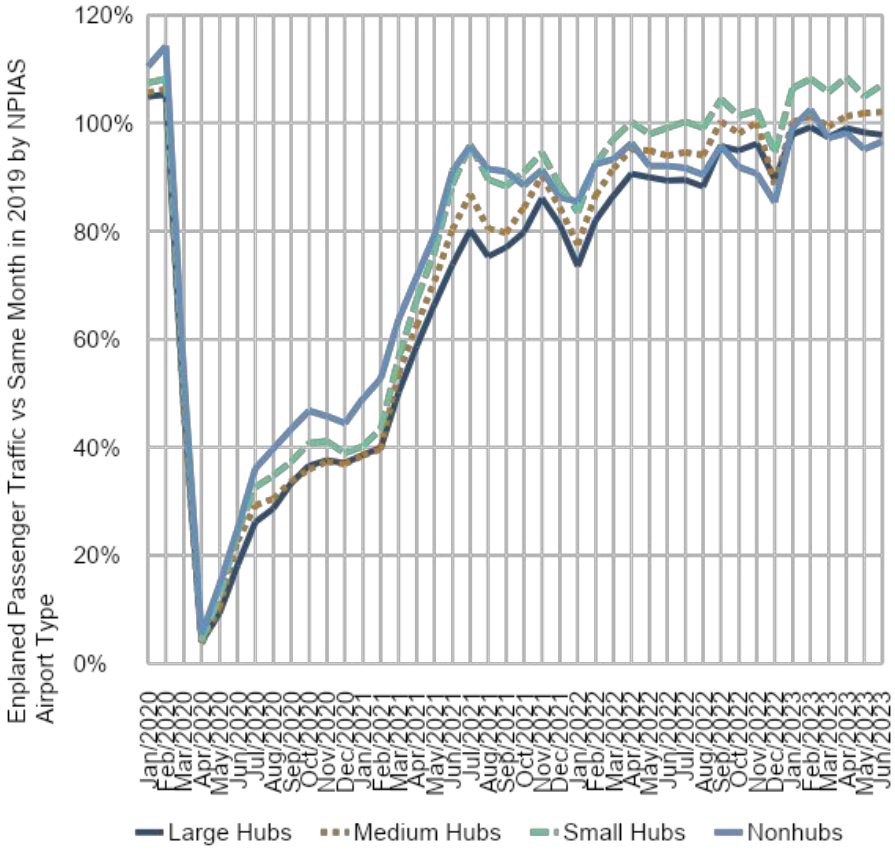


Impacts of the COVID-19 Pandemic

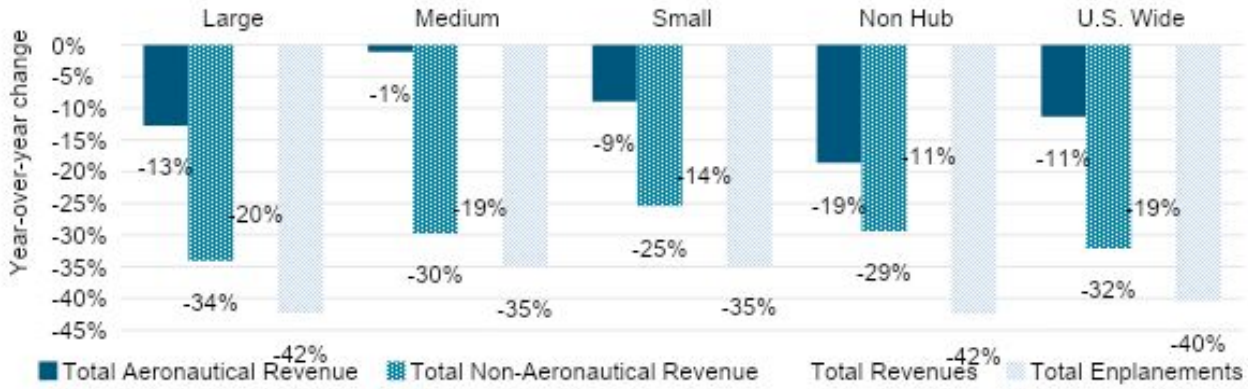
Impact on traffic and recovery depended on many factors

- Role of airport in airline networks (hub vs spoke)
- International vs domestic traffic mix
- Types of air carriers operating at airports: full-service carriers vs (ultra) low-cost carriers
- Financial position prior to pandemic
- Business vs leisure/VFR mix

Passenger Traffic Recovery by Airport Type



Financial Impacts on US Airports



- Airports of all sizes saw substantial reductions in operating revenues.
- Large airports were the hardest hit due to higher international exposure.
- Government grants were used towards airline cost centers and providing relief for non-aeronautical service providers (concessionaires).
- Federal grants estimated to cover nearly two-thirds of revenue losses in FY2019 and more than 80% in FY2020.

How Airports Responded to Pandemic

Airports responded to the downturn in traffic and operating revenues with a variety of strategies

- Temporary close airport facilities from entire concourses to portions of parking facilities
- Accelerate or re-prioritize infrastructure projects that would be disruptive to operations or passenger experience
- Provide support to concessionaires impacted by traffic loss
- Restructure debt obligations or favourably refinance debt

Impacts of Past Shock Events

Research examined other past shock events

- Infectious disease events: SARS (2002-2003)
- 9/11 Terrorist Attacks
- Extreme weather events: Hurricane Katrina
- Great Recession of 2008-2009
- Loss of a carrier or de-hubbing
- Carrier entry or rapid traffic growth

Understanding past shock events provides a basis to consider what shocks could impact an airport in the future

Research Findings on Shock Events

General Findings

- Shock events are generally overlooked in planning (in aviation and elsewhere) due to lack of information, imagination or willingness to consider them.
- Airport managers are not naive to the risk of more strategic shock events, but it is generally not a major focus for management and planning.
- Methods are available for identifying risks/shock events but there is a need to ensure that more left-field ideas are captured (ensure that "Cassandras" are heard).
- Rather, shock identification should be about opening management and planning thinking to the possibility of these events, not about covering all bases.
- There are **no practical methods** for accurately predicting or forecasting shock events.
- George Box, "*All models are wrong, but some are useful*" – forecasts still have a role in understanding what could happen (scenario forecasts)

Research Findings on Shock Events

General Findings

- **Scenario planning** holds promise as a way of exploring how an airport would be affected by a shock event and how it could respond.
- The value of the scenario planning approach is not necessarily to create more accurate forecasts, but rather it is presented as a learning process which challenges conventional thinking.
- Extends beyond simply forecasting various scenarios and includes the development of action strategies to respond to risks in the devised scenarios, as well as testing the actions and mitigation strategies.
- A common theme in the literature on scenario planning is the need for full organizational engagement.

A Systematic Methodology for Airports

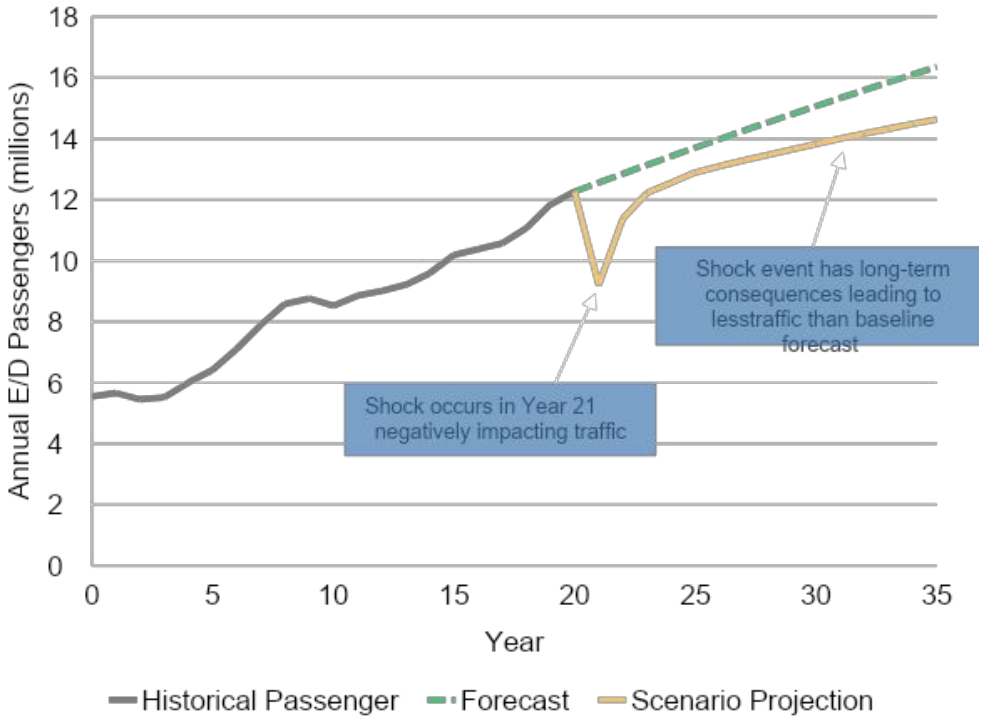
Methodology Developed With the Following Set of Guiding Principals

- Can be readily incorporated into existing airport practices
- Applicable and scalable to airports of all types and sizes
- Should be accessible to a wide range of practitioners and not require highly specialized knowledge or training.
- Produce a portfolio of ready-to-deploy strategies that can be quickly implemented.
- Be a genuine contribution to the robustness of the airport's business.
  Do not be a "check box" exercise.

- Use history as a guide but **not** a predictor. Past events can teach us a great deal but should not be the focus of the identification exercise.
- Incorporate a range of key functional areas from the airport business to have a wide-ranging set of viewpoints and opinions.
- Recommend a *structured brainstorming* approach to elicit potential shock events
  - Set clear objectives and educate participants about shock events and the process
  - Structure the discussion using major categories of shock events
  - Encourage wide-ranging and imaginative idea generation
  - Utilize a facilitator to organize and orient the process
- The exercise should be comprehensive and imaginative and produce many potential events that could be evaluated in more detail in following steps.

- From a select set of potential shocks, prepare scenario forecasts that model how airport activity would be impacted by the shock event
- Scenario forecasts are best prepared with input from multiple sources within the airport and potentially external sources of advice
- Forecasts can be highly complex or simple models. Importance is on considering *how* and *why* a shock event impacts activity

Illustrative Scenario Planning Traffic Projection



- How would the airport business cope with and respond to the shock scenarios?

- Assess the impacts across all aspects of the airport's business activities:
  - **Planning**: ongoing construction, planned investment, financing investments
  - **Finance**: aeronautical and non-aeronautical revenues, debt servicing, payroll and operations, capital investment
  - **Operations**: reduced/increased activity
  - **Safety**: safety considerations to people, operations, and infrastructure
  - **Marketing & Commercial**: Airline marketing strategies and opportunities
  - **Community & Stakeholders**: how their activities are impacted

- Stress testing should be comprehensive and holistic to the entire airport business

- How can the airport devise response strategies to be better prepared for a potential shock?
- Categorize response options into four key categories for positive/negative shocks

Negative Shocks	
Avoid	Transfer
Mitigate	Accept

Positive Shocks	
Exploit	Share
Enhance	Accept

- Response strategies should also look at the timing of the robustness strategy to be most effective in responding to shock
  - **No or low regret** options that provide benefits regardless (swing or MARS gates)
  - **Reactive options** when a shock occurs, often specific to a type of event (airline exit, natural disaster)
  - **Pre-emptive options** undertaken before a shock could occur, typically implemented in long-term planning and operational priorities (modular design)

- Research emphasizes that this process should not be a ‘one-off’ exercise, but an **ongoing and evolving process**.
  - Monitoring and early warning detection for threats of shocks
  - Periodic updates or full reassessments of shock impacts and responses
  - Disposing of or modifying scenarios as aviation environment changes
- Ongoing engagement is vital to the success of this process to keep organizations involved in considering shock events. Complacency in a post-shock environment must be overcome to better prepare for what may come next.
- Plans should be communicated within the organization to provide wider awareness of shock events and build confidence about resilience to future shocks.

Closing Thoughts

- Shock events are not uncommon in the aviation industry and airports require strategies to become more resilient to these shocks.
- The inability prepare for shock events is often not a technical or strategic one but a *lack of imagination* to consider future shocks and their impacts.
- The systematic methodology described in our research is applicable to airports of any size and role and can be scaled to meet the resources and abilities available.

FOR ADDITIONAL INFORMATION

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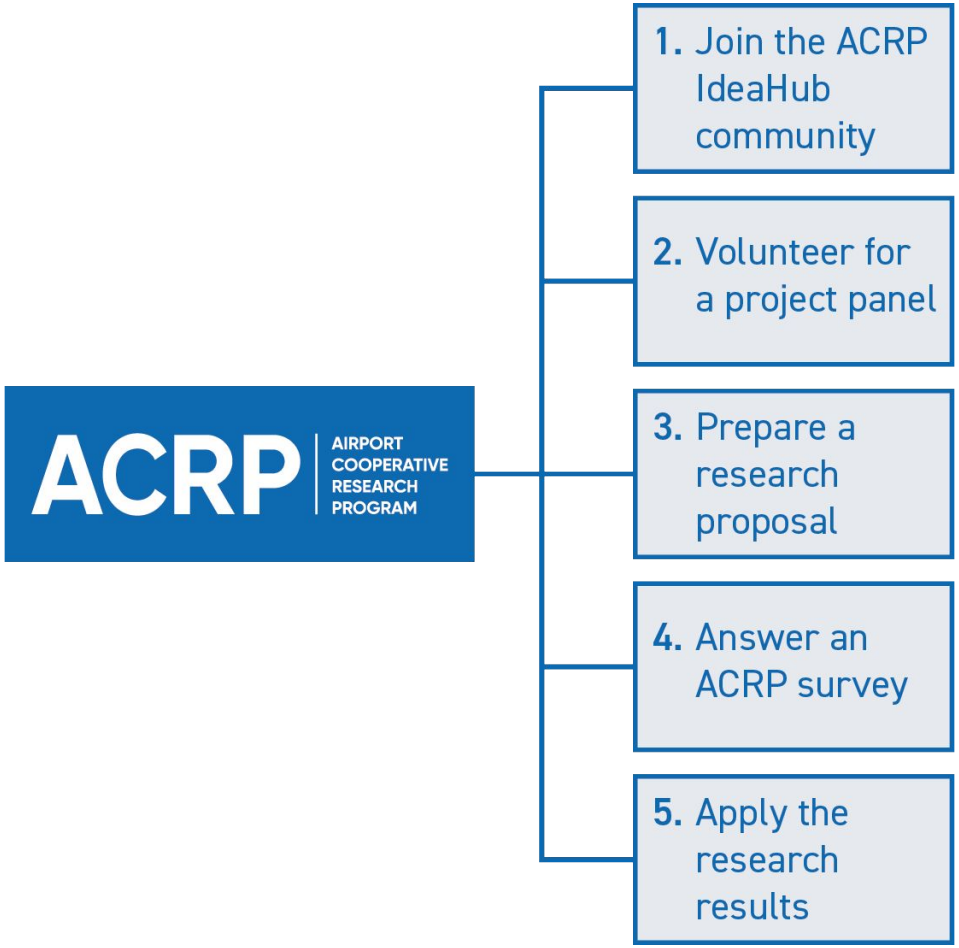

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