

**BEING PREPARED FOR IROPS: A BUSINESS PLANNING AND
DECISION-MAKING APPROACH**

FINAL REPORT

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ABSTRACT

The objective of this project was to develop and test an analytical approach to assess investments that airport owners and operators might make to reduce the disruptive impact of irregular operations (IROPS). The Research Team categorized and identified a range of possible IROPS events, identified and categorized airports, reviewed best practices for planning for IROPS, surveyed airports to review existing business planning practices for IROPS, developed a flexible business case analysis approach, developed a Microsoft Excel-based decision support tool, and conducted demonstrations exercising the approach and tool with airport representatives. The study deliverables are a guidebook to understanding business planning for mitigating IROPS events and an accompanying Microsoft Excel-based decision support tool. The guidebook and tool are intended to help airport operators (and others) to understand the business case for funding airport improvements intended to mitigate IROPS events.

CHAPTER 1: BACKGROUND

The objective of this project was to develop and test an analytical approach to assess investments that airport owners and operators might make to reduce the disruptive impact of irregular operations (IROPS). The study deliverables are a guidebook to understanding business planning for mitigating IROPS events and an accompanying Microsoft Excel-based decision support tool. The research was comprised of the following activities:

- Categorized and identified a range of possible IROPS events using existing literature on IROPS planning, individual airports tarmac delay contingency plans, and the Research Team's subject matter expertise and experience.
- Identified and categorized airports based on a number of criteria, which focus on passenger services..
- Reviewed best practices for planning for IROPS and surveyed airports to review existing business planning practices for IROPS.
- Developed a flexible business case analysis approach that merges a decision analysis with traditional benefit-cost analysis.
- Developed a Microsoft Excel-based business planning and decision support tool.
- Conducted demonstrations exercising the approach and tool with a sample of representative airports.

This report provides background on the research, explains the general approach, review the findings and applications, and discusses the conclusions and future research. The best management practices, decision analysis approach, and associated decision support tool are described in the accompanying guidebook.

1.1 Problem Statement

A well-structured business case analysis process produces clear and insightful results that project sponsors can rely on to select the best value options to meet their strategic objectives. A successful business case analysis should accomplish the following objectives:

- Clearly capture and present alternatives, benefits, costs, and risks.
- Be credible, defensible, and useful for effective decision making allowing airports to maximize the use of scarce resources.
- Be compliant with Federal Aviation Administration (FAA) and other federal agency requirements.

- Support strategic goals as well as higher level budget processes.
- Help effective planning and execution of investments.
- Support funding requests that help achieve strategic goals.

However, in the case of IROPS business planning, traditional business case analysis processes do not always result in complete and adequate results. This is due to several reasons:

- Traditional processes are labor intensive, especially when a relatively large number of cases must be considered.
- IROPS events are usually associated with a high level of uncertainty.
- Not all benefits of investments intended to mitigate IROPS events can be expressed in a standard fashion using current FAA guidance on investment analysis for airports.
- Cost estimates do not capture the full extent of the planning and coordination required among the many stakeholders involved.
- Existing benefits analysis guidance from the FAA focus on capacity enhancement projects.
- Airport activity metrics used for benefit-cost analyses (BCA) focus on accepted airport planning practices that draw on averages that do not adequately capture the volatility in activity during IROPS events.

An approach to assess IROPS mitigation investments addressing these concerns is required to assist airport operators in prioritizing scarce capital resources. The approach should allow for relatively rapid evaluation of business cases and be robust to high levels of uncertainty.

1.2 History

IROPS events are not a new phenomenon. However, they have received increased attention from the media, policy makers, operators, and the research community over the last few years. Much of the initial focus on IROPS has been on extended tarmac delays and their impact on passengers. By 2012, federal rules were in place to protect passengers subjected to extended delays on both domestic and international flights. These rules require carriers to prepare contingency plans and give passengers the option of deplaning. They allow for substantial fines – up to \$27,500 per passengers for delays extending beyond three hours for domestic flights or four hours for international flights (U.S. DOT 2012). Subsequent to the issuance of the rule, the number of extended tarmac delays dropped sharply, but has recently increased somewhat (Trejos 2012).

A number of IROPS-related ACRP projects have been initiated under the auspices of the TRB, including three that are of relevance as background information to this Research Plan. The Research Team coordinated ACRP 10-14 with the Principal Investigators of the ongoing studies (i.e. ACRP 03-18 and ACRP 04-15).

ACRP 10-10 Guidebook for Airport Irregular Operations (IROPS) Contingency Planning. This project resulted in the publication of ACRP Report 65, *Guidebook for Airport Irregular Operations (IROPS) Contingency Planning* (Nash, et al. 2012), as well as a research report and Microsoft Word documents that airports can use as interactive tools for preparing individual IROPS plans.

ACRP 01-18 Application of Enterprise Risk Management at Airports. This project resulted in the publication of ACRP Report 74, *Application of Enterprise Risk Management at Airports* (Marsh Risk Consulting 2012). This guidebook covers risk management, which is functionally related to IROPS planning. It contains a grading scheme for evaluating risks that is a useful template for developing effectiveness ratings. The project also included a decision support tool implemented in Microsoft Excel.

ACRP 03-18 Operational and Business Continuity Planning for Prolonged Airport Disruptions. The objective of this project is to develop a guidebook for airport operators to plan and prepare for catastrophic events that lead to prolonged airport closure. The project is more narrowly focused than the objectives of ACRP 10-10 and focuses on continuity planning. At the time of writing, the final deliverables had been submitted and were under editorial review.

ACRP 04-15 A Tool for Developing Airport Terminal Incident Response Plans. The objective of this research is to develop a tool to prepare and maintain incident response plans for airport terminals. While limited to the airport landside, the resulting guidebook should help airports identify IROPS-related mitigations and initiatives. At the time of writing, this project was ongoing.

CHAPTER 2: RESEARCH APPROACH

The research approach can be broadly categorized into three phases: (1) Understanding the problem, (2) developing the business case approach, and (3) implementing the approach in the decision support tool. Several of the activities within these broad phases occurred in parallel as, understanding of the problem, the approach, and the framework of the tool matured together.

2.1 Understanding the Problem

2.1.1 Review Existing IROPS Business Planning Practices and Needs

Prior to establishing the framework for the IROPS business planning approach, the Research Team surveyed the existing literature to document best industry practices. The results of this effort are presented in the annotated bibliography reproduced in Appendix A. In summary, there is no existing literature on business planning specifically tailored to IROPS. There is an extensive body of literature describing traditional business planning. Similarly, there is an extensive body of literature focusing on operational aspects of handling emergencies and severe weather events. These practices constitute useful background information to the IROPS business planning problem. This body of literature is also useful for determining which type of events will be handled through the airport's regular operational and business planning, and which are likely to be categorized as IROPS and therefore require special consideration.

2.1.2 Categorize Airports

The Research Team established a system for categorizing airports according to their IROPS business planning needs. The categorization scheme served two objectives: (1) It informed the development of the business planning approach, by considering a range of airports and their needs; and (2) it ensured that the outreach and demonstration efforts covered a representative sample of airports. The categorization scheme was based on the following criteria: The definition of service and hub levels presented in the National Plan for Integrated Airport Systems; the number of domestic vs. international passengers; the number of origin and destination (O&D) vs. connecting passenger; and the FAA region. Thresholds for the domestic/international and O&D/connecting criteria were based on the results of a previously published cluster analysis (Adikariwattage, V., et al. 2012). The criteria focus on passenger services, which is consistent with the definition of IROPS used by the Research Team (see Section 2.2).

2.1.3 Conduct Airport Outreach

In order to evaluate existing business planning practices in support of IROPS investment decisions, and the need for improvement, an electronic survey instrument was created and distributed to a sample of 323 airports. The Research Team received 37 total completed surveys. A total of 77 emails resulted in error messages, resulting in an effective response rate of 15%. The survey results are provided in Appendix B.

To supplement the airport survey effort, the Research Team conducted a series of structured interviews. A candidate group of seven airports were selected in consultation with the Project Panel. The airports were selected so as to represent a broad range of airports in terms of size, characteristics, and geographic region. Two alternate airports were also identified. One of these alternate options had to be exercised, as one of the original airports identified was severely affected by Hurricane Sandy. Invitations to participate were sent out to the seven airports, along with reminders, if needed. Of the seven airports contacted, five agreed to participate (71%).

2.2 Developing the Business Case Analysis Approach

The Research Team developed an integrated approach that merges a form of multi-criteria decision analysis (MCDA), the Analytical Hierarchy Process (AHP), with traditional benefit-cost analysis to provide a comprehensive evaluation of each potential mitigation initiative. Figure 1 diagrams the high-level approach for determining the criticality of IROPS events, estimating the costs, and evaluating the impact of mitigation initiatives.

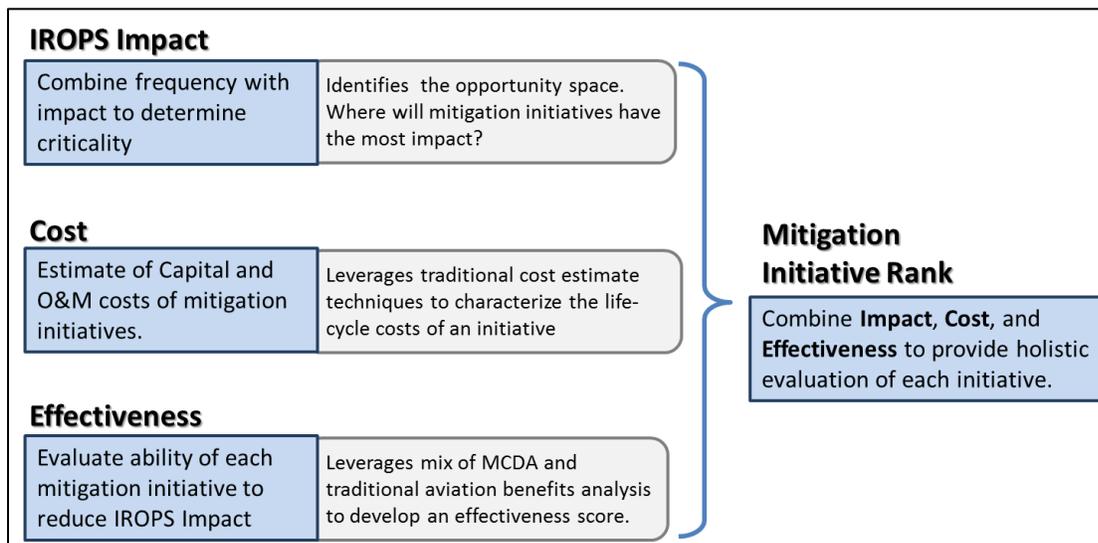


Figure 1: Overview of business case analysis approach

The first step in this process was to define the terminology for IROPS in the context of this study. The following definitions were created:

IROPS Event: Exceptional incidents that cause the airport to operate in off-nominal conditions that have not been planned for as part of the airport’s normal certification or emergency planning, thereby disrupting flight schedules and the normal flow of passengers through the air transportation system, and that require actions and/or capabilities beyond those considered usual by aviation service providers. An IROPS event typically lasts from a few hours up to 48 hours.

IROPS Impact: The resulting changes in operation from nominal conditions due to the IROPS Event.

Mitigation Initiative: Proposed action for lessening or eliminating the negative impact of an IROPS event.

A set of criteria was developed for identifying IROPS events. The criteria were rooted in the definition of IROPS events described above. They also reflect the technical and analytical requirements for developing the business planning approach. The criteria are:

1. The event should be relatively rare
2. The event should significantly impact passenger services
3. The event should, at least in part, fall outside the airport's normal planning for incidents, accidents, emergencies, and severe weather
4. The event should generally range in duration from a few hours up to 48 hours

The third criterion reflects the broad range of planning and preparation that airports conduct in order to respond to emergencies and other events that, while disruptive, occur or have occurred with sufficient frequency that they are anticipated. While there is overlap, planning for IROPS focuses on events that fall outside the scope of normal emergency planning and preparation. The results of the process of identifying IROPS events are shown in Appendix C.

The overall severity of an IROPS event can be thought of as a combination of the likelihood of the event happening and the impact on the airport and its customers if it does occur. This can be expressed through a conceptual impact rating, which would then be determined by:

$$\text{Impact Rating} = [\text{Propability of IROPS Event}] \times [\text{Impact of IROPS Event}]$$

2.2.1 Estimate Costs

The cost input required for the IROPS mitigation business planning approach is the same as for traditional benefit-cost analyses. Lifecycle cost estimates include the total costs to acquire, implement, operate, maintain, technology refresh and dispose of the proposed initiative. The IROPS business planning approach uses cost estimates at a highly distilled level requiring only two pieces of data: the initial costs and recurring costs. The guidebook includes a summary of best practices for cost estimating.

2.2.2 Determine Effectiveness

The Research Team's approach to determining effectiveness of mitigation initiatives is implemented using the following process: (1) Evaluation criteria are defined, (2) stakeholder priorities are set and quantified, and (3) an evaluation of the mitigation initiatives against the criteria is conducted.

Evaluation criteria are the foundation of AHP. They scope the analysis by establishing what aspects of a contingency initiative are important and further identify areas of differentiation. An appropriate set of evaluation criteria for any potential mitigation initiative defines the breadth of the analysis. The methodology used to value each criterion defines the depth. A conscious effort was made to match the scope of both the criteria and the methodology to the overall objectives of the analysis. Table 1 presents the list of criteria selected for evaluating IROPS contingency initiatives.

Stakeholder priorities are quantified as weights applied to the decision criteria. This weighting provides the opportunity for decision makers to impart their preferences and internalizes their experience into the analysis. This process results in a weight being assigned to each criterion at each level of the hierarchy. These weights indicate the overall level of importance relative to other criteria.

The final step in assessing the effectiveness of mitigation initiatives is to evaluate each initiative within the IROPS investment portfolio against the criteria, applied to the associated IROPS events and impacts. Initiatives are scored through a subjective evaluation of how effective each proposed initiative is at mitigating the impact of the IROPS event. A modified Likert scale is used to obtain a quantitative assessment of effectiveness.

Evaluations for each possible pairing of a proposed mitigation initiative with its associated IROPS event and impact are then computed by incorporating the effectiveness evaluations, weighted by stakeholder priorities. This process is repeated so to iterate through each element in the investment portfolio. An overall effectiveness score for each initiative is calculated by applying the weights computed from the pairwise comparisons to the evaluation of each effectiveness criterion.

2.2.3 Rank ordering the investment portfolio

The final step in the IROPS business planning approach is the rank ordering of each alternative in the investment portfolio. This ranking compares the estimated benefit of each initiative against its lifecycle cost. The overall benefit is computed from its rated effectiveness and the impact score of the IROPS event. The impact score, in turn, is based on the estimated likelihood and severity of the associated event.

Table 1: Definition of IROPS mitigation effectiveness criteria

Evaluation Criteria	Description
Strategic Challenges	
Airport Master Plan Alignment	How well does the mitigation initiative align with the current airport master plan? Was it already considered in the capital plan? Is it a completely new concept?
Funding Availability	How accessible will funding be for this initiative? Does it qualify for a federal grant, PFC funding, PFC backed bonds or other public funding? Airport generated funds? Does this create a significant ongoing operational expense to the airport?
Stakeholder Coordination	How many stakeholders must be involved for this initiative? What level of coordination is required across different interested parties? What are the potential related complications? Impact on rates and charges? Airline use agreement?
Implementation Timeline	How long will the initiative take to procure/implement?
User Benefits	
Reduction in Airline Impact	How will this mitigation initiative reduce disruption to airlines in terms of time? Consider flights delayed, missed connections, crew scheduling, and extended tarmac delays.
Reduction in Traveler Delay	How will this mitigation initiative reduce delay experienced by travelers? Consider the value of the travelers' time, missed connections, and baggage lost.
Traveler Comfort	An evaluation of the level of comfort that can be provided to travelers during the IROPS event. Consider access to food, water, bathrooms, cots, telephone, internet, airport/airline information, onsite overnight accommodations. Consider impacts on special needs travelers and the mobility impaired.
Improvement in Airport Operations	How does the mitigation strategy impact the work conditions for airport staff during IROPS events?
Tactical Complexity	
Disruption Level During Implementation	What level of disruption will this mitigation initiative cause to normal airport operations when it is in effect? [Note: This should not include disruption associated with the acquisition/construction of the alternative, for example temporary disruptions due to construction activity.]
Execution Response Time	How quickly can this contingency initiative be executed in order to address the IROPS event?
Policy & Regulatory Compliance Difficulty	How difficult will it be to maintain policy and regulatory compliance during the execution of the contingency initiative? Consider security, Federal Aviation Regulations Part 139, safety, etc.

2.3 Develop the Analytical Approach and Tool

The Research Team focused initial efforts on the development of an effective, flexible, and robust approach. Subsequent phases of the project focused on developing a decision support tool to facilitate demonstrations and testing of the approach. A number of guidelines were established to develop the tool. The tool should:

- Be implemented in Microsoft Excel, or similar. The tool will not require proprietary software and will be based on a platform that is ubiquitous and likely to be in use at most airports (e.g. Microsoft Office).
- Provide a guided approach in which the user is prompted to select pre-defined choices and/or enter required data along a logical path.
- Make use of subjective evaluations (e.g. comparative rankings), pre-defined data populated by the Research Team, and other data entered by the user.
- Include the ability to review and override pre-defined data and assumptions.
- Allow flexibility in reporting and output of the ranking and scoring of IROPS alternatives, to support reporting, printing, and exporting to other applications.

Following these guidelines, the IROPS Investment Support (IRIS) decision support tool was developed in Microsoft Excel. The main interface of IRIS, shown in Figure 2, serves both as visual map of the work flow and as the interface for executing each step in the process.



Figure 2: IROPS main interface with analysis steps

Each one of the steps is implemented using a “wizard”. The wizards consist of a short sequence of dialog boxes, accompanied by brief instructions, which solicit the input required to execute each task. The calculations required occur in the background, as the wizards are completed by the user. In short, IRIS can be said to consist of five wizards: The Portfolio wizard, Cost wizard, Comparisons wizard, Effectiveness wizard, and Results wizard.

2.4 Demonstration Project

A critical component of evaluating the success of the IRIS tool was to conduct demonstrations with actual airports. The demonstration project was assessed using the electronic survey instrument shown in Appendix D. The assessments provided the Research Team with valuable feedback on the ability of the tool to meet the research objectives, as well as its usability. The feedback was generally positive, with all participants finding value in the tool. The “Portfolio wizard” and the “Effectiveness Wizard” were both well received and deemed useful. The “Comparisons Wizard” was the area identified as needing the most improvement. The feedback received is summarized in Table 2. Changes made to the decision support tool to improve the pairwise comparisons process are described in Chapter 3.

Table 2: Assessment of demonstration project

	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
Overall Value of the Tool					
This tool would add value to the IROPS business planning needs of my airport.				2	1
The tool provides useful results.				3	
Overall I was satisfied with the usability of this tool.				3	
I would likely use a tool like this for future IROPS business planning.				2	1
Portfolio Wizard					
It was clear what needed to be entered at each stage of the process.				3	
I was satisfied with the user experience of the Portfolio Wizard.				3	
Cost Wizard					
It was clear what needed to be entered at each stage of the process.				2	1
I was satisfied with the user experience of the Cost Wizard.				2	1
Comparisons Wizard					
It was clear what needed to be entered at each stage of the process.			2	1	
It was relatively easy to complete the pair-wise comparisons.			2	1	
The criteria descriptions make sense and are relevant to IROPS business planning at my airport.		1	2		
I was satisfied with the user experience of the Comparisons Wizard.		1	1	1	
Effectiveness Wizard					
The effectiveness questions made sense to me.				3	
I was satisfied with the user experience of the Effectiveness Wizard.				3	
Results Wizard					
The results were presented clearly.				2	1
I was able to find and interpret the results I was looking for.			1	1	1
Quick Start Guide					
The Quick Start Guide was helpful for learning how to use the tool.				2	1

CHAPTER 3: FINDINGS AND APPLICATIONS

The review of existing best practices indicates that there is practically no literature on business planning for IROPS mitigations. This was not unexpected and serves to confirm the need for this research project. There is an emerging body of literature on operational planning for IROPS, notably ACRP Report 65, *Guidebook for Airport Irregular Operations (IROPS) Contingency Planning*. Likewise, there is a large body of literature on traditional methodologies for business case analysis, including specific guidance for airports.

An airport outreach was conducted to measure existing IROPS business planning practices and needs. The results indicated general alignment between the project's research plan and the airport community's reported IROPS-related planning needs. The team's definition of an IROPS event, as well as the initial lists of IROPS impacts/consequences and IROPS mitigation alternatives, matched the reported expectations of the survey respondents. The structured interviews confirmed that the same also holds for the metrics of effectiveness in the IRIS decision support tool. The survey and the structured interviews also provided several suggested changes and revisions to the approach that were adopted during the course of the project.

Another important finding is that the outreach effort indicated differences in IROPS-related business planning needs between larger and smaller airports. For example, large and medium hubs were more likely than smaller airports to indicate a strong need for formal business planning processes for IROPS-related investments. During the structured interviews, the larger airports could, generally, point towards more specific needs. However, even among the smaller airports, the majority of recipients indicates a need, although less emphatically and with fewer specifics.

In addition to operational consequences, operators must understand the financial implications of decisions to expend funds in support of IROPS mitigation initiatives. The Airline Use Agreement and rate setting methodologies in place at the airport will affect the complexity and transparency of those decisions. In terms of funding eligibility, IROPS mitigation initiatives are considered by FAA policy to be needed for contingencies, and are therefore generally not eligible for either Airport Improvement Program (AIP) or Passenger Facility Charge (PFC) funding. There is some flexibility in the use of AIP and/or PFC funds for purchases of systems that support the primary goals of enhancing airport safety, capacity, security, and environmental concerns, however. Cross-utilization of equipment funded with such funds for IROPS events is not prohibited. Specific guidance is often obtained on a project-by-project basis in consultation with the FAA Airport District Office or Airports Division of the FAA Regional Office.

The demonstration phase was vital in improving the business case analysis approach as well as the IRIS tool. The Research Team was able to validate the approach and better understand how the tool would be leveraged by the eventual end users. Several enhancements were made to the tool and the analysis approach as a result of the interactions with participating airports and the project panel.

In particular, the feedback received pointed to a need to improve the processes for conducting pairwise evaluations. The dissatisfaction with the pairwise comparison process is predominantly related to the application of AHP principles that require users to make pairwise comparisons. This forces hard choices between criteria in order to ascertain an unbiased and meaningful prioritization for the stakeholders. It is a challenge to balance this need for strong preference or prioritization, which is a cornerstone of the AHP process, against the usability of the tool and the comfort of the user. The pairwise comparisons also require choices to be logically consistent. If the validation of the data results in an error, the user is required to manually identify and correct any inconsistencies. This can be difficult since it is not possible to automatically determine which comparisons generate the error.

In response to the demonstration project, as well as results from internal testing, two improvements were made to the pairwise comparison process. The first was to slightly relax the threshold used to validate the presence of logical inconsistencies. This had the effect of reducing the likelihood of the error occurring, with only a small loss in fidelity. The second was to add a “Suggest Values” feature that allows the user to optionally have the tool eliminate any logical inconsistencies in the pairwise comparisons. When selected, the tool uses an iterative process to gradually adjust the user inputs until the error threshold is met. This option is described as a last resort, however, since it has the potential of reducing the fidelity in capturing stakeholder preferences.

CHAPTER 4: CONCLUSIONS AND SUGGESTED RESEARCH

This section highlights the conclusions drawn by the Research Team during the course of the project. Potential topics for future research are also identified.

Effective business planning and investment portfolio management are important for every airport. While substantial research has been conducted to assist airports undertake traditional business case analysis, the topic of investment planning for IROPS mitigation has not been addressed. This research demonstrates that airports are aware of the need to incorporate IROPS mitigation investments into their planning. Airports also recognize the utility of a decision support tool to assist in that process. The approach adopted by the Research Team addresses the unique, low frequency, high impact nature of IROPS events and supports business planning for capital expenditures to mitigate their impacts.

In developing the IRIS application, the Research Team was faced with human factors challenges in developing the graphical user interface (GUI). The Research Team had to balance the analytical purity of the approach with the ability of users to execute it, and develop methods to solicit subjective input in a manner that minimizes bias but is easy for users to provide. The process used to conduct pairwise evaluations is a good example of this challenge.

The Research Team would like to propose the following research involving tool development, decision support, and IROPS business planning that may benefit the ACRP its constituent airport community:

- Research the application of decision support techniques like AHP to other areas of airport planning and administration to provide airports simple approaches to standardize ad-hoc decision making.
- Research the application of AHP to supplement traditional benefit-cost analysis methodologies, with a focus on AHP's ability to quantify intangible benefits.
- Investigate methods for managing bias and differentiation in simplistic decision support techniques that rely heavily on subject matter expert input.
- Investigate alternatives to AHP, such as the Simple Multi-Attribute Rating Technique (SMART).
- Increase the utility of the IRIS application by improving the GUI without sacrificing the analytical underpinnings of the approach.
- Increase the utility of the IRIS application by enhancing the explanation of the priority rankings. Options include soliciting qualitative justifications of the effectiveness ratings, highlighting differences between the highest ranking and second alternatives, highlighting the largest differences in scores between alternatives, or highlighting criteria with the highest and lowest possible ratings.

- Pursue approaches for IROPS business planning tailored for specific airport types, regions, or particular severe IROPS events.

The IRIS application could also continue to evolve as airports begin to use the tool to assist in their investment planning process. Updating the tool with knowledge gained from a broader range of users and potential IROPS mitigation investment portfolios would further improve its effectiveness.

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U.S. Department of Transportation. 2012a. Enhancing Airline Passenger Protections. Second final rule, 14 CFR Parts 234, 253, 259, and 399.

LIST OF ABBREVIATIONS

ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
AHP	Analytical Hierarchy Process
AIP	Airport Improvement Program
AUA	Airport Use Agreement
BCA	Benefit-Cost Analysis
FAA	Federal Aviation Administration
GUI	Graphical User Interface
IRIS	IROPS Investment Support
IROPS	Irregular Operations
MCDA	Multi-criteria decision analysis
PFC	Passenger Facility Charge
SMART	Simple Multi-Attribute Rating Technique

APPENDIX A: BIBLIOGRAPHY

American Society of Professional Estimators, *Standard Estimating Practice*, 8th Edition, Nashville, Tenn., 2011

The American Society for Professional Estimators (ASPE) is one of two industry organizations identified by the U.S. Bureau of Labor Statistics as providing industry certification for professional cost estimating. ASPE publishes and regularly updates this standard “how-to” manual for use as a guide for all professional estimators in the construction industry.

Airport Tarmac Contingency Plans [Prepared by Individual Airports]

Following a series of high profile tarmac delays the U.S. DOT implemented new rules under the heading “Enhancing Airline Passenger Protections”. The initial rule was issued August 19, 2011, revised several times and reissued as the “Second Final Rule on Enhancing Airline Passenger Protections (EAPP #2)” on January 11, 2012. Following a series of highly publicized snowstorms and tarmac delays on the east coast in the early winter of 2011, the U.S. DOT published a new a requirement for airport’s to find individual contingency plans addressing extended tarmac delays. That notice states:

The FAA Modernization and Reform Act of 2012 requires covered U.S. carriers and U.S. airports to submit to the Secretary of Transportation for review and approval tarmac delay contingency plans on or before May 14, 2012. The U.S. Department of Transportation’s Office of Aviation Enforcement and Proceedings (Enforcement Office) will be establishing an electronic submission system to enable covered airlines and airports to submit the required plans through the World Wide Web. The Enforcement Office plans to issue another notice within 45 days that will provide information on how covered carriers and airports can submit these required plans. Submissions of the plans should not be made prior to that date to ensure proper review and recording.

The notice further states:

On February 14, 2012, President Obama signed the FAA Modernization and Reform Act of 2012 (the “Act”) into law. Among other things, the Act requires U.S. carriers that operate scheduled passenger service or public charter service using any aircraft with a design capacity of 30 or more seats, and operators of large hub, medium hub, small hub, or non-hub U.S. airports, to submit contingency plans for lengthy tarmac delays to the Secretary of Transportation for review and approval no later than May 14, 2012.

On February 24, the U.S. DOT issued an initial Notice regarding Section 42301 of the FAA Modernization and Reform Act of 2012, which requires operators of large, medium, small, and non-hub airports to prepare emergency contingency plans to handle extended tarmac delays when they occur.

Airports Council International – North America (ACI-NA) and the American Association of Airport Executives (AAAE) joined together to create a contingency plan template for the large, medium, small, and non-hub airports to use in meeting the requirement directed by the U.S. DOT. Because each airport is unique in its capabilities, size, physical characteristics, airline lease agreements, and other tenant lease agreements, ACI-NA and AAAE provided airports with suggested text for the different sections required to be in the contingency plans. The organizations urged members to limit the content of the plans submitted to the U.S. DOT to only the information required due to the potential for sizeable penalties for not complying with their plan. ACI-NA and AAAE suggested that airports put more detailed information in an internal IROPS contingency plan.

The template created by ACI-NA and AAAE, that the majority of airports followed, is a four-page document allowing the airport to fill in the blank areas with the individual airport information. The remaining text for each required section of the plan was selected by the airport from text options provided in the template. The Research Team collected 50 contingency plans from various size airports across the country (see Table A-1).

Table A-1: Airports in contingency plan sample

A.B. Won Pat International Airport (Guam)	Lexington Blue Grass Airport (Lexington, KY)
Billings Logan International Airport (Billings, MT)	Long Island MacArthur Airport (Islip, NY)
Bob Hope Airport (Burbank, CA)	Mammoth Yosemite Airport (Mammoth Lakes, CA)
Boise Airport (Boise, ID)	Minneapolis-St. Paul International Airport
Casper/Natrona County International Airport (Casper, WY)	Missoula International Airport (Missoula, MT)
Charlotte Douglas International Airport	Newark Liberty International Airport
Chicago Midway International Airport	Norman Y. Mineta San Jose International Airport
Corpus Christi International Airport	Northwest Florida Regional Airport (Ft. Walton Beach, FL)
Colorado Springs Airport	Oakland International Airport
Cincinnati/Northern Kentucky International Airport	Outagamie County Regional Airport (Appleton, WI)
Daytona Beach International Airport	Pensacola International Airport
Dane County Regional Airport (Madison, WI)	Pittsburgh International Airport
Dallas/Fort Worth International Airport	Portland International Airport
Denver International Airport	Raleigh-Durham International Airport
Dubuque Regional Airport (Dubuque, IA)	Richmond International Airport
Fort Lauderdale-Hollywood International Airport	Salt Lake City International Airport
Fresno Yosemite International Airport	San Diego International Airport
General Mitchell International Airport (Milwaukee, WI)	Santa Fe Municipal Airport
George Bush Intercontinental Airport (Houston, TX)	Sarasota Bradenton International Airport
Green Airport (Warwick, RI)	Seattle-Tacoma International Airport
Houghton County Memorial Airport (Hancock, MI)	Spokane International Airport
Huntsville International Airport (Huntsville, AL)	Washington Dulles International Airport
Jacksonville International Airport	Will Rogers World Airport (Oklahoma City, OK)
John F. Kennedy International Airport	William P. Hobby Airport (Houston, TX)
Lehigh Valley International Airport (Allentown, PA)	Yellowstone Regional Airport (Cody, WY)

The majority of the plans collected followed the ACI-NA/AAAE template and did not offer additional information. In following the template, these airports provided the following information:

- Introduction on the airport and that it was preparing the document pursuant to §42301 of the FAA Modernization and Reform Act of 2012
- Airport information
- Contact information
- Standard language describing the following airport-specific information:
 - Plan to provide for the deplanement of passengers following excessive tarmac delays
 - Plan to provide for the sharing of facilities and make gates available in an emergency
 - Plan to provide a sterile area for passengers who have not cleared CBP inspection
 - Public access to the emergency contingency plan
 - A small number of the contingency plans gathered provided more detailed information contained in the required sections of their contingency plans. Some examples of the details supplied include the various roles and responsibilities of the parties in an IROPS event, triggers to track excessive tarmac delays, breakdowns of procedures for domestic and international diversions, lists of equipment inventory, procedures established for cooperation between the airport and service providers, and more.

Executive Order 12893, *Principles for Federal Infrastructure Investments*, Washington, D.C., 1994

This Executive Order defines the underlying national policy on employing the benefit-cost analysis method for transportation infrastructure investments, representing the traditional approach to business case planning. It applies to the entire Federal Government and requires that each executive department and agency with infrastructure responsibilities develops and implements plans for investment management consistent with the following principles:

1. Systematic analysis of expected benefits and costs.
 - (a) Benefits and cost should be quantified and monetized to the maximum extent practicable.
 - (b) Benefits and costs should be measured and appropriately discounted over the full life-cycle of each project.
 - (c) When the amount and timing of important benefits and costs are uncertain, analyses shall recognize the uncertainty.
 - (d) Analyses shall compare a comprehensive set of options.
 - (e) Analyses should consider not only quantifiable measures of benefits and costs, but also qualitative measures.
2. Efficient management. Infrastructure shall be managed efficiently in accordance with the following:
 - (a) Agencies should conduct periodic reviews of the operation and maintenance of existing facilities.
 - (b) Agencies should use these reviews to consider a variety of management practices.
 - (c) Agencies also should use these reviews to identify the demand for different levels of infrastructure services.
3. Private sector participation.
4. Encouragement of more effective State and Local programs.

Federal Aviation Administration, *Airport Benefit-Cost Analysis Guidance*, Washington, D.C., 1999

The purpose of this document is to provide clear and thorough guidance to airport sponsors on the conduct of project-level benefit-cost analyses for capacity-related airport projects. It is intended to facilitate the production of consistent, thorough, and comparable analyses that can be used by the FAA in its consideration of airport projects for discretionary Airport Improvement Program (AIP) funding. Airport sponsors are required to conform to the general requirements of this guidance for all benefit-cost analyses submitted to FAA. This should be considered a seminal document in terms of providing guidance on business case analysis with airport applications, but the focus is primarily on capacity-enhancing projects.

Federal Aviation Administration, *Airport Certification Manual*, Advisory Circular 150/5210-22, April 26, 2004; and

Federal Aviation Administration, *Airport Emergency Plan*, Advisory Circular 150/5200-31C, June 19, 2009

These documents provide detailed guidance to airport operators related to the development of Airport Certification Manuals and, of particular relevance to the current study, Airport Emergency Plans. Key guidance in this regard is provided in Section 139.325, *Airport Emergency Plan*, of FAA Advisory Circular (AC) 150/4210-22 and the entire FAA AC 150/5200-31C, *Airport Emergency Plan*. The latter is a large document (close to 300 pages) providing detailed material used by airport operators to develop their emergency plans. Understanding these requirements will help the team determine what emergency provisions, practices, and procedures might be available for use during IROPS events. The following language from the document describes its purpose:

This Advisory Circular provides guidance to the airport operator in the development and implementation of an Airport Emergency Plan (AEP). The AEP addresses essential emergency related and deliberate actions planned to ensure the safety of and emergency services for the airport populace and the community in which the airport is located.

This AC discusses the development and implementation of an AEP document that (1) assigns responsibility for carrying out actions in response to an emergency; (2) sets forth organizational relationships to show how actions should be coordinated; (3) describes how people and property will be protected in emergencies; (4) identifies available resources for use during response and recovery operations; (5) as a public document, cites its legal basis, states its objectives, and acknowledges assumptions; and (6) facilitates response and short-term recovery.

The AC calls for an AEP team to be created that consists of the individuals and organizations that have a potential role in the airport's emergency response program. The planning process should also incorporate training, drills, and exercises so that the people assigned to support the AEP are familiar with their roles and responsibilities. AEPs should consist of four major components (Basic Plan, Functional Annexes, Hazard-specific Sections, and Standard Operating Procedures), provide an easy-to-use mechanism for organizing all pertinent information, and serve in all hazard situations, even unanticipated ones. This is achieved by organizing the AEP around performance of "generic" functions. The AEP should permit emphasis on hazards that pose the greatest risk to an airport and surrounding communities, through use of hazard-specific sections. It should also provide the flexibility needed to allow airports of all sizes to adapt to their specific needs based upon available resources and their specific situation. The AEP requires that airport operators develop plans and procedures in response to the following emergencies: (1) Aircraft accidents and incidents; (2) bomb incidents, including designated parking areas for the aircraft involved; (3) structural fires; (4) fires at fuel farms or fuel storage areas; (5) natural disasters; (6) hazardous materials/dangerous goods incidents; (7) sabotage, hijack incidents, and other unlawful interference with operations; (8) failure of power for movement area lighting; and (9) water rescue situations, as appropriate.

Federal Aviation Administration, *Airport Winter Safety and Operations*, Advisory Circular 150/5200-30C, December 9, 2008

This AC addresses airport winter safety and operations. To combat winter storms, the FAA recommends establishing an Airport Snow and Ice Control Committee (SICC) that holds pre- and post-seasonal planning meetings, operates a Snow Control Center (SCC), and implements a written Snow and Ice Control Plan (SICP). The SICC should (1) conduct pre-season planning, (2) focus on improving runway safety and communications, (3) address the needs of airport users, and (4) critique clearing activities after the season and after each storm. Topics that are recommended for discussion at pre- and post-season SICC meetings include (1) changes to airport staff, equipment, runway chemicals, and airport clearing procedures, (2) changes to deicing/anti-icing programs, and (3) “lessons learned” from actual events encountered. The SCC should (1) manage snow clearing operations, (2) report field conditions, (3) inform appropriate parties of expected runway closures and openings, and (4) issue timely notices to airmen (NOTAMs). The SICP document should have two separate phases: (1) Addressing pre- and post-season topics to prepare for the new winter season and (2) addressing the sequential actions taken for managing winter storms and notifying airport users of conditions. Similar to the AEP guidance, this information is useful in describing resources and planning that may already be in place to support handling of IROPS, and is also useful in putting bounds on the business planning for IROPS mitigation.

Federal Aviation Administration, *Aviation Forum Highlights Ways to Improve Information Sharing to Better Manage Flight Diversions*, Press Release, November 30, 2011

After the October 2011 Northeast snow storm that caused flight diversions for both international and domestic flights traveling to New York, a meeting was convened to address strategies to improve information-sharing and decision-making during severe weather. Attendees included U.S. DOT officials, airport operators, and airline operators. The FAA presented five recommendations: (1) Develop an airport information webpage; (2) increase participation of smaller airports in strategic planning teleconferences; (3) create special data tags for diverted flights on air traffic controller screens; (4) improve coordination of information on FAA equipment outages; and (5) improve airport contingency plans. Another suggestion involved expanding the regional hotlines used in Texas during severe weather events to other regions in the country. These hotlines facilitate the management of flight diversions for airports, airlines, and controllers. The forum did not, however, specifically address business planning for flight diversions.

Federal Aviation Administration, *Best Practices for Winter Operations, Airport Certification Information Bulletin 2011-3, FAA Great Lakes Region, December 13, 2010*

Quilty, S. M., *Preventing Vehicle-Aircraft Incidents During Winter Operations and Periods of Low Visibility, ACRP Synthesis 12, Transportation Research Board of the National Academies, Washington D.C., 2008*

The FAA Great Lakes Region informational bulletin and ACRP Synthesis 12 document best practices for winter operations, with a focus on vehicle-aircraft safety issues. The best practices are to maintain situational awareness, vehicle lighting and visibility, communications, and operational safety. Examples of maintaining situational awareness are training for low visibility and white out conditions, as well as ensuring airfield guidance and mandatory hold signs are visible. Vehicle lighting and visibility guidelines require vehicles to use all available lighting to ensure maximum visibility. Best practices for communications require periodic check-ins with air traffic control (ATC) to reconfirm ATC clearances at controlled airfields and vehicle operators to continually self-announce positions and intentions at uncontrolled airfields. Examples of operational safety include closing runways for snow removal operations via NOTAM when personnel and equipment will occupy the runway for an extended period of time and communicating airfield conditions with ATCT and users.

Federal Aviation Administration, *FAA Standard Work Breakdown Structure (WBS) Version 5, Washington, D.C., 2012*

This guidance provides a standardized structure for the organization of benefits and costs so that meaningful comparisons can be made between the status quo and alternative cases. The FAA WBS Version 5 is organized in four major phases: Mission Analysis, Investment Analysis, Solution Implementation, and In-Service Management. The WBS is sufficiently detailed and flexible to support a wide variety of capital investment projects of varying lifecycles and complexities.

Federal Aviation Administration, *Planning Information Needed for FAA Headquarters Review of Benefit-Cost Analyses, Washington, D.C., 2006*

This guidance identifies airport planning information required by FAA Headquarters for its review of BCAs prepared in support of AIP discretionary grants and letters of intent. Review offices include the FAA Office of Aviation Policy and Plans and the FAA Office of Planning and Programming.

Federal Aviation Administration, *Safety Management System for Airports, Advisory Circular 150/5200-37A (draft), June 29, 2012*

A Safety Management System (SMS) is an integrated collection of policies, practices and procedures that the FAA and airports use to ensure a formal approach to system safety through hazard identification and risk management. It is a proactive approach to safety that is intended to remove as many hazards as practicable by eliminating or mitigating them to a level as low as reasonably practicable. SMS uses a risk management approach for safety decisions that the FAA has defined in four components:

- Safety Policy
- Safety Risk Management (SRM)
- Safety Assurance
- Safety Promotion

The details of each component will not be reviewed here except for the SRM component. SRM is the most significant component of SMS and uses a problem solving process similar to those we anticipate will be used for this IROPS business planning project. For example, the SRM component uses descriptors and terminology to identify and evaluate likelihood and severity that can be adapted for use in IROPS business planning. SRM uses a set of standardized processes to proactively identify and document hazards, analyze and assess potential risks associated with the identified hazards, and identify and track mitigation strategies for each hazard.

The draft version of FAA AC 150/5200-37A, *Safety Management Systems for Airports*, states in part:

A comprehensive SMS using SRM provides management with a tool for identifying hazards and risks and prioritizing their resolution. While each airport's SRM processes may be unique to the airport's operations, physical geometry, history of incidents, and organizational structure, the airport should develop processes and procedures for hazard identification and analysis appropriate to the airport's operating environment. As previously stated, SMS processes and procedures should be scalable; the airport's SRM program should be scalable, as well.

The FAA has established a five-step process of identifying and analyzing hazards. This process provides a scalable framework and guidance to airports, no matter the size or the complexity of the airport environment. Figure A-1 is from the AC and illustrates the five-step process.

In the third step (i.e. "Analyze the risk associated with those hazards") is where the airport would use a safety risk assessment matrix to rank the severity and likelihood levels of the worst credible outcome for the identified hazard being assessed. Severity and likelihood are measured independent of each other. Each airport will most likely have their own definitions and categories for severity and likelihood due to their unique operating environment and their own senior management's view of acceptable and unacceptable levels of risk. In the draft AC, the FAA has developed sample definitions and categories. Once the definitions and levels are established, the worst possible credible outcome is determined by ranking it on the table and then the airport assesses the level of risk to determine if it is acceptable or not. Depending on where the hazard falls on the risk matrix, determines what mitigation strategies are developed for those hazards that are deemed unacceptable.

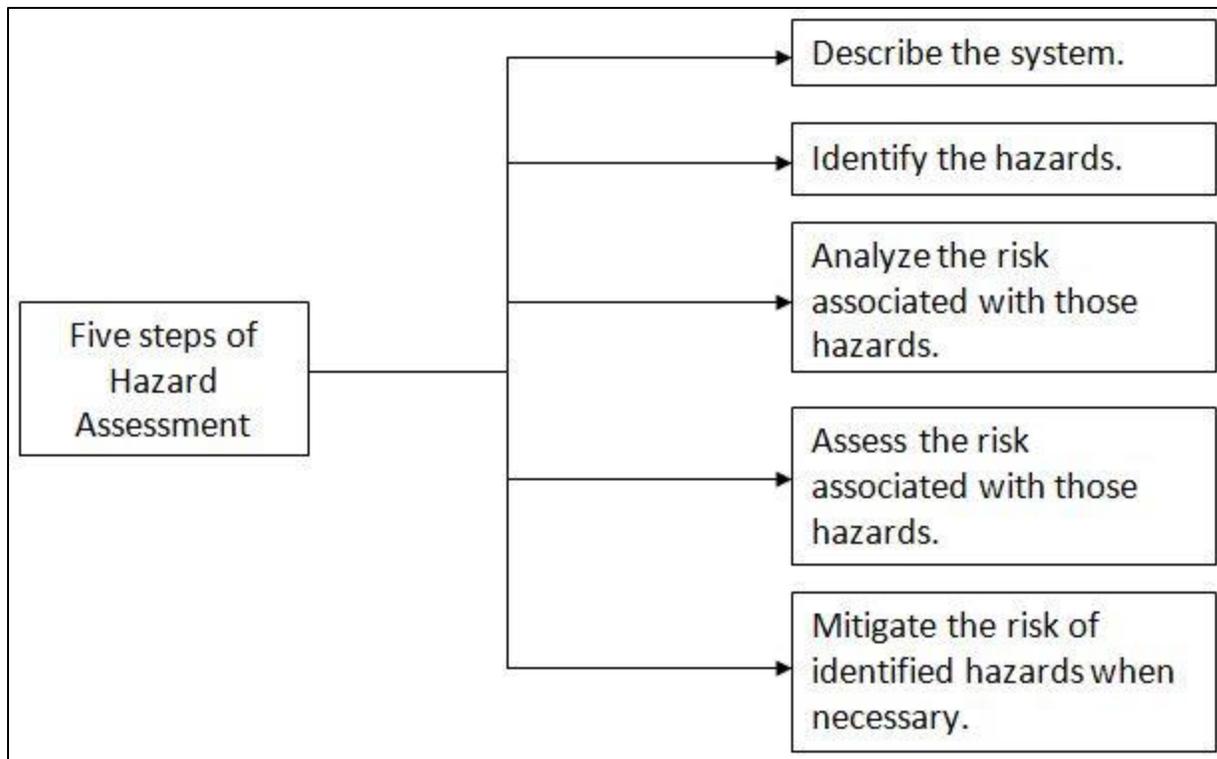


Figure A-1: Five-step hazard assessment process

Flight Safety Foundation, Communication and Coordination Keys to Safety and Effective Winter Operations. In *Airport Operations Editorial Staff Report*, Vol. 19, No. 1, January/February 1993.

The FAA-recommended procedures highlight coordination and effective communication to manage snow and ice removal tasks and ensure the safety of aircraft operations during the winter. The guidance suggests that a snow committee be created for all airports with an annual snowfall of several inches or icing conditions. A snow control center to coordinate and communicate snow and ice control activities should also be set up. A written snow removal plan that specifies the procedures and equipment needed should also be implemented for all airports in snow and ice affected areas. The guidance also recommends preseason preparations to include a review of equipment and supplies, training and communications, installation of snow fences, and identification of disposal areas. To prepare for deteriorating weather conditions, NOTAMs should be issued to notify airport users of unusual airport conditions. The guidance suggests that anti-icing is preferable to deicing, and cautions airport operators to closely monitor the impact that chemicals used in the snow and ice removal process has on the environment.

Government Accountability Office, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP, Washington, D.C., 2009

The U.S. Government Accountability Office (GAO) has released a guide designed to help federal, state, and local government agencies develop more reliable cost estimates for government projects of all sizes. The focus of the report is on federal acquisition projects. The guide is intended to help agencies produce well-documented, comprehensive, accurate, and credible estimates. The report constitutes an exhaustive primer on the art and science of cost estimating, identifying the processes, key stakeholders, and best practices. The report includes a large number of case studies. One of the case studies is from the field of aviation, but it is related to an FAA air traffic management system, and is not directly related to airports.

Landau, S. and G. Weisbrod, *ACRP Synthesis 13: Effective Practices for Preparing Airport Improvement Program Benefit-Cost Analysis*, Transportation Research Board of the National Academies, Washington, D.C., 2009

This document describes successful assessment techniques that can be used by airports in performing BCAs to quantify benefits for projects needing more than \$5 million in AIP discretionary funding. The synthesis includes a literature review, a review of BCAs submitted to the FAA for AIP funding, and evaluation and summary of successful practices. Its application to IROPS mitigation initiatives is limited, however, as these generally do not involve AIP funding, and even when they do, they are unlikely to exceed the \$5 million threshold.

Marsh Risk Consulting, *Application of Enterprise Risk Management at Airports*, ACRP Report 74, Transportation Research Board of the National Academies, Washington D.C., 2012

ACRP Report 74 addresses risk management, which is related to IROPS planning. It contains a grading scheme for evaluating risks that may serve as a useful template for developing IROPS mitigation alternative effectiveness ratings. ACRP Report 74 also includes a decision support tool implemented in Excel, which may provide useful ideas for the development of the ACRP 10-14 tool.

Nash, J. M., et al., *Guidebook for Airport Irregular Operations (IROPS) Contingency Planning*, ACRP Report 65, Transportation Research Board of the National Academies, Washington D.C., 2012

This report is the main precursor study to the ACRP 10-14 research effort. ACRP Report 65, the key deliverable of ACRP 10-10, *Guidebook for Airport Irregular Operations (IROPS) Contingency Planning*, was prepared by Mead & Hunt, Inc. and published in March 2012. It was developed using the authors' applied research methodology combined with surveys, focus groups, and case studies. The guidebook constitutes a primer on the fundamentals of IROPS planning, combined with specific resources, such as a model contingency plan, checklists, and worksheets.

The guidebook is intended for commercial service airports. Its objective is to help airports prepare a pragmatic IROPS response planning document to improve passenger safety, comfort, and convenience. The focus is on IROPS events that involve extended tarmac delays, passenger surges in terminals and security areas that challenge physical capacity, off-hour conditions related to staffing for security and border processing functions, passenger conditions during extended stays, and planning for special needs passengers. The guidebook is accompanied by a series of interactive documents, implemented in Microsoft Word, that serve as templates for developing IROPS planning references.

U.S. Department of Homeland Security, *National Interagency Incident Management System, 2008.*

The National Interagency Incident Management System (NIMS) is a system used in the United States to coordinate emergency preparedness and provide a national standard for incident management among various local, state, and federal agencies. NIMS was originally published in 2004 and updated in 2008, to reflect lessons learned from past incidents. The manual defines NIMS as:

The National Incident Management System (NIMS) provides a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment. NIMS works hand in hand with the National Response Framework (NRF). NIMS provides the template for the management of incidents, while the NRF provides the structure and mechanisms for national-level policy for incident management.

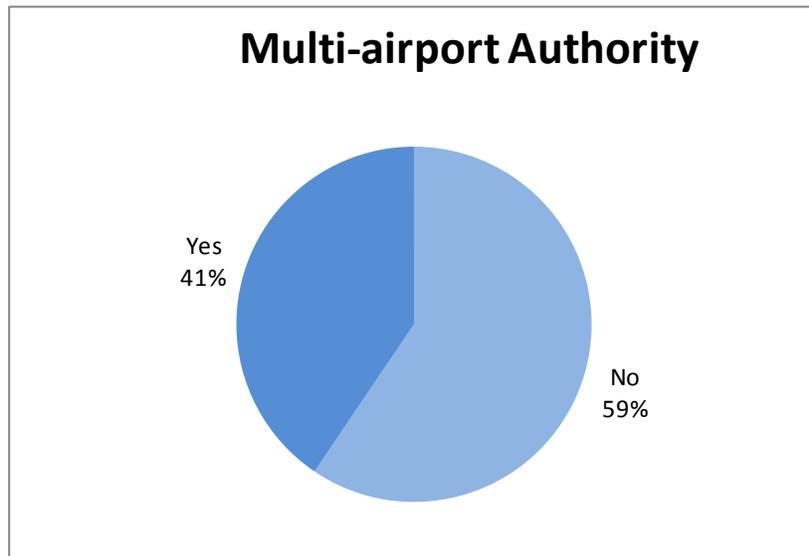
All Federal departments and agencies are required to adopt NIMS and to use it in their individual incident management programs and activities and use it to support actions taken to help state, local, and tribal governments. In order for state, local, and tribal entities to obtain Federal preparedness assistance, these entities were required to adopt NIMS and to have completed training for NIMS compliance in 2005.

APPENDIX B: SURVEY RESULTS

Airport Identification

1. Do you represent an airport authority or agency that operates more than one airport? *

	Count	Percent
Yes	15	41%
No	22	50%



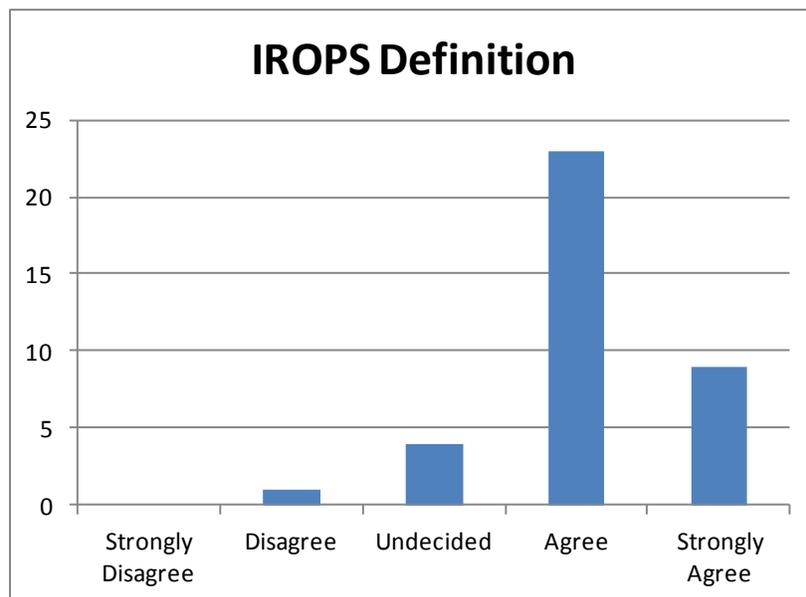
2. Please identify your airport's three letter airport identifier. Note: If you answered "yes" to Question 1, please pick a representative airport of your own choice or, alternatively, leave the airport identifier blank to indicate that your answers are representative for more than one airport.

[Confidential – excluded from summary.]

Background Information

3. The Research Team defined IROPS as follows: "IROPS events are exceptional incidents that cause the airport to operate in off-nominal conditions that have not been planned for as part of the airport's normal certification or emergency planning, thereby disrupting flight schedules and the normal flow of passengers through the air transportation system, and that require actions and/or capabilities beyond those considered usual by aviation service providers. An IROPS event typically lasts from a few hours up to 48 hours." Please rate your level of agreement with this definition. *(1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree)

	1	2	3	4	5	
Strongly Disagree	0 (0%)	1 (3%)	4 (11%)	23 (62%)	9 (24%)	Strongly Agree



4. Please provide additional feedback on our definition of IROPS. (optional)

There are times when IROPS can extend longer than 48 hours, but that is a whole separate set of planning variables. Hurricanes, snowstorms, etc. can have impacts more than 48 hours.

We do not feel that all IROPS are that extreme.

Consider revising for up to 72 hours.

Fundamentally, the airport's ACM and Emergency Plan should provide guidance for all IROPS, conventional or unconventional.

I wouldn't use the term exceptional. We consider IROPS anything irregular which may or may not significantly impact our normal operations.

Limiting the length of IROPS doesn't serve much of a point to me. Whether they are 5 minutes or 1 week the issues they cause are compounded with time.

It is my opinion one could delete the verbiage "...that have not been planned for as part of the airport's normal certification or emergency planning, thereby..." The reference to "normal certification" is vague, and there are numerous airports that already have IROPS plans in their Airport Emergency Plans or other procedural documents.

The only part I disagree about is the "...that have not been planned for as part of the airport's normal certification....." statement. We deal with all types of events that are irregular, from Presidential visits, military homecomings, etc. that are irregular in nature. So, even diversions, etc. have some level of planning.

I would disagree that it is not planned for under emergency planning. We routinely include it in our emergency plan reviews.

IROP events usually last 24 hours or less and involve a weather impact locally or up line/down line. Although not specifically planned, they are not abnormal in the nature of commercial aviation.

Not sure that the emergency planning should be included, because based on the FAA's new emergency planning guidelines, airports are to operate in a NIMS model for emergencies and under that type of emergency management, an airport should have the decision making process and resources in place to respond to any type of non normal event.

The definition could stress the catastrophic nature of potential IROPS events more explicitly.

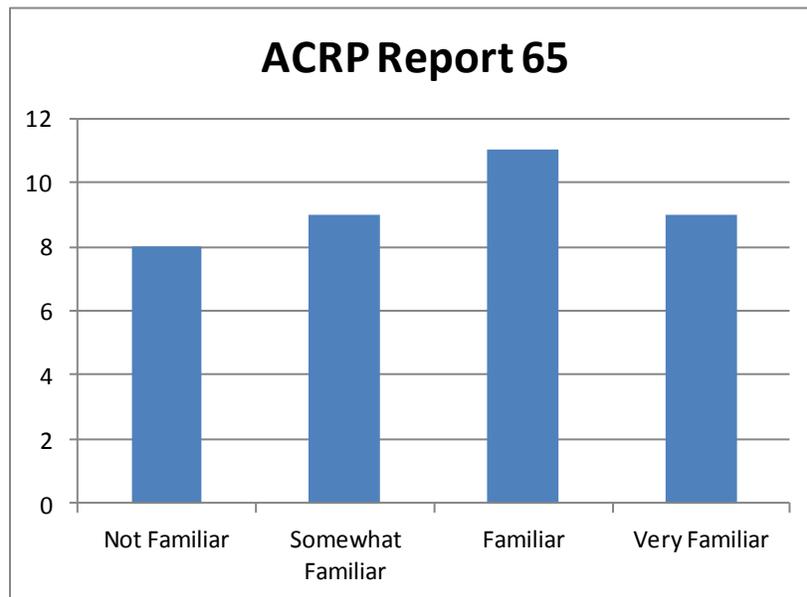
I don't believe that that the 3-48 hours part is necessary. That's a broad time frame.

Normal airport operations will vary by airport and/or region. Important to note that any disruption to "normal operations" can be considered an IROPS.

DOT has required airports to plan, in conjunction with the airport tenants, for IROPS. Events may be planned for in the AEP, however the majority of these planned for events are by definition irregular.

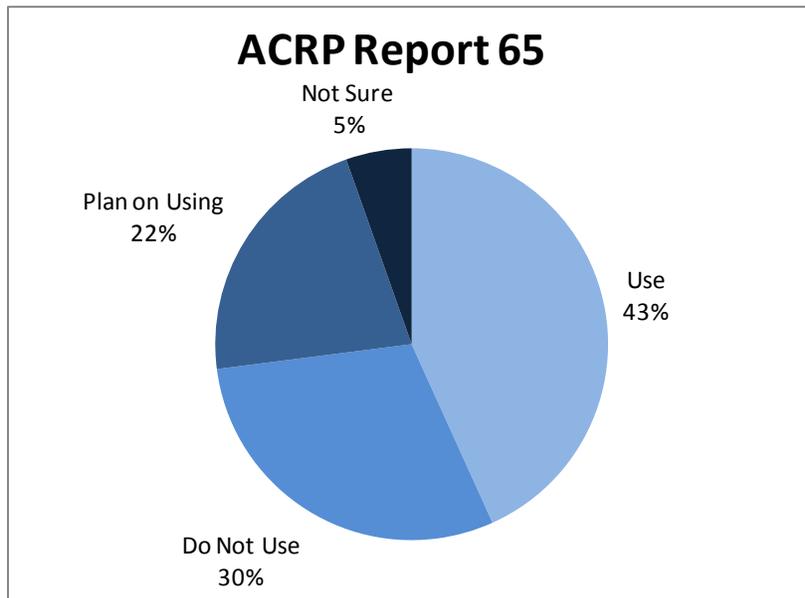
5. Please rate your familiarity with ACRP Report 65, Guidebook for Airport Irregular Operations (IROPS) Contingency Planning? *(1 = Not familiar, 2 = Somewhat familiar, 3 = Familiar, 4 = Very familiar)

	1	2	3	4	
Not Familiar	8 (22%)	9 (24%)	11 (30%)	9 (24%)	Very Familiar



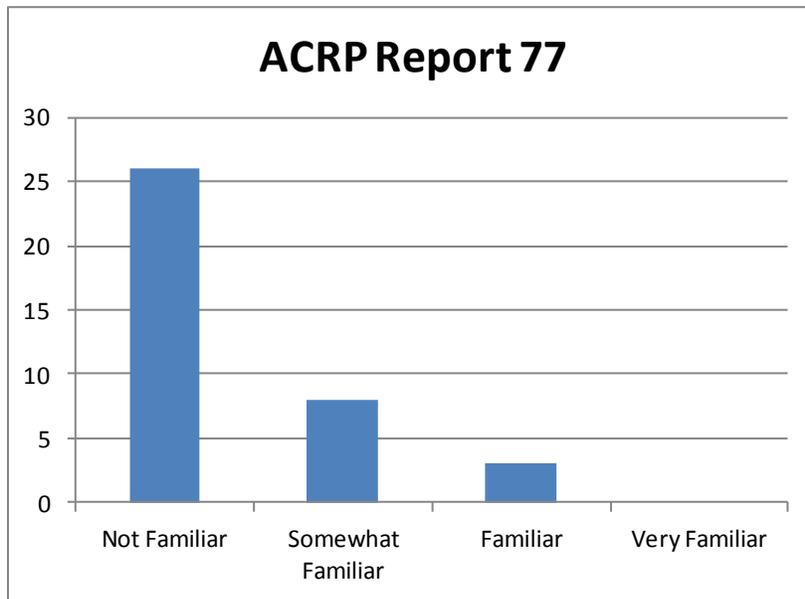
6. Please describe your airport's use of ACRP Report 65, Guidebook for Airport Irregular Operations (IROPS) Contingency Planning. *

	Count	Percent
We use ACRP Report 65	16	43%
We do not use ACRP Report 65	11	30%
We plan on using ACRP Report 65	8	22%
Not sure	2	5%



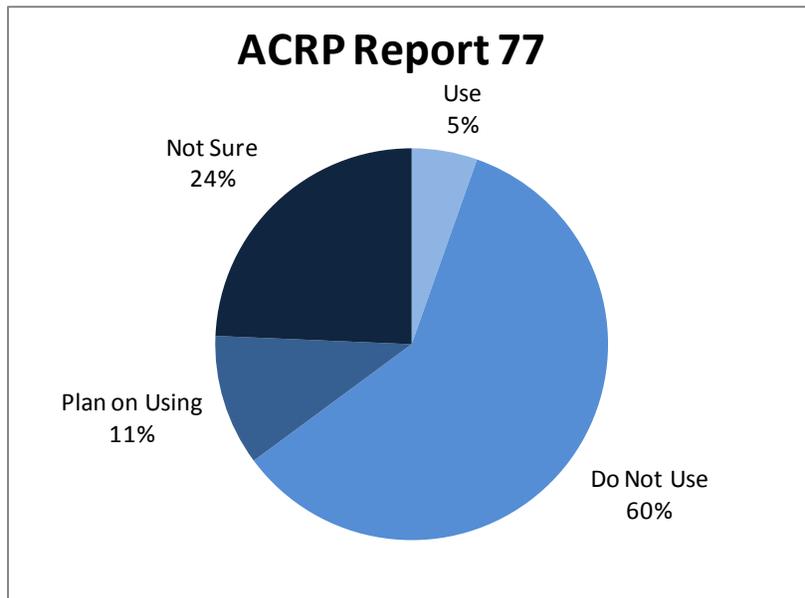
7. Please rate your familiarity with ACRP Report 77, Application of Enterprise Risk Management at Airports? *(1 = Not familiar, 2 = Somewhat familiar, 3 = Familiar, 4 = Very familiar)

	1	2	3	4	
Not Familiar	26 (70%)	8 (22%)	3 (8%)	0 (0%)	Very Familiar



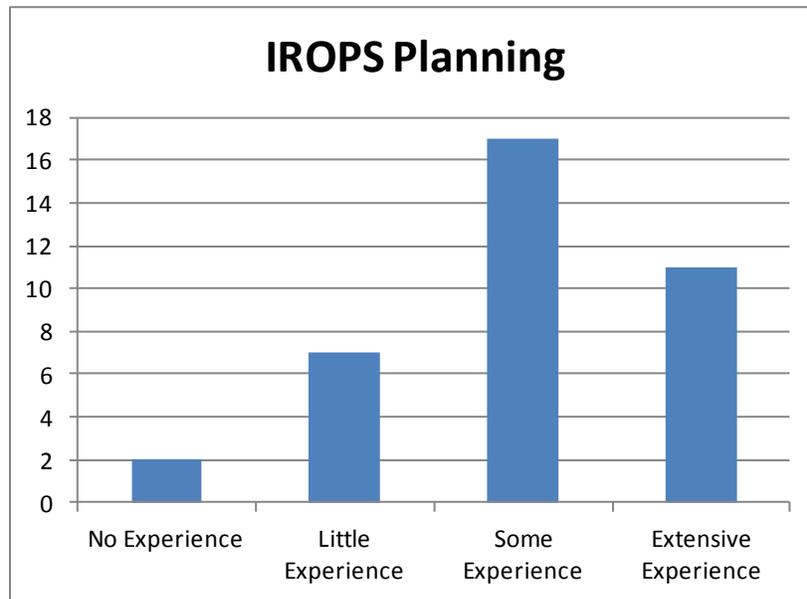
8. Please describe your airport's use of ACRP Report 77, Application of Enterprise Risk Management at Airports. *

	Count	Percent
We use ACRP Report 77	2	5%
We do not use ACRP Report 77	22	59%
We plan on using ACRP Report 77	4	11%
Not sure	9	24%



9. Please rate your experience with planning for IROPS. *(1 = No IROPS planning experience, 2 = Little IROPS planning experience, 3 = Some IROPS planning experience, 4 = Extensive IROPS planning experience)

	1	2	3	4	
No Experience	2 (5%)	7 (19%)	17 (46%)	11 (30%)	Extensive Experience



10. Please describe your IROPS planning experience in more detail. (optional)

Wrote a tarmac delay contingency plan.

We have planned for IROPS, but only on the scale needed for our small regional airport

We meet with tenants and vendors. We have formulated a plan, added some equipment and checklist to deal with both international and domestic IROPS. When we have an IROPS procedure, we analyze it and make changes.

Assisted in writing the airports IROPS contingency plan

Most cases, XXX is a reliever airport for Houston or Dallas during major weather events. Unscheduled aircraft arrive here, some being from international origins, and may require deplaning depending upon amount of delay or ground stop.

Primarily related to the recent tarmac delay rule planning required by airports

AEP and ACM development, routine participation in County Emergency Planning Committee.

In 2012 during Monsoon Season or when Dust Storms arose, XXX experienced frequent IROPS activity as a result of impacts to surrounding airports, i.e., PHX, LAS, etc. In many cases FAA ATCT advised XXX of the impact so we could coordinate our parking plan. In 2012 (to date), XXX was able to manage the IROPS with little impact to operations. However, we are limited in what we can reasonably handle because of availability of jet bridges; we have to rely on airlines or tenants for equipment (airstairs, ADA lift, etc.).

We pulled together an IROPS planning team, developed a comprehensive IROPS contingency plan and training program for the plan. We have participated in regional IROPS planning meetings and feel we are in a very good position to handle an IROPS occurrence.

IROPS for an Airport XXX's size is more about how to deal with weather, an influx of aircraft due to weather/incident elsewhere, or dealing with an emergency international aircraft not being an international Airport.

XXX has extensive planning for airfield IROPS events respective of accommodating and handling aircraft. The XXX IROPS plan also includes a regional airports communications network plan in the event of diversions. XXX was invited by the ACRP 65 team to present at multiple regional workshops. That said, XXX needs to improve the passenger accommodations portion of the plan, and is turning to the ACRP 65 guidebook for guidance.

Responded to FAA's requirement to have an IROPS Plan. That's about it. The likelihood of an IROPS affecting XXX is very, very unlikely.

Wrote new IROPS contingency plan and checklist. Continual IROPS planning for snow events, weather delays, etc.

We have a IROPS plan that is reviewed 2-3 times a year with the participating organizations. We are high-use divert airport.

I have none

We have a high degree of winter weather operational experience and train extensively. In addition to winter weather events, we are an alternate for ATL for spring, summer, fall storms.

I worked as a Customer Service/Operations manager for Northwest Airlines for over 23 years. I have been involved with IRROPS events at a large hub, Intl gateway and small airport. Due to XXX's close proximity to Northwest's hub in MSP we received a large number of weather, mechanical, and medical related diversions. We had situations with over 12 aircraft including Intl widebodies divert that required servicing and some cases deplaning of passengers. I am now in the position of Executive Director for the XXX airport and have a different set of responsibilities and planning when it comes to diversions. Most of the direct handling continues to be provided by the airlines, but I work to ensure that we can provide a back-up should the airline not be able to handle the IROP event.

Mostly weather related diversions for aircraft which arrive at XXX en route to another Florida airport destination (impacted by storms). A minimal percentage or very few turn into long duration events.

Continuous and year-round random due to length of runway and airport location relative to Latin America.

We worked with carriers and other tenants and concessionaires and ground handlers to develop contingencies.

Airport leadership has prior Airline experience with flight disruption planning Collaborative relationships with airport stakeholders afford the Airport leaders access to and free-flowing information from Airline and on-site regulatory personnel that would have both positive/negative influences on any contingency operation

We've had fuel stop overs with no agreements with those FBOs.

XXX has had a large focus on improving IROPS planning and execution for over five years. Many details involved in the planning of this, but the key focus and message would be the importance of Partnering by all key airport stakeholders. C3 – Communication, Collaboration and Coordination is a major focus for our airport.

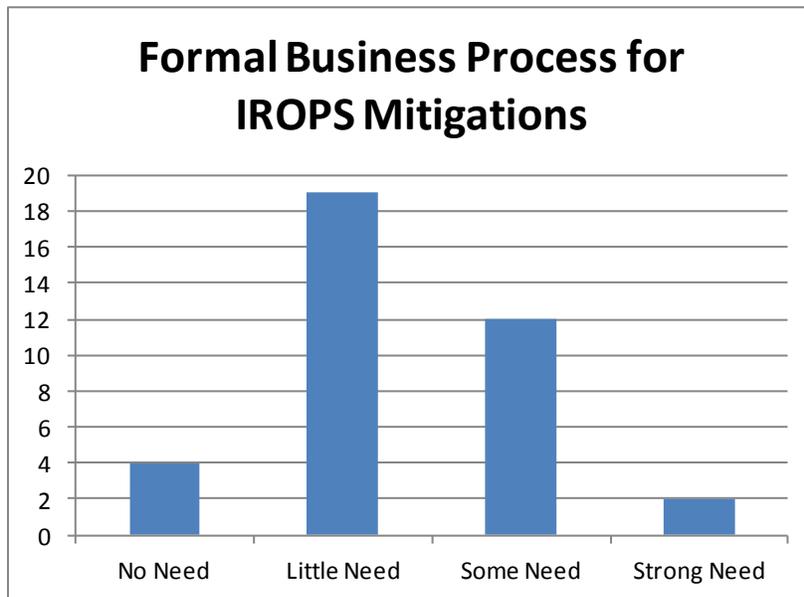
The current IROPS Contingency Plan in place at XXX, is the first detailed summary of procedures established to outline the necessary steps in the event of an irregular operations occurrence.

We are a Gulf Coast airport with IROPS planning for hurricanes. The airport serves as a diversion airport for IAH, HOU, DAL and DFW. The diversions received at the airport comprise about one third international arrivals. Planning has occurred for international IROPS.

Existing IROPS Planning and Needs

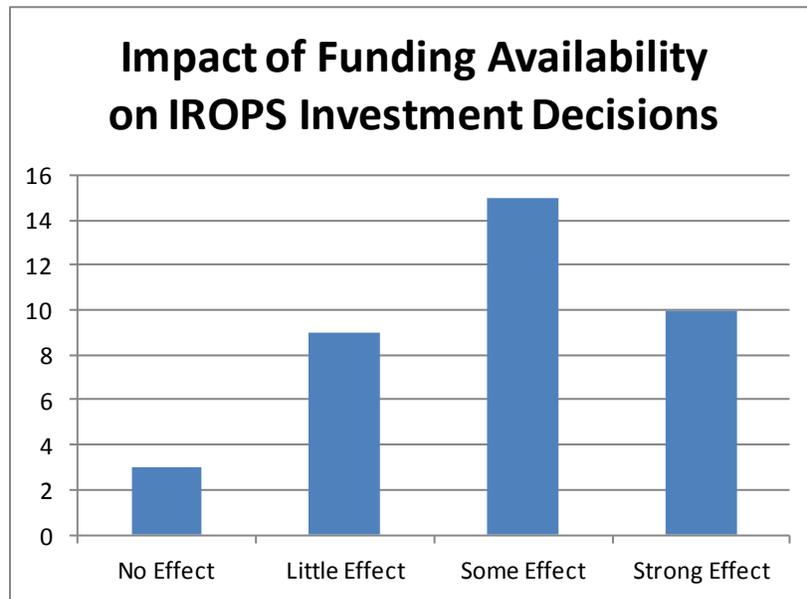
11. Please rate the need at your airport for a formal business planning process for making funding decisions about IROPS mitigation alternatives. *(1 = No need, 2 = Little need, 3 = Some need, 4 = Strong need)

	1	2	3	4	
No Need	4 (11%)	19 (51%)	12 (32%)	2 (5%)	Strong Need



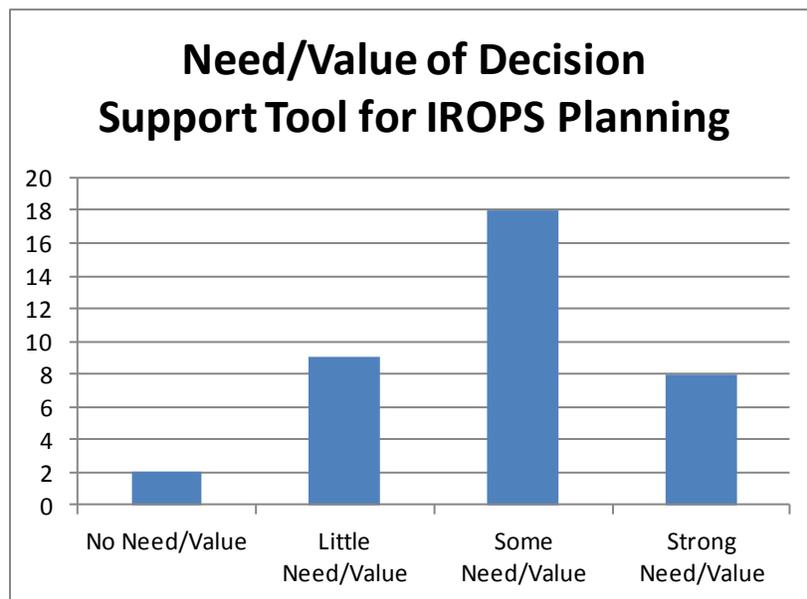
12. Describe the extent to which the availability of federal funds, state funds, or PFC eligibility would affect your investment decision for IROPS mitigation alternatives. *(1 = No effect, 2 = Little effect, 3 = Some effect, 4 = Strong effect)

	1	2	3	4	
No Effect	3 (8%)	9 (24%)	15 (41%)	10 (27%)	Strong Effect



13. The Research Team is proposing a decision support tool to help airports prioritize investments in IROPS mitigation alternatives. Evaluation criteria include items such as airport priorities, project risk, implementation difficulty, airline and passenger benefits, safety, severity of disruptions, and funding availability. The tool will rank alternatives based on effectiveness balanced against lifecycle cost. The tool would be freely available via download and would be implemented in Microsoft Excel or similar software. Please rate the perceived need and value of this approach to your airport's IROPS planning needs. *(1 = No need/value, 2 = Little need/value, 3 = Some need/value, 4 = Strong need/value)

	1	2	3	4	
No Need/Value	2 (5%)	9 (24%)	18 (49%)	8 (22%)	Strong Need/Value



14. Please provide any additional remarks describing your needs for business planning in support of investment decisions for IROPS mitigation alternatives.(optional)

There are equipment needs, i.e., airstairs and ADA lifts, that would be a benefit to the airport for its use during IROPS. However, the out-of-pocket expense for these items make this business decision hard to justify. The question becomes one of cost-benefit. If these or other related equipment needs were covered by federal funding, the equipment expense would be easier to justify and work into the airport budget.

Any tool is a tool, we would support additional tools/resources.

With smaller airports the "distance" between top and bottom airport officials is small enough that it doesn't take more than half a dozen people in a room to make decisions in an IROPS condition.

Any tool to address IROPs could be of valuable, but our exposure to the handling of IROPs is normally limited in frequency, duration and impact.

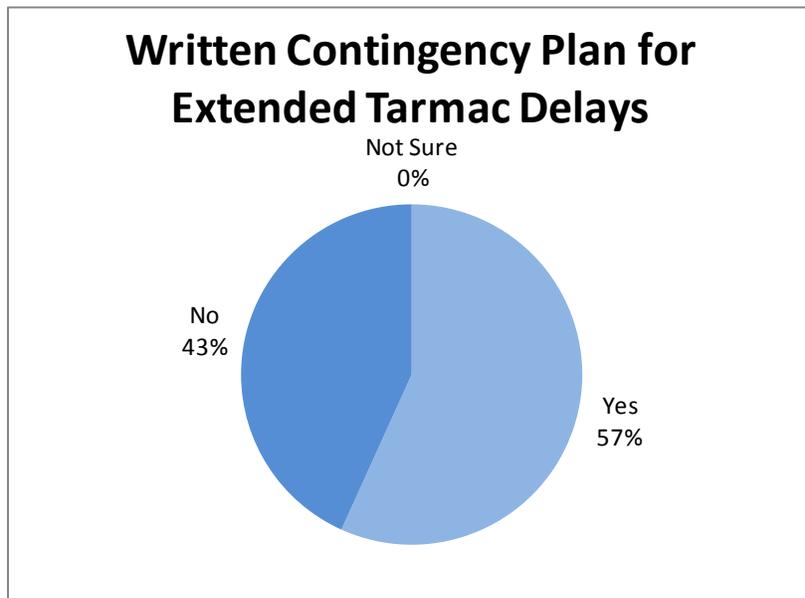
Being able to provide a business case for infrastructure improvement would be extremely helpful in trying to obtain FAA funding for ramp expansion or other IROP event planning. Would also be helpful to persuade the Airport Authority Board to expend airport funds for related projects.

XXX is a small Cat IV airport with 18 weekly round trips to ATL. IROPS is not a major priority at this airport.

While IROPS planning rates high on the list with other major airport initiatives, it's prudent for airports to be fiscally responsible as they work to balance all airport initiatives and planning projects.

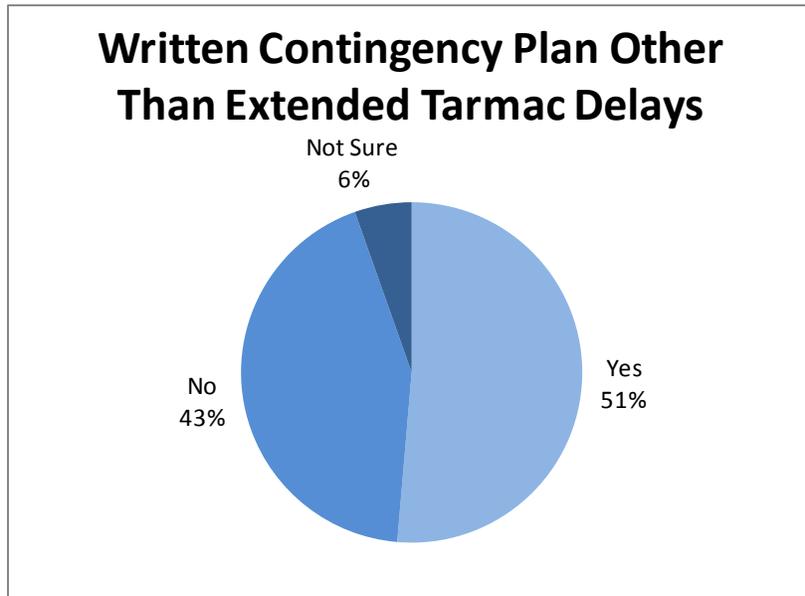
15. Does your airport have a written contingency plan for extended tarmac delays that exceeds the minimum requirements required by DOT (for example, does your plan go beyond the template provided by ACI-NA/AAAE)? *

	Count	Percent
Yes	21	57%
No	16	43%
Not Sure	0	0%



16. Does your airport have a written contingency plan for any type of IROPS impact other than extended tarmac delays? *

	Count	Percent
Yes	19	51%
No	16	43%
Not Sure	2	5%



17. If you answered "yes" to Question 16, please briefly describe the other types of IROPS impacts covered by the airport's contingency plan(s). (optional)

Diversions

Aircraft diversions.

Aircraft diversion, aircraft emergency, security threat, or any other irregular operation/impact to normal operations.

Concessionaire plans, aircraft mechanical/medical calls.

The airport does not have extensive written formal plans. However, discussions have been had with regards to "what if" situations regarding an increase in aircraft needing to park, delays into and out of the airport, and international planes landing at our airport and needing segregation.

The airport developed an overflow aircraft parking plan to address aircraft movement during winter operations. The plan was expanded to address airport capacity issues during any type of weather/event. The plan was coordinated with local air traffic control and is supported by Jeppesen publications.

Our plan addresses how we will contact diversion airports of aircraft heading in their direction. We also have a stranded passenger plan for inside our facilities.

The plan does not specifically call out other events, but the plan can be applied to numerous situations. We would use some of the procedures for a terminal evacuation as an example.

Contingencies contained in our winter operations plans required by 139.

We have the potential for getting diversions due to weather related events, so we need to plan for them as well.

XXX has several "Operations Instructions" which describe the processes to deal with various "urgent" situations (e.g. power failure, terminal evacuations, water flow failures, Baggage Handling System malfunctions, etc.). In addition, the airport's emergency plan deals with other large scale emergencies (fire, aircraft crash, bomb threats, etc.).

Hurricanes, diversions.

In process of developing greater 'business continuity' plans that may include but not limited to:

- roadway access points to/from airport**
- major terminal/concourse damage prohibiting/limiting use**
- major system failure/disruption prohibiting/limiting use (i.e. bag system, pax/bag screening, power/data)**

Plan can be used for disabled aircraft

If it's not covered under a Contingency Plan, there are many Standard Operating Procedures that cover different types of IROPS. Some include:

Landside Traffic Management

Severe Weather impacting terminals (shelter locations)

Security issues

In addition to tarmac delays, XXX has established a plan to provide a sterile area for passengers who have not cleared United States Customs and Borders Protection.

The airport has an IROPS plan for hurricane activities.

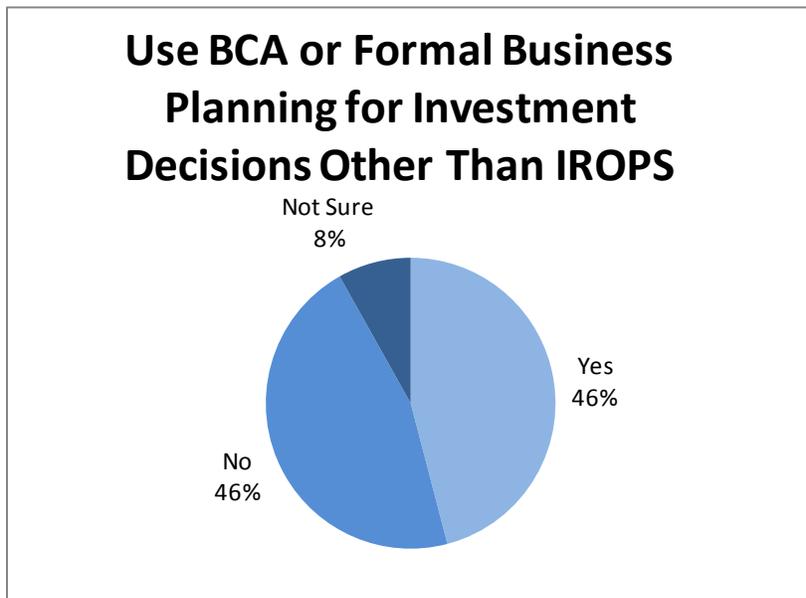
18. Does your airport have a formal process for identifying and managing risk? *

	Count	Percent
Yes	15	41%
No	19	51%
Not Sure	3	8%



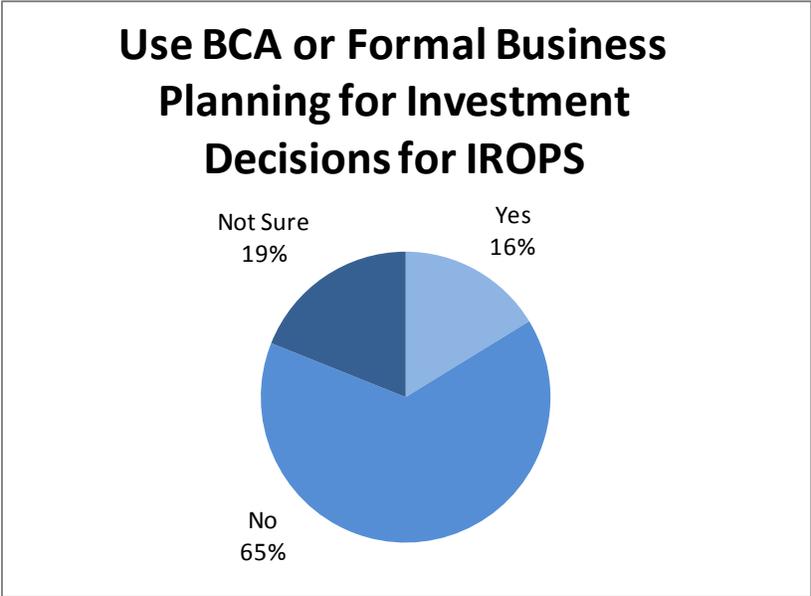
19. Does your airport use benefits-cost analyses or other formal business planning processes for making investment decisions for capital and O&M needs other than those intended to mitigate IROPS? *

	Count	Percent
Yes	17	46%
No	17	46%
Not Sure	3	8%



20. Does your airport use benefits-cost analyses or other formal business planning processes for making business decisions for IROPS mitigation alternatives? *

	Count	Percent
Yes	6	16%
No	24	65%
Not Sure	7	19%



21. If you answered “yes” to Question 20, please briefly describe the process currently used to support business planning for investment decisions for IROPS mitigation alternatives. (optional)

At the present time, XXX has a working group evaluating IROPS and potential mitigation measures, including potential equipment needs. As items are identified, they will be subjected to a risk and cost-benefit analysis.

Not a formal process, but we always look at costs and what the benefits are either financial benefits, or many times the goodwill benefits.

Cost-benefit analyses.

If equipment is being purchased, look at Total Cost (purchase, O&M, facility/storage, etc.)

Lease vs. Purchase

What is the ROI (not always easy to determine)

Resources to operate/maintain equipment

XXX uses historical data and trends to identify the specific needs for IROPS planning. The Consumer Price Index table is of value to XXX's approach to determine the needs for IROPS funding.

IROPS Impacts

The Research Team has identified an initial list of potential impacts and consequences of IROPS events by reviewing individual airport contingency plans and best industry practices, as well as applying our experience in the field. We would like your feedback on the applicability of this list, including your estimate of the likelihood of specific IROPS impacts occurring at your airport and the frequency of IROPS impacts that have occurred in the past.

22. Please rate the following impacts and consequences of IROPS events in terms of their likelihood of occurring at your airport: *

	Very Unlikely	Somewhat Unlikely	Somewhat Likely	Very Likely	Not Sure	Rank
Extended Passenger Delay (Terminal)	6 (16%)	10 (27%)	13 (35%)	8 (22%)	0 (0%)	2
Extended Passenger Delay (Generated Off - Airport)	10 (27%)	9 (24%)	12 (32%)	4 (11%)	2 (5%)	5
Extended Tarmac Delay	14 (38%)	4 (11%)	15 (41%)	4 (11%)	0 (0%)	7
Excessive Queue Lengths (Check-in)	12 (32%)	12 (32%)	9 (24%)	4 (11%)	0 (0%)	10
Excessive Queue Lengths (Security)	12 (32%)	9 (24%)	9 (24%)	6 (16%)	1 (3%)	6
Unexpected Passenger Surge (Terminal)	14 (38%)	9 (24%)	12 (32%)	2 (5%)	0 (0%)	12

Unexpected Closure of Control Tower / TRACON	21 (57%)	11 (30%)	4 (11%)	1 (3%)	0 (0%)	15
Diverted Flights to Airport	1 (3%)	5 (14%)	12 (32%)	19 (51%)	0 (0%)	1
Power Outage and/or Utility Disruptions	5 (14%)	13 (35%)	12 (32%)	7 (19%)	0 (0%)	4
Unanticipated Need for Federal Inspection Services	12 (32%)	13 (35%)	5 (14%)	7 (19%)	0 (0%)	8
Quarantined Aircraft	16 (43%)	11 (30%)	7 (19%)	2 (5%)	1 (3%)	13
Unexpected Closure of Terminal / Concourse	17 (46%)	11 (30%)	9 (24%)	0 (0%)	0 (0%)	14
Aircraft Recalled to Gate	6 (16%)	11 (30%)	11 (30%)	9 (24%)	0 (0%)	2
Disrupted Communications	10 (27%)	15 (41%)	7 (19%)	5 (14%)	0 (0%)	8
Unexpected Closure of Runway	12 (32%)	11 (30%)	11 (30%)	3 (8%)	0 (0%)	10

Note: See graph comparing Q22 and Q24 titled “IROPS Impacts Correlation: Actual Occurrence vs. Likelihood” under Q24.

23. Please identify any additional impacts or consequences of IROPS events that you believe have the potential to disrupt passenger services at your airport. (optional)

Weather events. Airline not paying attention to 3-hour rule.

Non winter severe weather such as tornadoes or thunderstorms plus the possibility of an earthquake (proximity to the New Madrid fault).

Weather for us is always a factor. We get a lot of fog, freezing rain and snow that could have a potential impact for outbound and inbound aircraft.

Weather, fuel, mechanical, medical diversion.

Baggage system, screening units (pax, bags)

There are many to consider:

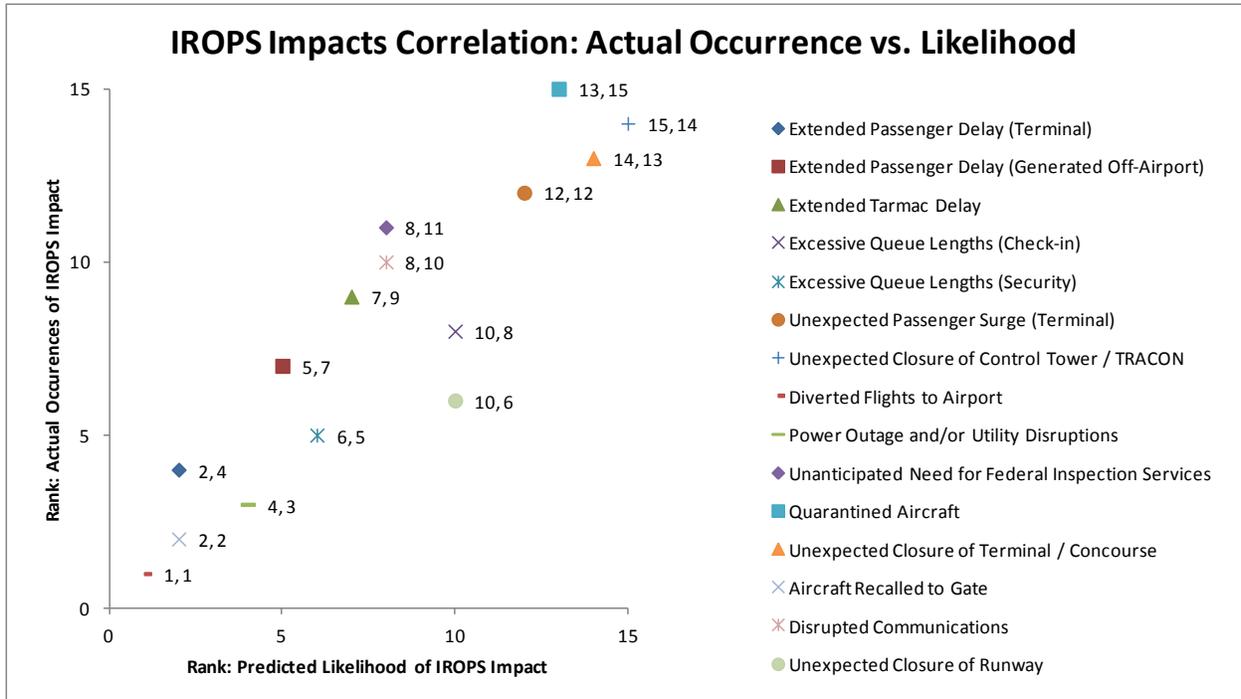
Major accident on a main road inside the airport

Water main break

24. Please identify which of the following IROPS impacts have occurred at your airport over the last 5 years: *

	Has Not Occurred	Occurred Once	Occurred More Than Once	Not Sure	Rank
Extended Passenger Delay (Terminal)	13 (35%)	2 (5%)	22 (59%)	0 (0%)	4
Extended Passenger Delay (Generated Off - Airport)	13 (35%)	5 (14%)	10 (27%)	9 (24%)	7
Extended Tarmac Delay	21 (57%)	2 (5%)	13 (35%)	1 (3%)	9
Excessive Queue Lengths (Check-in)	19 (51%)	2 (5%)	15 (41%)	1 (3%)	8
Excessive Queue Lengths (Security)	14 (38%)	5 (14%)	17 (46%)	1 (3%)	5

Unexpected Passenger Surge (Terminal)	25 (68%)	2 (5%)	10 (27%)	0 (0%)	12
Unexpected Closure of Control Tower / TRACON	25 (68%)	6 (16%)	4 (11%)	2 (5%)	14
Diverted Flights to Airport	2 (5%)	3 (8%)	32 (86%)	0 (0%)	1
Power Outage and/or Utility Disruptions	6 (16%)	5 (14%)	24 (65%)	2 (5%)	3
Unanticipated Need for Federal Inspection Services	21 (57%)	5 (14%)	10 (27%)	1 (3%)	11
Quarantined Aircraft	28 (76%)	5 (14%)	1 (3%)	3 (8%)	15
Unexpected Closure of Terminal / Concourse	27 (73%)	3 (8%)	6 (16%)	1 (3%)	13
Aircraft Recalled to Gate	6 (16%)	3 (8%)	25 (68%)	3 (8%)	2
Disrupted Communications	18 (49%)	4 (11%)	10 (27%)	5 (14%)	10
Unexpected Closure of Runway	15 (41%)	4 (11%)	16 (43%)	2 (5%)	6



25. Please identify any additional impacts or consequences of IROPS events that have occurred at your airport in the past. (optional)

Terminal crowding, need for customs, need for concessions, etc.

IROPS have been very minimal impact if any at XXX

Aircraft deicing companies late to respond to Airport

2 air crashes in the last 10 years that closed 1 runway in each event for approximately 24 hours, but had minimal long term impacts.

Again, there are other types of events, such as major vehicle accidents, utility issues (water main breaks), tornadoes, etc.

Mitigation Alternatives

The Research Team has identified an initial list of potential alternatives to mitigate the disruptive impact of IROPS events. The list was created by reviewing individual airport contingency plans and best industry practices, as well as applying our experience in the field. Only alternatives with a cost level that would warrant formal business planning are included. We would like your feedback on the applicability of this list.

26. Please rate the following IROPS mitigation alternatives in terms of their likelihood to be considered by your airport: *

	Very Unlikely	Somewhat Unlikely	Somewhat Likely	Very Likely	Not Sure	Rank
Add additional terminal space that can be configured as sterile space for temporary customs/immigration processing	18 (49%)	9 (24%)	6 (16%)	4 (11%)	0 (0%)	20
Acquire buses	16 (43%)	7 (19%)	3 (8%)	10 (27%)	1 (3%)	13
Construct additional gates	20 (54%)	10 (27%)	2 (5%)	4 (11%)	1 (3%)	22
Acquire additional remote aircraft parking stands	15 (41%)	6 (16%)	8 (22%)	6 (16%)	2 (5%)	14
Train airport staff to assist with deplaning of passengers	7 (19%)	3 (8%)	15 (41%)	12 (32%)	0 (0%)	2
Establish communications center	7 (19%)	5 (14%)	11 (30%)	12 (32%)	2 (5%)	3
Develop IROPS / coordination plan	4 (11%)	6 (16%)	6 (16%)	19 (51%)	2 (5%)	1

Acquire portable stairs	9 (24%)	5 (14%)	8 (22%)	13 (35%)	2 (5%)	6
Acquire ADA lifts	10 (27%)	5 (14%)	8 (22%)	13 (35%)	1 (3%)	7
Acquire ground power units	14 (38%)	7 (19%)	2 (5%)	11 (30%)	3 (8%)	11
Acquire communication software system	16 (43%)	6 (16%)	3 (8%)	7 (19%)	5 (14%)	16
Acquire surface management software	20 (54%)	8 (22%)	3 (8%)	3 (8%)	3 (8%)	23
Practice / simulate IROPS scenarios	6 (16%)	9 (24%)	10 (27%)	11 (30%)	1 (3%)	5
Acquire supplies for stranded passengers (cots, blankets, pillows, diapers & wipes, formula for babies, sanitary items, MRE's, etc.)	11 (30%)	6 (16%)	9 (24%)	10 (27%)	1 (3%)	9
Set aside contingency funds to pay for meals	18 (49%)	7 (19%)	5 (14%)	5 (14%)	2 (5%)	19
Hire additional staff	25 (68%)	6 (16%)	3 (8%)	2 (5%)	1 (3%)	24
Modify existing airline use agreements to allow airports to use exclusive-use gates during IROPS events	17 (46%)	6 (16%)	4 (11%)	6 (16%)	4 (11%)	18

Contract with airlines to use airport personnel to provide ground handling services	19 (51%)	7 (19%)	7 (19%)	2 (5%)	2 (5%)	21
Upgrade generator capability for terminal facilities	16 (43%)	7 (19%)	5 (14%)	6 (16%)	3 (8%)	17
Provide emergency electrical generators	15 (41%)	7 (19%)	7 (19%)	6 (16%)	2 (5%)	15
Review plans to house and feed airport staff that are stranded at airport	8 (22%)	8 (22%)	11 (30%)	8 (22%)	2 (5%)	8
Review plans to get airport staff from off-airport to work	13 (35%)	8 (22%)	6 (16%)	8 (22%)	2 (5%)	12
Acquire alert system for aircraft diversions headed to airport	12 (32%)	7 (19%)	4 (11%)	11 (30%)	3 (8%)	10
Strengthen network with airports that are diversion generators	7 (19%)	8 (22%)	7 (19%)	13 (35%)	2 (5%)	4

See graph comparing Q26 and Q27 titled “IROPS Mitigations Correlation: Actual Occurrence vs. Likelihood” under Q27.

27. Please identify which of the following mitigation alternatives your airport has funded to mitigate IROPS events, regardless of the source of funding: *

	Not Funded	Funded	Not Sure	Rank
Add additional terminal space that can be configured as sterile space for temporary customs/immigration processing	33 (89%)	3 (8%)	1 (3%)	22
Acquire buses	23 (62%)	13 (35%)	1 (3%)	7
Construct additional gates	28 (76%)	7 (19%)	2 (5%)	18
Acquire additional remote aircraft parking stands	25 (68%)	10 (27%)	2 (5%)	13
Train airport staff to assist with deplaning of passengers	19 (51%)	16 (43%)	2 (5%)	3
Establish communications center	20 (54%)	16 (43%)	1 (3%)	4
Develop IROPS / coordination plan	20 (54%)	16 (43%)	1 (3%)	4
Acquire portable stairs	18 (49%)	18 (49%)	1 (3%)	2
Acquire ADA lifts	16 (43%)	19 (51%)	2 (5%)	1

Acquire ground power units	24 (65%)	11 (30%)	2 (5%)	9
Acquire communication software system	26 (70%)	9 (24%)	2 (5%)	14
Acquire surface management software	30 (81%)	6 (16%)	1 (3%)	19
Practice / simulate IROPS scenarios	21 (57%)	14 (38%)	2 (5%)	6
Acquire supplies for stranded passengers (cots, blankets, pillows, diapers & wipes, formula for babies, sanitary items, MRE's, etc.)	28 (76%)	8 (22%)	1 (3%)	17
Set aside contingency funds to pay for meals	27 (73%)	8 (22%)	2 (5%)	16
Hire additional staff	33 (89%)	2 (5%)	2 (5%)	24
Modify existing airline use agreements to allow airports to use exclusive-use gates during IROPS events	26 (70%)	4 (11%)	7 (19%)	21
Contract with airlines to use airport personnel to provide ground handling services	33 (89%)	3 (8%)	1 (3%)	22
Upgrade generator capability for terminal facilities	26 (70%)	9 (24%)	2 (5%)	14

Provide emergency electrical generators	23 (62%)	12 (32%)	2 (5%)	8
Review plans to house and feed airport staff that are stranded at airport	24 (65%)	10 (27%)	3 (8%)	12
Review plans to get airport staff from off-airport to work	29 (78%)	5 (14%)	3 (8%)	20
Acquire alert system for aircraft diversions headed to airport	25 (68%)	11 (30%)	1 (3%)	11
Strengthen network with airports that are diversion generators	24 (65%)	11 (30%)	2 (5%)	9

IROPS Mitigations Correlation: Actual Occurrence vs. Likelihood



28. Please identify any additional IROPS mitigation alternatives that: (1) have been funded at your airport or (2) are considered possible for future funding. (optional)

Nothing additional that hasn't been mentioned.

As question #26 was phrased "to be considered by your airport..." a "not sure" response was used to indicate XXX already incorporates that piece of mitigation in its current IROPS plan. Responses to question #27 reinforces the responses.

Many of these items we have already funded, but not because of IROPS, but just smart airport principles. We also do not 'fund' plan reviews, as they are a part of normal duties. Our agreement already calls out gates to be non-preferential so we do not need to consider adjusting agreements.

In questions #26 & #27...many of the items referenced we already have on hand and would not need additional purchases solely for mitigation such as generators, air stairs, terminal & ramp space etc.,

Having meals/supplies set aside will be considered for future funding. We currently have a ground handling crew that works for the airport that could assist in an IROPS event. Most of the other items listed we either have or don't plan on getting any time soon.

FOD detection system.

Aircraft parking plans on existing taxiways

For an IROPS event such as a diversion flight with passengers who have not yet cleared United States Customs and Borders, passengers will be provided with a sterile area, with includes restroom facilities, while awaiting to be cleared by a United States Customs and Borders Officer. XXX will continue to review IROPS procedures with the affected parties involved to determine specific funding objectives and needs.

Emergency generators have been acquired and repaired under current FAA grant. Dispatch/communications center has been upgraded.

The Research Team would like to extend its gratitude and appreciation for your participation in this survey.

29. If you would like to receive a courtesy copy of a summary of the survey results, please enter your e-mail address below. (optional)

[Confidential – excluded from summary.]

APPENDIX C: IDENTIFICATION OF IROPS EVENTS

Table C-1: IROPS events

Event	Event Subtype
Severe weather	High wind
	Tornado
	Hurricane/tropical cyclone
	Heat wave
	Extreme cold
	Dense fog
	Thunderstorm/heavy rain/flooding
	Electrical storm
	Snow/blizzard
	Damaging hail
Ice storm	
Dust storm	
Natural disasters	Earthquake
	Volcanic eruption
	Landslide
	Dam break
	Tsunami
	Wildfire
Solar storm	
Man-made disasters	Hazardous materials releases
	Military aircraft/ordnance issues
	Explosives
Aircraft and vehicle accidents/emergencies	Aircraft accident
	Structural fire
	Access road accident
	Railway/people mover accident/mechanical problem
Medical emergency	Aircraft medical emergency
	Terminal medical emergency
Infectious diseases	Individual carrier
	Epidemic
	Pandemic

Security	<ul style="list-style-type: none"> Checkpoint security breach Navigation system jamming/spoof Hijacked aircraft Laser attack Perimeter security breach Terrorist attack Unattended/suspicious baggage
Construction/mechanical	<ul style="list-style-type: none"> Air conditioning failure Damaged cable Damaged pipeline Heat failure Power failure Water line break
Airline operations	<ul style="list-style-type: none"> Flight reservation system/IT outage
Labor disruption	<ul style="list-style-type: none"> Air traffic control labor disruption Airline labor disruption Airport labor disruption Security/Federal Inspection Services labor disruption
VIP	<ul style="list-style-type: none"> VIP/sports team arrival/departure

APPENDIX D: ASSESSMENT INSTRUMENT

ACRP 10-14 Being Prepared for IROPS – A Business Planning and Decision-Making Approach

Survey: The IROPS Investment Support (IRIS) Demonstration

Now that you have tested the IRIS tool, help us improve it by filling out the following survey. After completing the survey, please forward it to jkarlsson@mcri.com. The survey begins with questions about your overall experience with the tool and then asks about more specific components.

Please respond to each question by checking the appropriate answer. Most questions are multiple choice questions, where you are asked to indicate your level of agreement with a statement using a five-point scale. Several questions provide space for additional explanation. Such explanations are optional, but provide valuable supplemental information to the Research Team. If you need more space, please use the last page of the survey. You can also use that space for any feedback you would like to provide that is not covered by the survey questions.

No personal information is collected in the survey. The airport identifier is requested for tracking purposes, but will not be published. The results of the multiple choice questions will be published only in aggregate form. Remarks and narrative responses may be cited or summarized but will be anonymous and will not identify your airport.

If you have any questions, please contact the Principal Investigator for the ACRP 10-14 project, Joakim Karlsson, MCR Federal, LLC, at jkarlsson@mcri.com or (978) 528-4922.

Thank you in advance for your support and cooperation!

Identification

Please provide your airport's three letter airport identifier:

Overall Value of the Tool

This tool would add value to the IROPS business planning needs of my airport.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

This tool provides useful results.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Overall I was satisfied with the usability of this tool.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

I would likely use a tool like this for future IROPS business planning.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Please list any suggestions that would improve the usability of the tool:

Please list any additional suggestions that would improve the usefulness of the tool:

Portfolio Wizard

In the Portfolio Wizard, the IROPS events are defined and, for each event, up to five mitigation alternatives are entered.

It was clear what needed to be entered at each stage of the process.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

I was satisfied with the user experience of the Portfolio Wizard.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

In the space below, please provide any additional feedback on your experience running the Portfolio Wizard. Be sure to note any errors or difficulties you encountered while using this wizard.

Cost Wizard

In the Cost Wizard, initial and recurring cost estimates are entered, and the annual cost escalation rate can be adjusted.

It was clear what needed to be entered at each stage of the process.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

I was satisfied with the user experience of the Cost Wizard.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

In the space below, please provide any additional feedback on your experience running the Cost Wizard. Be sure to note any errors or difficulties you encountered while using this wizard.

Comparisons Wizard

In the Comparisons Wizard, a series of pairwise comparisons are used to extract airport and stakeholder preferences in three categories: User benefits, tactical complexity, and strategic challenges.

It was clear what needed to be entered at each stage of the process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="radio"/>				

It was relatively easy to complete the pair-wise comparisons.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="radio"/>				

The criteria descriptions make sense and are relevant to IROPS business planning at my airport.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="radio"/>				

I was satisfied with the user experience of the Comparisons Wizard.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

Did you ever encounter an error message in the Comparisons Wizard indicating that the comparisons you entered were not logically consistent?

Yes

No

If you answered yes to the previous question, how easy was it to correct the inconsistency?

Very Easy

Easy

Neither Easy
nor Difficult

Difficult

Very Difficult

N/A

In the space below, please provide any additional feedback on your experience running the Comparisons Wizard. Be sure to note any errors or difficulties you encountered while using this wizard.

Effectiveness Wizard

In the Effectiveness Wizard, the effectiveness of each mitigation alternative in the IROPS portfolio is evaluated using drop-down menus for a number of criteria in the categories user benefits, tactical complexity, and strategic challenges.

The effectiveness questions made sense to me.

Strongly Agree



Agree



Neutral



Disagree



Strongly Disagree



I was satisfied with the user experience of the Effectiveness Wizard.

Strongly Agree



Agree



Neutral



Disagree



Strongly Disagree



In the space below, please provide feedback on the effectiveness questions posed in this wizard and indicate if there were any that were confusing or did not appear relevant.

In the space below, please provide any additional feedback on your experience running the Effectiveness Wizard. Be sure to note any errors or difficulties you encountered while using this wizard.

Results Wizard

In the Results Wizard a name is provided for the reports that present the output of IRIS and then a number of output tables are generated to display the output for review, printing, exporting, saving, etc.

The results were presented clearly.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

I was able to find and interpret the results I was looking for.

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

In the space below, please provide any additional feedback on your experience running the Results Wizard, including additional results you would like to see or changes in the way you think the results should be presented. Be sure to note any errors or difficulties you encountered while using this wizard.

Quick Start Guide

The Quick Start Guide provides documentation for getting started with IRIS.

The Quick Start Guide was helpful for learning how to use the tool.

Strongly Agree

Agree

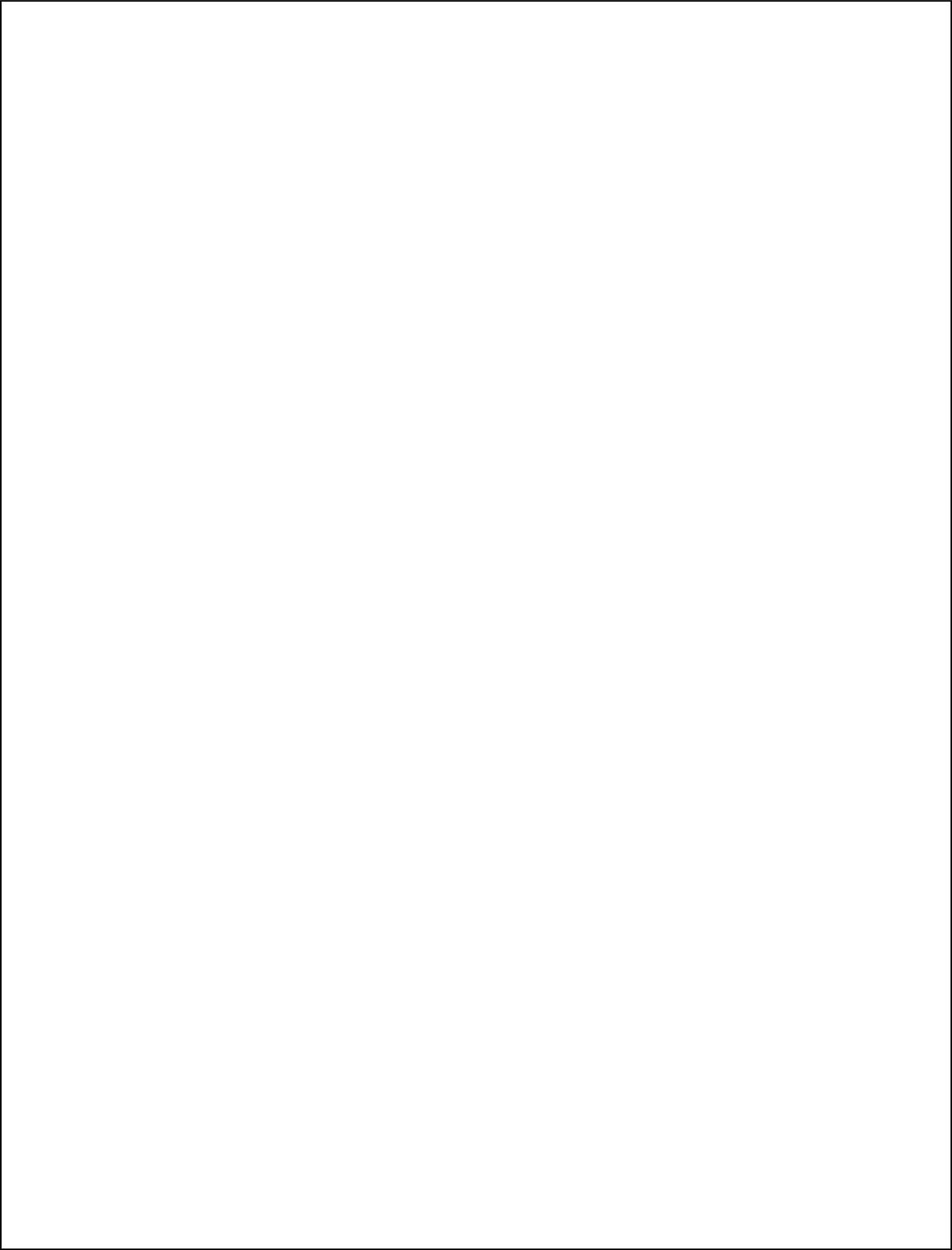
Neutral

Disagree

Strongly Disagree

In the space below, please provide any additional feedback on changes or additions that could be made to the Quick Start Guide to improve its usefulness.

If you need additional space to answer any questions, please use the area below. You can also use this space for any additional feedback you would like to provide on IRIS.

A large, empty rectangular box with a thin black border, occupying most of the page below the text. It is intended for the user to provide answers or feedback.