

# Rethinking Airport Resiliency in the Aftermath of COVID-19

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## Purpose

Amid the COVID-19 pandemic, airports and their stakeholders are managing disruption unlike any previously experienced in the modern world. With an unprecedented decrease in aircraft and passenger traffic, growing economic stress, and further uncertainty ahead, airports require **resilient financial and operational planning** to ride out COVID-19 and to plan for the post-pandemic future.

Survival for airports requires re-prioritizing previously identified plans, exploring new ways to operate and fund airport operations, and learning from past experiences to improve an airport's ability to succeed in the future. This guidance provides direction for airport operators and consultants, including planners and emergency management staff, on how airports can enhance resilience to weather the COVID-19 pandemic and prepare for future disruptions ahead.

## 1. Building Financial Resilience and Mitigating Risk Exposure

### *Stretching Your Dollars While Aviation Restarts*

Financial resilience is a critical issue for airports, particularly in light of recent economic stresses due to the COVID-19 pandemic. It is important that airport operators place a greater emphasis on improving the resilience of their assets and mitigating risk from future disruptions. With revenues difficult to predict, implementing practices to contain costs, improve efficiencies, and manage risk will benefit an airport in both the short- and long-term. In this current level of business disruption, airports must learn to operate in a changing environment, where financial resilience is necessary to better prepare for, adapt to, and recover from disruption.

#### **1.1 Incorporate Resilience Measures into Project Scoping**

Currently, [Airport Improvement Program](#) (AIP) eligible funding activities for capital improvement projects include data collection, planning, environmental, design and engineering activities associated with a project. To best prepare and protect airports from disruption (due to events such as pandemics or other natural or man-made disasters), we recommend including project tasks that evaluate potential *hazards* to the airport, *vulnerabilities* of airport assets, and *exposure* or *risk* to disaster. In light of current circumstances, project scoping should include discussions regarding elements that may not have been included previously. Such considerations may include potential recovery scenarios, climate projections, terrorism threats, potential future health crises, and other possible disruptions such as power outages.

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### 1.2 Non-Aeronautical Land Use Development

Revenue diversification is a critical tool for enhancing financial resiliency, and non-aeronautical land use offers airports an opportunity to expand revenue streams. Until recently, federal grant assurances required that all land at federally obligated airports were subject to regulation by FAA. However, Section 163 of the FAA Reauthorization Act of 2018 prohibits federal regulation of property that has no prior federal investment and is not needed for protection of aeronautical uses. In light of this provision, it is recommended that airports work with FAA to identify projects that can now proceed with lower levels of FAA oversight (i.e., federal environmental review) than previously required.

### 1.3 Evaluate Insurance Options

In the time of COVID-19, *parametric (or index-based)* insurance is receiving increased attention. While common indemnity insurance compensates exactly for a loss to restore assets (i.e., the cost to restore a home after a fire), parametric insurance measures the amount of payout based on a causal event (rather than the damage sustained). For example, payout for damage related to a windstorm could be related to the wind speed at a certain location. The wind speed is the “trigger” in this situation. Because the payout is not linked to property damages, this form of insurance has the capacity to address a broader range of disruptions including terrorism events, climate change impacts, and economic distress associated with an infectious disease outbreak or other calamity. Parametric insurance can provide an opportunity for airports to cover operational disruptions (often excluded in asset damage assessment).

Benefits of using parametric insurance include a potentially faster payout (due to its association with a triggering event rather than notification of a claim) and flexibility to cover many different needs, including those that incorporate uncertainty (like climate change). A potential triggering event for an airport could be a threshold reduction in operations (or enplanements). This indicator would provide extensive flexibility for coverage based on an unknown event.

While it is too late to purchase parametric insurance for this pandemic outbreak, it is imperative to use this case as a lesson for the future. With anticipated increases in impacts from climate change and economic depression (i.e., reduced travel, job loss, financial stress) that can affect airport operations, this insurance product provides a way to cover business interruption losses. However, as with all risk-based coverage, it is necessary to investigate all aspects of this type insurance program, including costs of managing risk and risk associated with selection of a trigger event.

### 1.4 Monetize Risk

When assessing costs and benefits, airport decision makers should consider all potential risks that could affect a project’s success. The resiliency of a project will be enhanced by incorporating risk (and uncertainties) associated with elements such as a future pandemic, climate change impacts, terrorism threats, and the ever-evolving aviation business environment. For example, based on experience at airports during COVID-19, it is clear that terminal planning should incorporate flexibility for spacing between travelers and employees to prepare for a potential future pandemic.

A *detailed financial analysis* should address direct costs, as well as opportunity costs, to best inform the decision-making process. Further, a monetary measurement should be included for *each* item in a benefit cost analysis. ACRP Report 199 *Climate Resilience and Benefit Cost Analysis* provides guidance on how

*Some airports have experienced being offline for an extended period of time due to climate change impacts (i.e., flooding). What would the cost have been if infrastructure had been built to withstand the impact?*

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to apply quantitative measures to long-term impacts of climate change and extreme weather events. Assigning a dollar value to these kinds of risks will better define the economic case for each investment, thereby leading to better informed decisions and enhanced financial resilience.

## 2. Managing the Impact of COVID-19: Re-Prioritizing Projects

### *Pause, Reflect, Revise, Repeat...*

More than ever before, it is critical for airports to review planning documents, reassess ongoing and upcoming projects, and rethink ambitions.

Due to a reduction in revenue from passenger ticket fees, segment fees, air cargo fees, and fuel taxes, airports must prepare for potential reductions in AIP funding. In adapting to the current situation, airports must be willing to “press pause” on some projects, while ushering forward alternative plans that will provide greater benefits at this time. This requires a reassessment of an airport’s approved projects to prioritize those that should move ahead and identify those which can be delayed to preserve capital. Projects conducted during this time must demonstrate efficiency, timeliness, and cost savings. In this vein, the following project types are those which an airport may justify working on during the slow period of COVID-19.

*What are the goals and projected outcomes of individual airport projects? Are they still relevant? Does their value equate (or exceed) the funding needed to carry them out?*

### **2.1 Capital Improvement Projects that Require Facility Closures**

Many airports have temporarily suspended capital projects to cut costs and maintain liquidity. Others are taking advantage of the reduced activity levels by continuing with much-needed improvements while delaying non-priority projects. Airport safety, capacity, security, and environmental improvements are FAA priorities that are eligible for grants under the AIP. Reduced activity in passenger traffic during the pandemic has created *favorable conditions to accelerate work* on capital projects that require closure of facilities. While in the past these project activities may have been relegated to nighttime hours, they may now be conducted around the clock, allowing for faster completion and improved cost-efficiency.

### **2.2 Sustainability Projects for Which Funding is Available**

**VALE and ZEV:** Both the FAA [Voluntary Airport Low Emissions \(VALE\)](#) and [Zero Emission Vehicle \(ZEV\) and Infrastructure Pilot Programs](#) are financed through a guaranteed set-aside of AIP discretionary funds. The goal of both programs is to improve airport air quality by acquiring or replacing low emission vehicles and/or infrastructure. Using these funds would lead to environmental benefits and modernization of an airport’s assets, with a key focus on efficiency improvements and potential cost savings. (Note: although funding for VALE and ZEV programs is currently available, the set-aside is a percent of the total AIP budget, and thus could be impacted in the future.)

**Energy efficiency:** Section 512 of the FAA Modernization and Reform Act of 2012 ([Public Law 112-95](#)) identifies projects that increase the energy efficiency of airport power sources that are eligible for AIP funding. Eligible projects include on-airport power generation, energy efficiency upgrades, replacement of stationary and mobile ground support equipment (GSE), or replacement of airport-owned vehicles. Ultimately, energy efficiency upgrades could result in cost savings over the life cycle of a project. Funding for energy efficiency projects comes directly from the AIP (not a set-aside).

### 2.3 NEPA Environmental Reviews

According to the National Environmental Policy Act (NEPA), environmental reviews are required for any federally funded or obligated project. While cost is dependent upon the project, NEPA costs are generally low relative to capital improvement costs and are often eligible for federal funding. NEPA evaluations are considered valid for three years, barring any substantial changes to the project description or project area, and will make for a “shovel-ready” project when FAA funding is available.

Note that prior to conducting the NEPA process, a Section 163 evaluation must be submitted to FAA to confirm if a project (or components of a project) are applicable to the statute. Those projects that are subject to Section 163 would not require NEPA, thereby expediting the project.

### 2.4 Review and Update Existing Plans

One of the biggest obstacles in reviewing and updating an airport’s planning documents is finding the time to focus and make needed revisions. Airports must be proactive in maintaining plans to preserve business continuity, protect airport operations, and provide the most current direction in planning for the future. Therefore, during the slowdown, airports should take advantage of the opportunity to review and reassess existing airport plans such as Master Plans, Emergency Response Plans, Capital Improvement Programs, Irregular Operations (IROPS), Communicable Disease Plans, Emergency Plans, Sustainability Plans, and Passenger Support Plans, among others. Updating these plans will provide a clearer path for the future and provide for greater readiness for potential future disruptions.

*What lessons learned can be used for updating or developing an Emergency Response Plan? How are ongoing or future master plans constrained by new conditions (e.g., reductions or changes in air service)?*

## 3. Weathering the Current Pandemic and Preparing for the Next

### *Learning from COVID-19 to Safeguard Public Health and Safety*

Airports should plan for a post-COVID-19 era that will be more resilient toward future epidemics and pandemics (as well as other natural and manmade disasters). The approach proposed hereafter presents pillars and principles to safeguard the health safety of both airport workers and passengers, and promotes a collaborative approach at all levels for making the aviation system stronger and more resilient.

### 3.1 Path to Short-Term Recovery

The following [five pillars](#) are recommended to airports when planning for a successful, short-term recovery.

1. **Joint preparedness and operational readiness:** Airports and their stakeholders should facilitate joint readiness through a *collaborative COVID-19 plan and procedures*, mandatory training including online modules for staff before returning to work, and health and safety promotion.
2. **Safe and healthy operations:** The airport community cannot protect passengers if they are not safe and healthy themselves. Ensuring the safety of the airport staff includes making available PPE and sanitation products, as well as addressing mental health concerns. An online or app-based

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self-assessment should be performed daily before going to work. Workers with symptoms or having been potentially exposed to the virus should be able to safely quarantine.

3. **Safe and healthy passenger journey:** Airports and their stakeholders should ensure passengers' health and safety by providing an acceptable level of safety from the curbside to the gate of the departing aircraft, and then from the gate of the arrival airport to the curbside. As each airport is unique, different mitigation strategies might be justified considering an approach based on local specificities (risk-based approach). However, passengers may not perceive these differences positively; therefore, it is imperative that the industry explain the safety measures and their rationale.
4. **Financial sustainability:** The financial sustainability of the whole aviation system has been threatened by the COVID-19 pandemic. Airports and their stakeholders bring significant benefits to their local communities including jobs, tax revenues, as emergency response centers and by providing much needed access in and out of the community. Solidarity with stakeholders is critical, [especially with community groups and local businesses](#).
5. **Internal and external communication:** Communication is vital for informing the airport community and the public. Transparency, clarity, consistency, and regularity in communication are essential to successfully convey messages. Communication plans should be broad and include information to passengers via the air carriers, in mass transit systems, when arriving at the airport, and in the terminal facilities.

The short-term response developed with the stakeholders should be risk-based (i.e., adapted to the effective level of risk, considering the specificities of aviation and the local context). The efficiency of the mitigation should be monitored, and the response revised accordingly. Also, the response should be consistent from the curbside to the gate with actions and policies that provide the same level of safety all along the passenger journey. To provide a healthy and safe environment throughout the airport, tenants shall follow the same policies as airport and airline workers.

### ***3.2 A Risk-Based Approach for More Resilient Operations during a Pandemic***

Airports should develop plans and procedures for protecting against transmission of communicable diseases. Some airports have already developed these plans based on past outbreaks of avian flu, SARS, MERS, and Ebola. A risk-based plan will include standard operating procedures and specific measures that can be quickly implemented, as needed, depending on the level and type of threat (e.g., stage and severity of epidemic/pandemic, location of clusters, transmission), and should be updated regularly based on lessons learned, the evolution of practices and standards, and local threat assessments. A more comprehensive implementation may be achieved if plan elements are integrated into an airport's integrated management system.

For airports that accommodate international operations, it is recommended to work with airlines to take into consideration restrictions and procedures applicable to foreign countries. Many countries are following risk-based approaches with the concept of [Public Health Corridors \(PHC\)](#) and other 'safe bubbles' between areas of similar risk. Ultimately, more vaccinations than on [today's WHO list](#) might be required to travel abroad. The International Certificate of Vaccination (ICV) or a new type of 'Health Certificate' might become an essential piece of identification for international travel. They could be requested by airlines for domestic flights as well.

### 3.3 Selected Measures for Enhancing Resilience

Resiliency in planning, design, and operations provides an opportunity to reduce vulnerabilities and exposure in an uncertain future. The sections below describe multiple ways that airports can employ resilient measures to better prepare for the next disruption.

**Flexibility in Terminal Design:** Terminal planning can include provisions for social distancing, such as removal of bottlenecks and chokepoints on the passenger journey. Also, signage, equipment and furniture should incorporate scalable and as-needed features (e.g., removable plastic screens, 6-ft. markers) that can be easily added in case of a pandemic. While a terminal entirely designed for social distancing might not be viable, such provisions can be prepared assuming a lower level of traffic during pandemics when social distancing may be warranted.

**International Arrivals & Departures:** Provisions for supplementary, ad hoc health screening processes can be applied for international arrivals and/or departures, depending on the restrictions and procedures enforced. International practices are emerging with Airports Council International's [Airport Health Accreditation Program](#) and ICAO's Passenger Health Corridor concept.

**Touchless Technologies:** Self-service and touchless technologies might rapidly expand in the aftermath of COVID-19. Biometric identification and especially facial recognition that is completely touchless, might become a traveler's unique ID from the curbside to the gate (note that this solution has been recently implemented at Nice-Côte d'Azur in France). Security screening will also need to evolve. The TSA "tunnel" concept with sensors replacing the current techniques of passenger screening might arrive sooner than expected. Simplified and touchless processes (e.g., TSA Pre-Check) should be promoted to eligible travelers.

**Sanitation:** *Enhanced cleaning* and other *best practices* shall be implemented as new baseline standards. To be ahead of the next public health and safety crisis, airport operators should monitor the global situation in relation with the origin and destination of their passengers. Cleaning and sanitation of frequently touched objects and areas, such as food court tables, will need to be reassessed. Depending on the configuration and operations of these facilities and services, they might be sanitized after each use by personnel, or even by devices or robots. Also, some materials limit the survivability of germs and viruses. Use of antimicrobial materials might become more widespread.

**Air Quality:** To improve indoor air quality, the design of air ventilation systems should consider airport-specific pollutants such as volatile organic compounds from jet fuel combustion. Preventing contamination from communicable diseases through specific features or design criteria of HVAC systems is a mitigation method that is emerging rapidly. Increased air inflow and the installation of active processes (e.g., bipolar ionization) are potential features that could become best practices for future projects.

**Stakeholder Coordination:** In order to achieve consistency from door to door, mass transit systems serving the airport, shuttle services, taxis, and TNCs should be included in the planning process to implement adequate measures to protect passengers and workers throughout their travel. This coordination can also help manage passenger expectations when they arrive at and depart from the airport.

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### 3.4 Guidance and Policy Resources

In the United States, the Centers for Disease Control and Prevention (CDC) has published advisories and guidance for the [public](#) and [airport personnel](#), as well as [research findings](#). A joint task force between the U.S. Departments of Transportation, Homeland Security, and Health and Human Services has released guidance that lays out a framework for implementing public health measures in the aviation sector to minimize the risk of transmission. The U.S. Equal Employment Opportunity Commission (EEOC) has established a consolidated resource on [COVID-19 and EEO laws](#). On the aviation operations side, the Federal Aviation Administration (FAA) has published Safety Alerts for Operators (SAFOs) and CertAlerts for Part 139 Airport Certification regarding COVID-19-related safety hazards and the compliance with regulatory requirements. They are compiled in an [online resource on regulatory updates](#).

Beyond these federal policies and recommendations, airports are conducting their own initiatives to facilitate recovery and increase resilience. For instance, John Glenn Columbus International Airport (CMH) has developed [a comprehensive "Safe Work Playbook"](#) providing guidance, policies, and procedures related to COVID-19 for the airport operations community. Also, Metropolitan Washington Airports Authority (MWAA) has formed committees and task forces to identify issues, develop objectives, prioritize actions, provide a timeline for projects, and develop recommendations.

U.S. airports should also be aware of international guidance (i.e., International Civil Aviation Organization) and industry best practices. Airports Council International World and the International Air Transport Association have released a [joint approach to safely restarting aviation](#) in addition to extensive resources. Airports should also monitor policies in other countries for accommodating international flights.

## 4. Beyond COVID-19: Let's Make Aviation Stronger Together

### *Toward Total Airport Resiliency*

The COVID-19 pandemic demonstrates the need to *broaden our vision of airport resiliency*. For the purpose of this guidance, the concept of "Total Airport Resiliency" is defined as a comprehensive approach of airport resiliency, from the curbside to the airside, at the airport, and in conjunction with local communities and economic regions.

#### 4.1 The World After COVID-19 and the Next Disruption

Aside from financial and infrastructure resiliency, climate and operational resiliency are important domains that airport organizations and state DOTs must consider to better prepare the industry for the future.

**Climate Resiliency:** Climate change is already affecting our [transportation systems](#). Impacts include (but are not limited to) more frequent flight disruptions and cancellations due to extreme weather events, reduced payloads due to extreme heat impacting aircraft performance, and various adverse effects on the lifecycle of airport assets. Many airports might be exposed to increased *flooding hazards*, especially in low-elevation coastal areas threatened by [sea level rise](#). Resilient planning demands the development of [climate vulnerability assessments](#) of both airport operations and facilities, the identification of risk-mitigation strategies customized for individual airports, and the implementation of climate adaptation measures needed to protect airports. Further, *reducing greenhouse gas emissions* is necessary to mitigate

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for climate change and is a growing social expectation. The aviation industry is embracing this challenge by championing green initiatives to improve energy efficiencies and reduce facility and aircraft related emissions. However, not all climate mitigation and climate adaptation initiatives are eligible for AIP funding. It is critical that these types of projects that support the long-term viability of airport operations and facilities be prioritized and funded.

**Operational Resiliency:** [Airport Collaborative Decision Making](#) (ACDM) can provide a framework for enhancing collaboration between the stakeholders ranging from ground access to flight operations, making individual aviation facilities more resilient to adverse conditions. As airports are interdependent, operational resiliency has to be developed at the *regional level* as well; coordination between airports beyond state lines can facilitate the mitigation of wide adverse events and associated recovery. For instance, Southeast Airports Disaster Operations Group (SEADOG) brings together airports and stakeholders all along the East coast and inland to coordinate and promote mutual aid, especially during the hurricane season. Dallas–Fort Worth International Airport collaborates with several airports in and outside Texas for managing flight diversions. ACDM concepts and features are relevant for addressing these regional aviation systems as well.

### **4.2 Integrating Innovation and Emerging Aviation Users**

Aviation is at the verge of several unprecedented breakthroughs and transformational changes. These changes will affect all domains, activities, and stakeholders. To succeed in these transformations as an industry, airports need to anticipate and prepare together with the stakeholders.

The information technology revolution in the passenger journey is already here. Most commercial airports now have data centers and they will be soon connected to the airport environment and the passengers through the Internet of Things (IoT) and Everything (IoE). Artificial intelligence to analyze data is dramatically expanding the horizon of possibilities. Deep learning using artificial neural networks and deep automation will be the next step and could assist, supplement, and even replace human analysis and decision-making in domains such as operational resource management and asset management.

Processing these data through intelligent systems and organizations to predict potential disruptions, trigger preventive actions before they happen, and eventually mitigate their effects, is now becoming possible. As airports rely increasingly on information systems and data exchange, they become more vulnerable to disruptions.

New aviation-specific innovations are coming, including unmanned aerial systems, urban and regional air mobilities, electric and hydrogen aircraft, sustainable aviation fuels (SAF), advanced aircraft features and configurations, supersonic aircraft, and even shared airspace and airfields with spacecraft. Changes on the airside are occurring at the fastest pace ever. The airport industry and individual facilities should increase awareness and be proactive on these issues in order to prepare proactively to accommodate these new users and [make aviation systems compatible](#) with these emerging technologies.

### **4.3 Promoting Resiliency Through Standards and Industry Practices**

Current design standards do not necessarily incorporate provisions for resiliency. For instance, per the FAA standards, runway length requirements for planning and design are supposed to be computed based on past temperature observations (not future climate predictions). Further, FAA’s requirement to demonstrate an “actual need” based on a 5-year outlook does not allow for consideration of long-term resilience needs. Also, airport vulnerability assessments and resiliency plans are not always eligible for federal funding. The national aviation system is a critical infrastructure that serves our communities and



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our economy. To ensure the system is future ready, federal and state policies, directives, and standards must promote and support the *incorporation of resiliency features* in the planning and design of aviation facilities.

The workplace itself is changing. As new technologies are developed and environmental conditions evolve, the aviation industry will need to adapt. We are at the threshold of the introduction of artificial intelligence and machine learning on a large scale that is going to deeply change our interactions with our world, including the way we move, communicate, experience, consume and work; climate change brings new environmental disruptions that will affect airports, including both physical and operational infrastructure. Diversity and inclusion will be key to transitioning to new technologies and processes as they make organization more resilient and innovative. Adjusting industry practices to prepare for and accommodate these changes will determine the success of the industry in the long-term.

## Conclusion

The COVID-19 pandemic has illustrated the dire importance of resilience planning. While airports continue to adjust their strategies to remain operational in the wake of this current disruption, it is necessary that lessons learned are used to inform a better approach to weather the next disaster. Updated emergency plans, diversification of revenue sources, adoption of innovative technologies and other resilient measures will allow airports to prepare for and adapt quickly to future stressors. However, it is imperative that federal and state agencies provide direction, as well as funding, for employing these measures. **For airports to survive, and to *thrive* in the future, resiliency must be integrated in every aspect of the aviation industry.**

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### Appendix A. Research and Policy Needs

The following research and policy needs were identified by the ACC Airport Resiliency Task Force. Airport practitioners have the opportunity to participate in these discussions in forums, committees and working groups in industry organizations such as the TRB ([ACRP IdeaHub](#)), [ACI-NA](#), [AAAE](#), among others.

- Assessing performance of policies and practices toward communicable diseases at airports.
- Considering climate change in design standards.
- Developing resiliency plans and implementing resiliency measures.
- Lessons learned on temporary parking of overflow aircraft.
  - *Note: A working group on this matter is being initiated by the Infrastructure WG of The French-Speaking Airports (UAF&FA).*
- Parametric insurance for airports.
- Privacy and social justice aspects of biometric technologies.
- Updating existing guidance on transmissible disease with COVID-19 lessons learned.
- Review of VALE policies and guidance (dated 2010) and considering new policies for supporting greener aviation projects (e.g., e-aircraft, SAF, decoupling VALE with specific air quality criteria (NAAQS)).

### Appendix B. Resources

- Le Bris, G. et al. [Airport Collaborative Decision Making \(ACDM\) to Manage Adverse Conditions](#), ACRP Research Report 229, TRB, 2021
- [Airport Information Technology recommendations during COVID-19](#), Advisory Bulletin, ACI, March 2020
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- [Emergency Preparedness and Contingency Planning Handbook](#), 1<sup>st</sup> Edition, ACI World, 2014
- [Flight Plan to Recovery: Preparing Airports and Their Business Partners for the Return of the Flying Public](#), ACRP Insight Event, Transportation Research Board, May 28, 2020
- [Guidance for ground handling during COVID-19](#), Edition 4, IATA, May 2020
- [Guidance for ground handling return to service](#), Edition 1, IATA, May 2020
- [Guidance for the transport of cargo and mail on aircraft configured for the carriage of passengers](#), Edition 3, IATA, May 2020
- [Implementing a Public Health Corridor to Protect Flight Crew During the COVID-19 Pandemic \(Cargo Operations\)](#), EB 2020/30, ICAO, May 2020
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- [Notice to Airmen \(NOTAM\) Examples when Closing Runway\(s\) and/or Taxiway\(s\) to Temporarily Park Aircraft](#), Part 139 CertAlert No. 20-03, FAA, May 2020
- [Pandemic Preparedness in the Workplace and the Americans with Disabilities Act](#), U.S. EEOC, March 2020
- [Parametric Insurance for Disasters](#), University of Pennsylvania Wharton Risk Management and Decision Processes Center, September 2020
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