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Airports

Airport Climate Adaptation and Resilience:

FAA Perspectives and Future Direction

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FAA
Office of Airports

Presentation Outline

- Potential climate impacts for airports
- Resilience challenges
- Considering resilience in airport planning
- Examples of resilience measures
- Lessons learned from climate resilience
- Resources on climate resilience

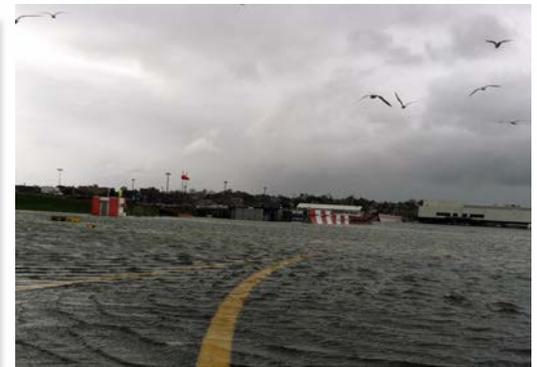
Potential Impacts - Flooding

- More frequent/severe flooding of low-lying infrastructure due to more intense precipitation, sea level rise, and storm surge
- Increased numbers and magnitude of storm surges and/or relative sea level rise
- Culvert and drainage infrastructure damage, due to changes in precipitation intensity, changes in snow melt timing, or rising water tables
- Blocked ground access to airport



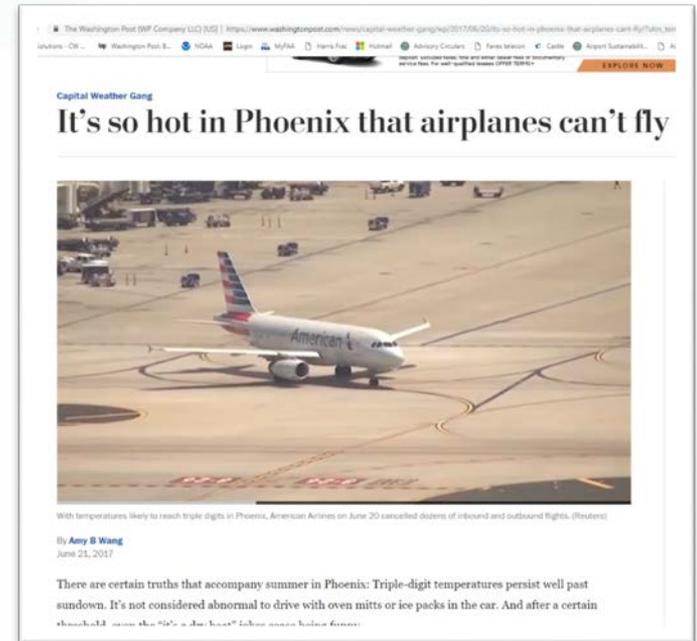
Potential Impacts - Storms

- Increased numbers and magnitude of extreme storms, such as hurricanes and typhoons
- More intense precipitation, storm surges and/or relative sea level rise
- Wind and debris damage
- Internet and cell phone services may be disrupted
- Storm refugees often seek out airport



Potential Impacts - Heat

- Increased thermal expansion and potential degradation of paved surfaces, due to higher temperatures and increased duration of heat waves
- Reduced aircraft performance on extremely hot days leading to limited range capabilities and reduced payloads
- Electrical fluctuations due to high load demand



Potential Impacts Sea-Level Rise

- More frequent/severe flooding of low-lying infrastructure from sea level rise and associated storm surge
- Increased numbers and magnitude of storm surges as a result of sea level rise (e.g., salt water inundation)
- Culvert and drainage ineffective due to elevated water table



Resilience Challenges

Requires working across every part of the airport

- Airport Planning and Engineering
- Operational considerations
- Investments

Costs can be high

- Some mitigation is extremely expensive – e.g., flood prevention
- Some less so

Uncertainties

- Hard to know what to plan for
- Looking into the future is always imprecise
- Can't know all the risks



Considering Resilience at the Airport

- **Airport Planning:**

- Master Plans and layout plans – should consider future climate
- Engineering standards – should consider future climate. Some airports have issued ‘specifications’ or ‘planning standards’ that take climate into consideration
- Environmental impact assessment
- Plan for irregular operations – e.g. Incident Command System (ICS), or Continuity of Operations Plan (COOP)



Hardened infrastructure

FAA's Engineering Services team has started elevating:

- Instruments: Radars and LOC
- Some ATC towers

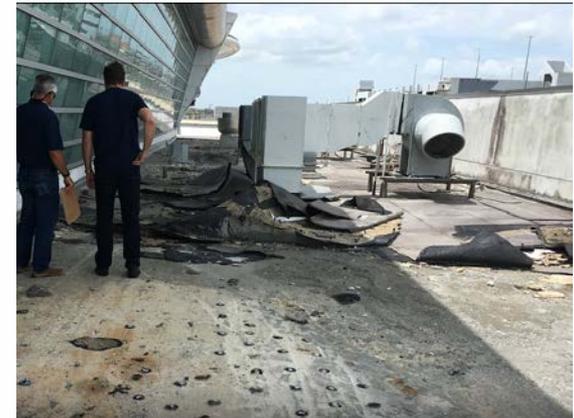
Generally done on a case by case basis as needed



Design Airport buildings for resilience

Resilience tips:

- Install concrete buildings on islands, as well as tie downs for LIR masts and shelters
- Plan for electric generators – install plugs on buildings, configure power systems to accommodate vulnerabilities
- Consider unusual foundation designs – e.g., deep piles driven into sand specifically to withstand soil liquefaction in coastal areas, strong storm surge, and to resist hurricane force winds
- Some components can be configured for quick removal in flood prone areas. Include eyelets to ease lifting, and design with quick disconnects for the electrical



Airport Sustainability and Energy

The US is seeing a lot of creative energy projects

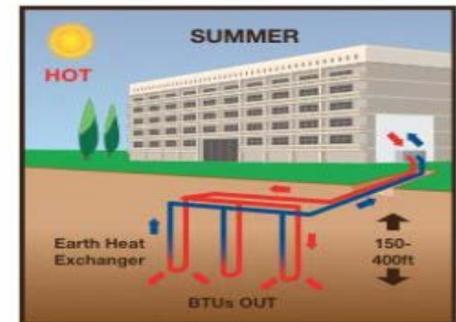
Energy projects:

Renewable on-airport power generation for electricity and heating/cooling (i.e., solar, geothermal, hydrogen powered electrical energy generation)

Stand-alone energy efficiency upgrades – HVAC, hot water heater, and energy efficient lighting

Airport microgrid as a secondary system to generate and distribute power

Elevating substations and other electrical components, strengthening to withstand flooding and salt water



Lessons learned

Good planning is critical

- There is time to adapt, but plan now – most impacts like sea-level rise are not sudden
- Achieve resilience incrementally
- Know your facility and local climate projections
- Ask “What do I really need to operate the airport safely for the next 20 years or so?”
- Prioritize projects/upgrades and implement them accordingly



Have a plan for extreme or emergency events

- Practice the plan so everyone knows their role

SJU: “We were not improvising”

Lessons learned on resilience

Avoid 'unanswerable' issues

- Don't be too concerned with uncertainties of climate data or 'quantifying risk'
- You don't need 'downscaled' high-resolution climate data to make reasonable decisions about your airport

There is a lot of climate data readily available

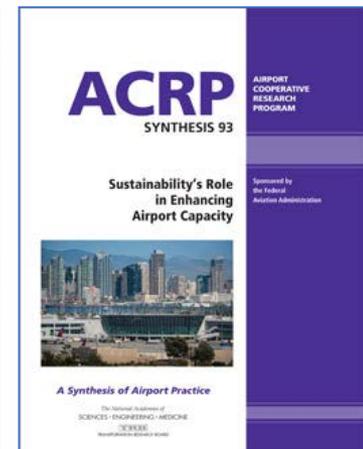
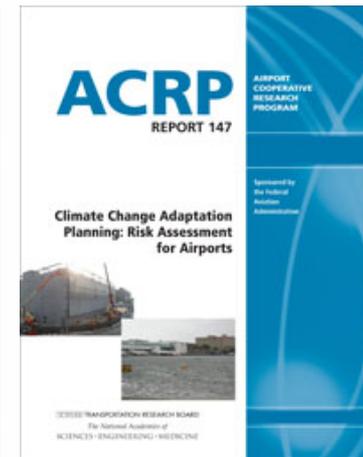
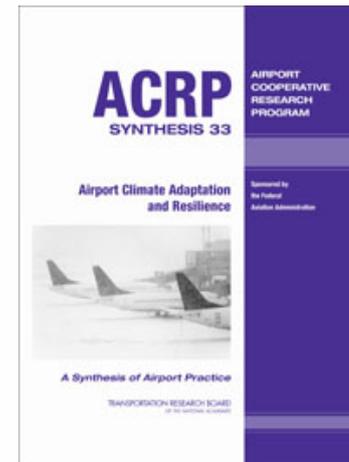
Cost/investment

- There is no perfect benefit/cost analysis for decision-making
- Remember that every \$1 spent on prevention saves \$6 later



Airport Resilience Resources

- *Airport Climate Adaptation and Resilience, 2012 (Synthesis 33)*
- *Climate Change Adaptation Planning: Risk Assessment for Airports, 2015 (Report 147)*
- *Using Existing Airport Systems to Manage Climate Risk, 2018 (Report 188)*
- *Sustainability's Role in Enhancing Airport Capacity, Aug. 2018 (Synthesis 93)*



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