Problem Statement No.: 703

Digital Twin for Airports : Why and How?

Recommended Allocation: $350,000

Tags: Airport-Planning, Design, Information-Technology, Maintenance

Related Emerging Issues/Themes: INNOVATIVE AND EMERGING TECHNOLOGIES--Use technology to improve airport operations and communication.

Research Roadmaps: N/A

Staff Comments: The author did not provide a research approach or cost estimate. Based on the objective, staff recommends an allocation of $350,000.

Average Airport Employee Review Rating: 4.09

ACRP Oversight Committee (AOC) Disposition: Approved as ACRP Project 03-66 and funded at $350,000.

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Summary

Virtually building a "digital twin" of an airport is becoming increasingly popular by architects and engineers who need to more efficiently plan, design, and build; staff who need to effectively operate and maintain these complex facilities; and managers who constantly need to make informed decisions. The concepts behind a digital twin (e.g. graphical representation of facilities, recording current status of assets, systems integration, simulation, mobile access, reporting) are not new. What is new is the technical capabilities to bring all of these capabilities together to provide not just an appealing 3D view, but an intuitive information resource supports informed and coordinated decision making across airport organizations.

Conference topics, requests for proposals, and a growing number of successful cases indicate the need for "digital twins" of our airports, as well as sparked the attention of large, medium, and small airport managers. Questions asked include "what is a digital twin?", "can I realistically achieve one for our airport?", "what steps can I take?", and "how much will it cost?" are being asked, hence the need for industry research on this topic.

Research into "digital twins" for airports should determine what airports need and how they will apply the technology to meet their needs. The cost-benefit of digital twins and how to "right-size" them for different sizes and types of airports should be considered. Relevant literature and case studies inside and outside the U.S. as well as within the airport industry, as well as other industries investing in complex infrastructure should be summarized. The technologies involved and how they can be approach, as well as options such as cloud-hosting, should be evaluated. A guidebook on steps to take would be an important final result.

Technology has made the concept of a digital twin possible, research is now needed to help airports realize its potential to meet their development, operational, and maintenance needs.

Background

Airports appear to be looking to do more with less, especially in the current environment. Manager's expect to have reliable information at their fingertips and have grown impatient with persistent silos between organizational units. Our aging infrastructure needs to be efficiently improved. For all of these reasons, airports want to use "digital twins" to efficiently, effectively, and reliably respond to their facility, asset, and customer needs. This desire was expressed at a recent AAAE Geospatial Technologies Conference, where several airports expressed interest in digital twins as well as industry research that they can apply to fulfill this interest.

Objective

A guidebook that explains what a digital twin is for an airport and how it can be achieved. What steps can be followed and what best practices should be emulated and challenges overcome. What will the costs and benefits be?

Research Approach

N/A

Cost Estimate and Backup

N/A

Related Research

N/A

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Airport Employee Comments

Digital Twin technology enables airports to optimize airside and landside mobility reducing environmental impacts, identifying new revenue sources, and improving customer experience
Digital Twins are all the buzz in airport design, construction and operations. This subject matter needs to be addressed as more and more airports consider planning for and implementing some form of Digital Twins. Because it is in the early stages of its application to airports there are only a few case studies where some portion of a Digital Twin has been implemented. If the idea is to focus on the definition of Digital Twins, how it's applicable to airports and what the key steps are to achieving early and later on results than this is an achievable study. The problem statement is fairly generic and incomplete. There is nothing on Research Approach, Cost Estimate and Backup, or Related Research. This is why I gave it 3 stars. The subject matter is timely and I believe could be an excellent research project for the industry. The statement is just lacking.
Digital Twins technologies are an awesome means of modeling existing systems as well as initiatives to model in a virtual environment to understand benefits and effect. DFW Airport has developed a digital twin through a relationship with NREL. This tool has provided significant benefit well beyond its original scope.
Highly recommended in this tech concept has afforded airports of all sizes the flexibility in their design build operations at their airports. Having this resource document could be of major significance to an airport in their design build operations.
I had not heard this term before and when I read the problem statement I became even more interested. A good ACRP project in that it's forward looking.
Interesting concepts. I would defer to those who may better understand the benefits of such a study.
So many applications/uses for a digital twin! Could reduce the silos often found at airports - by providing a model for everyone to reference.
Think this would be interesting and useful for airports of all sizes.
This topic is becoming a more needed tool for the industry at large, especially when more efficient management is needed. There needs to be more thought provided into the problem statement. I suggest a cost range of $150K - $200K to be able to deploy a fully working digital twin and test the system while creating documentation of the process to create it.

TRB Committee Comments

Reviewing Committee(s)	Committee Comments
AV010	AVIATION ADMINITRATION AND POLICY: This statement was not supported largely due to it being an incomplete submittal (several sections were not completed). Recommend resubmitting once further refined and author should consider inclusion of a review of airport case studies.

IdeaHub Votes and Comments

Idea Number: **703**

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The votes and comments below were provided by the **IdeaHub** community prior to the idea's submission as a problem statement.

Idea Link: http://ideascale.com/t/UKsrZBoEq

Tags: Airport-Planning, Design, Information-Technology, Maintenance

Votes:

Votes	
Up	7
Down	0
Total	7

Comments:

Fully detailed digital twins will be the realm of large airports primarily until cost decreases and airports' maturity model grows over time. It is important to show the continuum of Digital Twins at the high end and low-end "Digital Cousins" at smaller airports.

What organizations/stakeholders will contribute to establishing the DT, and who will be responsible for this information regarding availability and liability. What system is deemed necessary to be integrated into the digital twin platform and identified as a source of information and related processes?. Development of business case value for Airport decision-maker requesting the necessary fund. The Interface control between the different airport organizations, defining, for example, which level of access is permitted to each entity/group. We all know one size doesn't fit all, so the DT Maturity matrix needs to be addressed to address different airports' readiness and establish a clear path for future development. Comment from Mohammad Salem of DAR based on Digital Twin work at Dubai Airport.

As a progression of life cycle BIM, Digital Twin provides closed loop feedback between physical and digital assets. It is an important concept which should be realized for complex infrastructure systems like airports to enable profitably performing assets.

While a few airports (some outside the U.S.) have been successful, I feel that the topic is in its infancy and that there is not yet enough published material to support a synthesis. I also feel that more in-depth primary research and the types of research products enabled by a full research project would be of great benefit.
Thanks for submitting an idea! I'm aware of digital twins because of the NREL/Athena work on ground transportation at DFW, and we've heard it has been helpful there. Are there enough examples of digital twins for airports and elsewhere that a synthesis might be helpful?