

Airport Research Strategic Roadmap

Prepared by:

Dr. Michel Hovan, Mgr., Airport Technology Research Branch Murphy Flynn, Acting Mgr. Airport Safety Research Section

Jeff Gagnon, Mgr., Airport Pavement Research Section

Jim Patterson, Mgr., Airport Safety Research Section and UAS Airports Research Program Manager

And FAA's Office of Airports, John Dermody, Director, Airport Safety and Standards

Federal Aviation Administration William J. Hughes Technical Center



October 20, 2021

Path for R&D Roadmaps



FAA's Stakeholders-Driven Research



Today's	Airports		Tomorrow's Airports (2030+)
Research Category	Research Area	FAA's Current Focus	
Airport Pavement	Structural	Developing pavement performance models, extending pavement life Improving pavement life calculations to include material characteristics	Airport pavement will be designed to extend their pavement life from the current 20 years to 40 years or beyond thus decrease the cost of the pavement pre years and reducing the use of quickly declining natural resources
	Longevity	Determining remaining life of pavements, developing Life-Cycle Assessment (LCA)tools, use of pavement Maintenace materials.	Airport pavements will be economically design from cradle-grave using the LCA method and the true cost for greenhouse gases will be determined helping the airport become net-zero emissions
	Environmentally Friendly	Development of new performance specifications, use of nanotechnologies and new additives, use of recycled products within pavement materials and design.	Use of emerging composite materials include Self Healing Materials and Carbon Nano Tubes will allow airports to use recycled products such as glass, concrete and asphalt in their pavements thus reducing land fill costs and material costs and reducing the carbo foot prints
Airport of the Future	Airport Safety (ARFF, Wildlife, Visual guidance, EMAS, etc.)	Ensuring the highest level of safety for ARFF, Wildlife management, visual guidance.	Continuous improvements integrating new technologies and procedures, using data and operational feedbacks.
	Data and Technology Integration for improved safety and operations	Acquiring and analyzing large amount of operational data to improve airport safety and operations	Airports transitioning to a data driven fully integrated intelligent safety information and management system, and an integral part of the Info-NAS centric system.
	Resilience, Sustainability	Understanding current trends and developing a framework for airport adaptation.	Airports resilient to severe weathers events and long effects of climate change, while ensuring airport sustainability.
Emerging Entrants	Advanced Air Mobility	Enabling operations with existing infrastructure, while planning for future installations	Types of new vehicles/services include highly automated AAM services transporting people, cargo in congested and high altitude areas
	Unmanned Aircraft Systems (UAS)	Safe integration into the airport environment	Types of new vehicles/services include UAS delivering packages, and performing a range of automated function at and near airports.

Airport Evolution Roadmap

Industry Led Research- Why? Quick to innovation, Access to Capital markets, involved with airport industries of all types, Cooperative Research Development Agreements, Airport Cooperative Research Program

FAA Led Research- Why? Develop standards/guidelines to develop performance standards, safely support integration of these technologies at airports, Supports the \$3.35 Billion Annual FAA's Airport Improvement Program (AIP).

> 2022-2023*

Pavement Structures, evolving design and materials

Airport Safety testing and evaluating latest technologies

Use of ML/AI to analyze large amounts of airports related data (pavements, and safety)

Electric and physical Infrastructure to support emerging entrants

UAS integration at airports testing and evaluation, and detection



technologies and inspection data in an integrated environment , sharing of data

2030+*

Long Term

Autonomous Airport Support Function Implementation of various xBOTS and autonomous airfield safety devices

Energy grids at airport to support future users, in a sustainable way

Highly Automated AAM Services and UAS applications

Novel and environmentally friendly Materials for Pavements

2024-

2029*

Mid Term

Making use of ML/AI and autonomous systems for airport safety applications

New Inspection Techniques (UAS/ML/AI)

Energy Needs Systems for emerging entrants (electric, fuel cells)

New Advanced Air Mobility Vehicles and other UAS operations

Airport Pavement Research Roadmap

	Focus Areas	Near Term (1-3 years) In Progress	Mid Term (4-9 years) Research Portfolio Development	Long Term (10+ years) Monitoring		
		HIGH CLARITY	LOW TO MEDIUM CLARITY	MONITORING ONLY		
		2022-2023	2023-2029	2030+		
ent	Extended Pavement Life	Develop Performance Models	Remaining Life Predictions Integ	grate into Pavement design		
aveme	FAARFIELD –Next Gen	Artificial Intelligence Integration, Analysi	s, Design and Overlay Design Improvements	Deploy FAARFIELD 3.0		
port P Struc	Full Scale Testing	Construction of testing pavements	/ data collection and analysis Im	proved Design model		
Air	Stabilized Base Design	Full Scale Testing	Develop better material Sp	pecifications		
oort ment evity	Advanced Characterization	Develop Remaining Life Calculations and software Advisory Circular				
Airp Paveı Long	Life Cycle Analysis (LCA)	Developing Life-Cycle	Analysis Framework	Software tool and integration		
ally	Additives & Nanoparticles	Advanced additives asphalt and concrete materials- nano's and self-healing and others				
t Paven onmento riendly	Recycled Materials	Recycling of traditional products – glass/rubber	Recycling of nontraditional products – plastics/soybean husks	New materials specification		
Airpor Envira F.	New Pavement Materials Technologies	New Airfield Pavement Materials	Alternative Materials (Slag/Ash)	uring materials		

Toolsets

Flight Testing

Training

Airport of the Future Research Roadmap

Focus Areas	Near Term (1-3 years) In Progress	Mid Term (4-9 years) Research Portfolio Development	Long Term (10+ years) Monitoring		
	HIGH CLARITY	LOW TO MEDIUM CLARITY	MONITORING ONLY		
	2022-2023	2023-2029	2030+		
	Testing of FFF products				
Airport Safety	Standards for Fluorine firefigh	Free Foams (FFF) aircraft ting agents	Innovative products		
	Evaluate New Systems for FOD/Wil	Evaluate New Systems for FOD/Wildlife Detection			
	LED based airport lighting				
		Smart Lighting & Signage	Intelligent Visual Guidance systems		
	Wildlife Strike Management Tools				
	Improvements to A	Improvements to Aircraft Arrestor Systems			
	Runway Safe	ety Technologies			
	Airport Surveillance Senso	Airport Surveillance Sensors (Wrong Surface, Radars, etc.)			
		Innovative Airport Safety products			
Data and Technology Integration	1				
	Wildlife Strike Database				
	Airport Safety Databases (RIM, runway safety)	One Database- info centric NAS integration			
	FOD Database			Standards/Gu	
	Aircraft Braking Limited Friction – aircraft and airport data		n Limited Landings – warning System	Toolsets	
	5 G	i, faster intelligent networks	All things "Data Integrated"	ted"	
	Cybersecurity with Airport Systems			J	

Airport of the Future

Airport of the Future Research Roadmap



 \diamond

Airport of the Future

Emerging Entrants Research Roadmap

