

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 23-506 (project 666) | November 2023

Autonomous Aircraft: Challenges and Opportunities



the **ISSUE**

The emerging field of advanced air mobility (AAM) presents myriad opportunities for disrupting traditional modes of transport, including passenger travel to cargo logistics. However, its path to full-scale adoption is fraught with regulatory, market, and logistical challenges. There is a need to examine regulatory factors, market opportunities, and specific cargo applications so that stakeholders can strategically plan AAM deployment, ensuring economic viability, environmental sustainability, and social responsibility.

the **RESEARCH**

This report aims to unravel the multi-faceted dimensions of AAM adoption. The research is segmented into various aspects, including predicting adoption rates, market opportunity forecasting, cargo drone deployment, risk mitigation in transporting dangerous goods, and supply chain disruptions in the pharmaceutical sector. The methodology is interdisciplinary, leveraging machine learning algorithms, geographic information system (GIS) tools, and data-mining techniques.

In the first segment, the authors assembled a unique dataset with 36 indicators across 204 nations to predict AAM adoption. The machine learning model identified gross domestic product and the Regulatory Quality Index as the top predictors. The second study employed a hybrid methodology, focusing on the Uber Elevate use case, to forecast AAM demand. It uncovers viable routes for electric vertical take-off and landing (eVTOL) aircraft among 859 U.S. cities.

The cargo-focused studies introduced data-mining algorithms and GIS to identify key markets and routes for cargo drones in the U.S., specifically targeting four primary commodity categories. Another segment examines the potential for drones to safely transport dangerous cargo, thereby reducing risk and costs. The final part of the research used a hybrid machine learning and GIS approach to pinpoint how AAM can resolve challenges in the pharmaceutical supply chain.



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the FINDINGS

The researchers identified key indicators for predicting AAM adoption, with GDP and the Regulatory Quality Index emerging as top predictors. In terms of market opportunities, the researchers forecasted demand for 78,000 daily passengers accessing 4,214 vertipads across 859 U.S. cities. For cargo deployment, it identified four primary commodity categories, accounting for more than one-third of air-transported value. In the area of transporting dangerous goods, drones could initially serve nine metropolitan areas to move 38% of dangerous commodities within 400 miles. Finally, the study found that drones could greatly improve the pharmaceutical supply chain by serving just nine metropolitan areas, thereby moving more than 28% of the weight of all pharmaceuticals.

the IMPACT

The research offers a roadmap for AAM adoption, pinpointing key economic and regulatory factors that could accelerate or impede its deployment. By identifying high-demand routes and commodity categories, it facilitates targeted investments and policymaking. The focus on transporting dangerous goods and pharmaceuticals showcases AAM's potential for enhancing safety and healthcare outcomes. These insights will significantly inform governmental and business decisions, shaping a more sustainable, efficient, and responsive transportation ecosystem.

For more information on this project, download the Main report at <https://www.ugpti.org/resources/reports/details.php?id=1142>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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