Deloitte.
Insights

The future of work in manufacturing

What will jobs look like in the digital era?

UAM FLIGHT CONTROLLER

UAM FLIGHT CONTROLLER

Summary

By 2035, the urban air mobility (UAM) ecosystem could see commercial success of remotely managed air taxis, paving the way for autonomous vehicles. Though autonomous air taxis would eliminate the need for a pilot in the vehicle, it would be essential to have a controller, situated in operation centers, who can remotely manage and monitor passenger (and cargo) mobility vehicles.
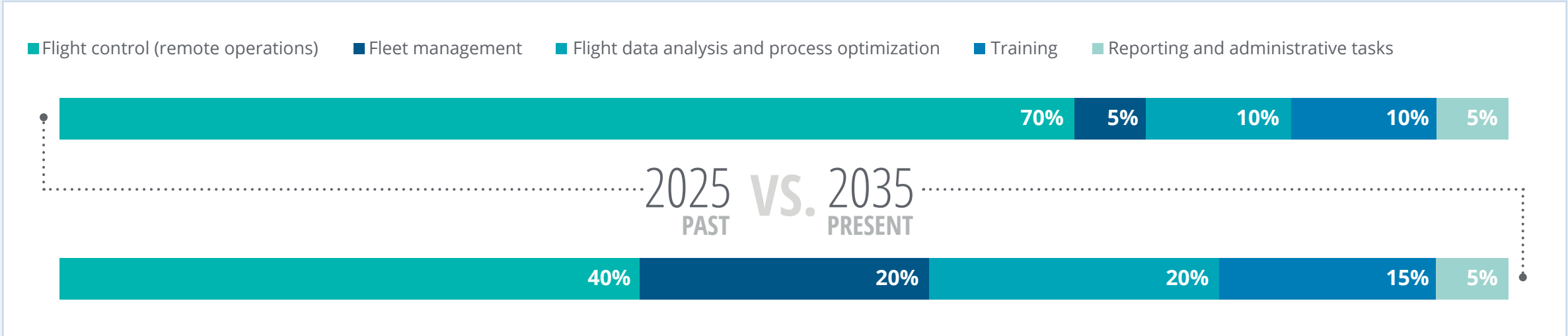
UAM flight controllers would be expected to manage multiple aircraft, since these aircraft would largely be able to operate independently. They would be certified aviation and UAM professionals who would be capable of remotely communicating with autonomous systems equipped in air taxis and be able to control and guide them, whenever required.

The primary responsibility of a UAM flight controller would be to ensure smooth take-off and landing of the vehicle and that the flight path is followed accurately. In addition, the UAM flight controller would be capable of managing exigencies. They would perform flight data analysis, route optimization, fleet management, and resource planning.

Responsibilities

- Use advanced digital communication and navigation systems to remotely operate and manage air taxis, constantly monitor them, and ensure safe and secure operations

- Remotely manage and respond to emergency situations by coordinating with air traffic controllers, vertiport managers, and maintenance engineers, primarily by using augmented and virtual reality (AR/VR) and advanced communication tools

- Plan routes and optimize passenger mobility vehicles to increase efficiencies

- Remotely manage a fleet of air taxis as well as a team of junior UAM flight controllers, including their training and mentoring requirements

- Review flight statistic reports and analysis to identify areas to operate more efficiently

Time spent on activities

■ Flight control (remote operations)　■ Fleet management　■ Flight data analysis and process optimization　■ Training　■ Reporting and administrative tasks

70%	5%	10%	10%	5%

2025 VS. **2035**
PAST　　PRESENT

40%	20%	20%	15%	5%

MARKIAN GONSALVES

UAM FLIGHT CONTROLLER

NAM Pacific | *Los Angeles, California*

Experienced civilian pilot and a UAM professional with a demonstrated history of working in the aviation industry; highly skilled in airline operations, training, and aeronautics, with proficiency in project, resource, and fleet management; plays a pivotal role in the expansion of UAV operations at NAM Pacific.

Skills and endorsements

⊕ Aeronautics · 450
    Endorsed by **Kathie** and **Rupert**, who are highly skilled at this

⊕ Flight planning · 410
    Endorsed by **Kim** and **Racheal**, who are highly skilled at this

⊕ Civil aviation · 356
    Endorsed by **Ekram** and **David**, who are highly skilled at this

⊕ Flight control (remote operations) · 350
    Endorsed by **Mandy** and **Anto**, who are highly skilled at this

⊕ Team leadership · 247
    Endorsed by **Megan**, who is highly skilled at this

⊕ Change management · 253
    Endorsed by **Jacob** and **Feroz**, who are highly skilled at this

⊕ Route optimization · 235
    Endorsed by **Riesa** and **Kuong**, who are highly skilled at this

⊕ Flight operations · 200
    Endorsed by **Bob** and **Chris**, who are highly skilled at this

⊕ Wearables for safety management · 160
    Endorsed by **Lee** and **Racheal**, who are highly skilled at this

⊕ Resource allocation · 158
    Endorsed by **Suzanna** and **Chris**, who are highly skilled at this

⊕ Simulation training · 150
    Endorsed by **Ross** and **Jacob**, who are highly skilled at this

⊕ People management · 112
    Endorsed by **Ravi**, who is highly skilled at this

⊕ Risk assessment · 110
    Endorsed by **Peter**, who is highly skilled at this

Experience

NAM Pacific
UAM flight controller   *Oct 2030–present | 4 years 6 months*
Managing a fleet of unmanned aerial vehicles (UAVs), ensuring safe and secure UAV operations; overseeing a fleet of 40 UAVs and managing a team of 10 junior flight controllers.

NAM Pacific
UAM consultant   *Aug 2027–Sep 2030 | 2 years 8 months*
Lead UAM consultant; played a key role in establishing business models, conducting feasibility analysis, and testing prototypes.

GB Airlines
Flight operations manager   *Apr 2025–Jul 2027 | 2 years 3 months*
Responsible for safe and efficient operations of commercial transport aircraft; equipped with knowledge of FAA air traffic control systems; was also the controller and operator of the firm's cargo drone fleet.

GB Airlines
Civilian pilot   *Sep 2020–Mar 2025 | 4 years 7 months*
With flying time of 2,000 hours, oversaw flying operations for Europe-bound flights.

Education

Lynn University
Master of business administration in aviation management
2014–2015

Metropolitan State University
Bachelor's in aviation management
Denver, Colorado | 2009–2012

Certifications

FAA
Remote pilot airman certificate, airline transport pilot certification, commercial pilot license

Trident Technical College
Certificate in avionics maintenance technology

TOOLBOX

THE TOOLBOX SUPPORTS THE WORKER AS A WHOLE—IN ACHIEVING EXTERNAL OUTCOMES SUCH AS PRODUCTIVITY AS WELL AS INTERNALLY FOCUSED ONES SUCH AS DECISION-MAKING AND LEARNING.

Productivity

Air Talkies
This voice-enabled, wireless headset can connect to air traffic controllers through voice commands in a fraction of a second.

AuRo
It is an AR tool that is designed to assist maintenance personnel in maintaining and repairing equipment using vision picking to produce a faster, hands-free solution for precarious or delicate tasks.

Venus
This AI-powered, voice-enabled digital assistant provides a conversational interface for all productivity-related tasks, from scheduling to finding answers to questions and checking the status of products and projects.

VirtuMeet
This AR smart-glass conference room with AI capabilities allows global partners to meet and collaborate, overcoming the barriers of physical separation. With built-in AI, AR screens can present short bios or other relevant information about attendees as the user pans across their faces.

Decision-making

Flight Analyzer
This predictive tool monitors air taxi performance, by capturing and analyzing flight data from routine operations. It also helps improve flight operations safety as well as operational efficiency.

Smart Dash
It is a visual display that presents data, live information, and analysis, including predictive analytics, from multiple sources to facilitate informed decision-making.

UAV NavCom
It is a virtual version of a cockpit that allows remote flight controllers to communicate and navigate UAVs. It also allows flight controllers to take complete manual control of the vehicle.

Learning

UAV Sim X
This training simulator helps train UAM flight controllers in a virtual environment that is realistic, but eliminates the risks of a real flight. Through simulations, it allows controllers to prepare for situations that may arise while air taxis are being remotely managed.

A DAY IN THE LIFE

07:00 AM
Captain Mark, after drinking his morning espresso, leaves for his workplace—an air taxi operation center. He calls for an unmanned air taxi, using his company's ride-sharing app, which will pick him from the nearest vertiport. While en route, **Venus** helps him quickly check his roster to understand which air taxis he and his team will be remotely managing today.

07:15 AM
Mark reaches the operations center. He has a quick transition discussion with Jennifer, the captain operating in the previous shift, who will be providing an overlap until Mark and his team are ready to take over. Mark's team comprises 10 first officers (FOs), situated in different locations, who will each be responsible for managing around four UAVs, while Mark will be managing and overseeing the overall operations. He logs in to **Smart Dash**, which gives a complete overview of the UAVs that are allocated to him and the team of FOs.

08:00 AM
Using **VirtuMeet**, Mark connects with his team of FOs for a morning meeting, where he allocates UAVs to each one of them. Using the unique identifier codes for each UAV, FOs immediately connect to the allocated UAVs on **Smart Dash**, which helps them constantly keep track of UAVs, including their navigation systems, battery performance, and surrounding weather conditions. Given this is the peak hour for air taxi operations, all the UAVs allocated to Mark and team are airborne with passengers on-board.

09:30 AM
With eyes glued to their respective **Smart Dash** systems, Mark and his team are ensuring all flights are smoothly taking off, landing, and following their designated flight path. The team of FOs is also constantly communicating with the air traffic controllers (ATCs) of manned commercial aircraft, using **Air Talkies**, which can seamlessly connect with ATCs in a specific area.

11:00 AM
Mark receives an alert from one of his FOs, Cathy, who is advised by the ATC to change the flight path of the UAV under her control, to avoid obstruction to a descending manned commercial aircraft that is working to manage a mechanical issue. He approves the change in flight path from **Smart Dash**. Cathy uses **UAV NavCom** to communicate with the UAV and remotely modify the flight path by taking control of the advanced digital communication and navigation system equipped in the vehicle.

12:30 PM
Another alert pops up on the **Smart Dash** of an FO, Ryan, indicating a technical issue in one of the batteries of the UAV. Ryan uses his **Smart Dash** to send a request to Mark for permission to land the UAV at the nearest vertiport. As Ryan receives approval from Mark, he lands the vehicle at the nearest vertiport, where maintenance engineers are ready to fix the issue, since Ryan had already alerted them from his **Smart Dash** system. Ryan provides for alternative transportation for the passengers of the vehicle that was landed. Maintenance engineers use **AuRo** to connect virtually with the maintenance supervisor and collaboratively work on fixing the issue. Using **AuRo**, the maintenance supervisor ensures the issue has been successfully resolved and that quality controls are in place. The UAV then takes off to its destination.

01:30 PM
Toward the end of their work day/shift, each FO uploads daily flight statistic reports on **Flight Analyzer**, which collates and analyzes them to create a consolidated report. While the new captain, John, and his team of FOs in the next shift start preparing, Mark utilizes this time to extract the consolidated flight statistics and analysis report from **Flight Analyzer**. These reports are reviewed by Mark every month and the insights are used in making UAM operations more efficient.

02:30 PM
As his day finally comes to an end, Mark transitions to John, while his team of FOs logs in to **UAV Sim X** to complete their mandatory weekly simulation hours. As soon as John and his team take over, Mark hops on to an air taxi that **Venus** pre-booked for him so that he can reach in time to participate in the first round of the 2035 drone-racing league.

About the authors

PAUL WELLENER is a vice chairman, Deloitte LLP, and the leader of the US Industrial Products & Construction practice with Deloitte Consulting LLP. He has more than three decades of experience in the industrial products and automotive sectors, and has focused on helping organizations address major transformations. Wellener drives key sector industry initiatives to help companies adapt to an environment of rapid change and uncertainty—globalization, exponential technologies, the skills gap, and the evolution of Industry 4.0. Connect with him on LinkedIn at https://linkedin.com/in/pwellener/.

BEN DOLLAR is a principal in the Global Supply Chain practice of Deloitte Consulting LLP. Dollar has helped some of Deloitte's largest defense, automotive, and industrial products manufacturing clients achieve tangible benefits through organization design, process adoption, and human capital management. Connect with him on LinkedIn at https://www.linkedin.com/in/ben-dollar-1018aa/.

LUKE MONCK is a senior manager in the Human Capital practice. Monck has more than 13 years of experience leading large-scale organizational transformation initiatives for Fortune 100 companies, focusing on automotive, A&D and chemical manufacturers. He designs and delivers the operating model/organizational design, talent, and change management solutions that business transformations require to be successful. Connect with him on LinkedIn at https://www.linkedin.com/in/luke-monck-51885949/.

HEATHER ASHTON MANOLIAN leads industrial manufacturing research in the Deloitte Research Center for Energy and Industrials. Manolian has delivered compelling insight for manufacturing executives on major enterprise business and technology trends for more than 20 years. Her expertise includes developing thought leadership at the intersection of business and technology, and covering emerging technologies from cloud to blockchain and augmented reality. Connect with her on Twitter at @hashtonmanolian and on LinkedIn at https://www.linkedin.com/in/heather-ashton-manolian-6241b78.

AIJAZ HUSSAIN is a research and insights leader serving the manufacturing and energy industries. He leads the aerospace and defense, engineering and construction, and chemicals sector research for the US firm and serves as the principal advisor to national sector leadership and the practice leaders in these markets. Hussain has over 18 years of experience in research, thoughtware development, business strategy, market/competitive intelligence, and financial analysis. He has authored numerous compelling, high-impact thought leadership studies in the areas of business strategy, advanced technologies, digital transformation, innovation, and the future of work. Connect with him on LinkedIn at https://www.linkedin.com/in/aijazshaikhussain/.

Acknowledgments

The author would like to thank **Robin Lineberger**, principal and Aerospace & Defense leader with Deloitte Consulting LLP, for his significant contribution in shaping our research.

The authors would also like to thank the team that helped tremendously in developing this series of reports: **Siddhant Mehra** of Deloitte Support Services India Pvt. Ltd., **Junko Kaji**, **Rithu Mariam Thomas**, **Preetha Devan**, and **Molly Woodworth** of Deloitte Insights.

Contacts

INDUSTRY CONTACT
Victor Reyes
Managing director
Deloitte Consulting LLP
+1 571 766 7433
vreyes@deloitte.com

DELOITTE RESEARCH CENTER FOR ENERGY AND INDUSTRIALS
Katherine Hardin
Managing director
Deloitte Research Center for Energy & Industrials
+1 617 437 3332
khardin@deloitte.com

Deloitte.
Insights

Sign up for Deloitte Insights updates at www.deloitte.com/insights.

Follow @DeloitteInsight

Deloitte Insights contributors

Editorial: Rithu Thomas, Rupesh Bhat, Preetha Devan, and Nairita Gangopadhyay
Creative: Molly Woodworth and Rajesh Venkataraju
Promotion: Nikita Garia
Cover artwork: Lucie Rice

About Deloitte Insights

Deloitte Insights publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte Insights is an imprint of Deloitte Development LLC.

About this publication

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.