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RESEARCH REPORT

**Unsettled Issues Concerning
eVTOL for Rapid-response,
On-demand Firefighting**

Johnny Doo

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Unsettled Issues Concerning eVTOL for Rapid-response, On-demand Firefighting

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About the Editor



Mr. Johnny T. Doo is the President of International Vehicle Research Inc., focusing on innovative flight vehicle and electric vertical takeoff and landing (eVTOL) technologies and unmanned aerial vehicle (UAV) and wing-in-ground vehicle development and applications. He is Lead of the National Aeronautics and Space Administration (NASA) Transformative Vertical Flight Working Group on Public Services, teaming with over 100 industry leaders and experts to develop the roadmap and use cases for disaster relief, humanitarian aid, search and rescue, police and firefighting, medical transport, and military eVTOL applications. He also supports aviation industry growth by providing strategic consulting, including business planning, product development, and market strategy to selected global clients.

He has over 30 years of experience in manned and unmanned aviation products, with many years of executive-level responsibilities in aviation product development, program management, and supply chain development, as well as marketing and business development. His technical and program experiences range from high-performance piston aircraft, personal and business jets, and regional aircraft, to new-generation aircraft engines and industrial UAVs. His expertise includes aeronautical engineering, product design and testing,

advanced technology, aircraft certification, and project management, with particular focus on design-to-cost and design-for-production aspects.

He was Executive Vice President of Advanced Technology, Executive Vice President of Marketing and Business Development, and Senior Vice President of Engineering and Product Integrity at Continental Motors Group. He not only managed the product line expansion of the Avgas and Jet-A diesel aviation engines, but also developed multiple new market segments, achieving significant growth of the global original equipment manufacturer (OEM) customer base and sales revenue. He was also the president of a flight training subsidiary with an innovative training model and was responsible for the maintenance, repair, and overhaul business unit, quadrupling business growth over three years.

Prior to Continental Motors, he was Vice President at Diamond Aircraft in Canada, with full responsibility for the new-generation personal jet program. He built a new program team from the ground up and led the successful development of the all-composite, single-engine personal jet in three years. At the same time, he established the design, test, and certification capabilities, negotiated with all the key suppliers, and managed the new supply chain to support the development and production operations. His hands-on experiences with the high-performance business jet at Sino Swearingen Aircraft, regional aircraft at Fairchild Aircraft, and new generation piston aircraft at Mooney Aircraft formed a broad spectrum of technical and project management knowledge base.

He has a bachelor's degree in Mechanical Engineering from Chung Yuan Christian University and a master's degree in Aerospace Engineering from the University of Colorado. He is the lead author of NASA's *Electric Vertical Takeoff and Landing (eVTOL) Aircraft Technology for Public Services* white paper, co-author of the book *WIG Craft and Ekranoplan - Ground Effect Craft Technology*, and is the GoFly Master Lecturer on "eVTOL for Public Services - Design and Applications."

contents

About the Editor

Unsettled Issues Concerning eVTOL for Rapid-response, On-demand Firefighting . . . 3

Introduction	<u>4</u>
<i>State of the Industry</i>	<u>4</u>
<i>Unsettled Issues Concerning eVTOL for Rapid-response, On-demand Firefighting</i>	<u>4</u>
<i>Unsettled Issues</i>	<u>5</u>

eVTOL Technology: Past, Present, and Future . . .	<u>6</u>
<i>eVTOL Systems Currently Under Development</i> . . .	<u>6</u>
<i>Potential Ways to Use eVTOL to Complement Firefighting Capabilities</i>	<u>7</u>
Rapid Response	<u>7</u>
Early Fire Suppression and Control	<u>7</u>
Firefighter Transport	<u>7</u>
Civilian Evacuation	<u>7</u>
<i>Technology Readiness Level</i>	<u>7</u>

Current Firefighting Operations	<u>8</u>
<i>Urban and Suburban Firefighting Operations</i>	<u>8</u>
Ground-/Water-based Firefighting Systems	<u>8</u>
Aerial Firefighting Assets and Operations	<u>8</u>
<i>Fighting Wildfires</i>	<u>9</u>
Current Approach and Challenges	<u>10</u>
Aerial Fire Suppression Systems	<u>10</u>
Firefighter Deployment and Extraction	<u>10</u>
Civilian Evacuation	<u>12</u>

eVTOL Capabilities for Firefighting Applications	<u>12</u>
<i>Quick-response Firefighting Coordination</i>	<u>13</u>
<i>Distributed, On-demand Rapid Firefighter Deployment</i>	<u>13</u>
<i>Early-stage, Tactical Aerial Fire Suppression</i>	<u>14</u>
<i>Distributed, On-demand Transport and Logistics</i>	<u>14</u>
<i>High-rise Building Fire Control and Rescue</i>	<u>14</u>
<i>Wildfire Early-stage Suppression and Containment</i>	<u>17</u>
<i>Wildfire Firefighter Deployment and Extraction</i>	<u>17</u>

<i>Civilian Emergency Evacuation</i>	<u>17</u>
------------------------------------------------	-----------

Challenges and Development Needed 19

<i>Vehicle-specific Capabilities</i>	<u>19</u>
Firefighting-specific eVTOL Development	<u>19</u>
Modular Missions Adaptable Configuration	<u>19</u>
Multisensor Suite and Sensor Fusion	<u>20</u>
Sense and Avoid, Terrain Sensing, and Auto-land	<u>21</u>
Compact Design and Transportability	<u>21</u>
Payload Range, Endurance, and Energy Supply	<u>22</u>
Mobile Recharging Stations and Automotive Charging System Adoption	<u>22</u>
<i>Autonomy, Training, and Airspace Management</i>	<u>22</u>
Autonomous and Semi-autonomous Capabilities with Remote Control	<u>22</u>
Coordinated Multi-vehicle Operation and Swarm Capabilities	<u>23</u>
Simplified Vehicle Operation and Training	<u>23</u>
Dynamic and Flexible Airspace Management	<u>23</u>
<i>Operations, Logistics, and Support</i>	<u>23</u>
Temporary Operating Site Setup and Management	<u>23</u>
Fire Retardant Logistics	<u>24</u>
Ground Support, Spare Parts Logistics, and Maintenance	<u>25</u>
Distributed, On-demand Network System	<u>25</u>
<i>Unconventional Firefighting Mode Evaluation</i>	<u>25</u>
Distributed, On-demand Aerial Operations for Firefighters and First Responders	<u>25</u>
eVTOL Fire Suppression Best Practices	<u>25</u>
Command System Integration with Current Operations	<u>26</u>
<i>Funding, Acquisition, and Acceptance</i>	<u>26</u>
Federal, State, and Local Government Funding and Support	<u>26</u>
Commander, Firefighter, and First Responder Acceptance	<u>26</u>

General Public and Community Support	26	Summary	27
Regional and Global Challenges	26	SAE EDGE Research Reports	28
Social Benefits	27	Next Steps for eVTOL Vehicles and System Development for Firefighting	28
Lifesaving	27	Recommendations	28
Fire Impact and Property Damage Reduction	27	Definitions	29
Environmental Benefit	27	Acknowledgments	29
Enhanced Societal Acceptance of eVTOL Technology	27	References	29
		Contact Information	31

Unsettled Issues Concerning eVTOL for Rapid-response, On-demand Firefighting

Abstract

Recent advancements of electric vertical take-off and landing (eVTOL) aircraft have generated significant interest within and beyond the traditional aviation industry, and many novel applications have been identified and are in development. One promising application for these innovative systems is in firefighting, with eVTOL aircraft complementing current firefighting capabilities to help save lives and reduce fire-induced damages. With increasing global occurrences and scales of wildfires—not to mention the issues firefighters face during urban and rural firefighting operations daily—eVTOL technology could offer timely, on-demand and potentially cost-effective aerial mobility capabilities to counter these challenges. Early detection and suppression of wildfires could prevent many fires from becoming large-scale disasters. eVTOL aircraft may not have the capacity of larger aerial assets for firefighting, but targeted suppression, potentially in swarm operations, could be valuable.

Most importantly, on-demand aerial extraction of firefighters can be a crucial benefit during wildfire control operations. Aerial firefighter dispatch from local fire stations or vertiports can result in more effective operations, and targeted aerial fire suppression and civilian extraction from high-rise buildings could enhance capabilities significantly.

There are some challenges that need to be addressed before the identified capabilities and benefits are realized at scale, including the development of firefighting-specific eVTOL vehicles; sensor and avionics capabilities in complex, smoke-inhibited environments; autonomous and remote operation capabilities; charging system compatibility and availability; operator and controller training; dynamic airspace management; and vehicle/fleet logistics and support. Acceptance from both the first-responder community and the general public is also critical for the successful implementation of these new capabilities.

The purpose of this report is to identify the benefits and challenges of implementation, as well as some of the potential solutions. Based on the rapid development progress of eVTOL aircraft and infrastructures with proactive community engagement, it is envisioned that these challenges can be addressed soon.

NOTE: SAE EDGE™ Research Reports are intended to identify and illuminate key issues in emerging, but still unsettled, technologies of interest to the mobility industry. The goal of SAE EDGE™ Research Reports is to stimulate discussion and work in the hope of promoting and speeding resolution of identified issues. These reports are not intended to resolve the challenges they identify or close any topic to further scrutiny.

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