

# **Vertical/Short Take-Off and Landing (VSTOL) Aircraft Systems**

Papers Presented at the AIAA Aviation Forum 2019

Dallas, Texas, USA  
17-21 June 2019

ISBN: 978-1-5108-9322-1

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 34922 Uvptkug'Xcmg{'Ftkxg.'Uwkg'422, Reston, VA 20191, USA.

# TABLE OF CONTENTS

## ON-DEMAND MOBILITY CONCEPTS AND MARKET STUDIES

<b>AIAA-2019-2871: A Survey to Model Demand for eVTOL Urban Air Trips and Competition with Autonomous Ground Vehicles</b> .....	1
<i>Laurie A. Garrow, Brian German, Patricia Mokhtarian, John Glodek</i>	

## V/STOL AND VTOL CONTROLS DESIGN AND APPLICATIONS

<b>AIAA-2019-3265: Control Allocation Framework with SVD-based Protection for a Tilt-rotor VTOL Transition Air Vehicle</b> .....	46
<i>Jiannan Zhang, Pranav Bhardwaj, Stefan A. Raab, Florian Holzappel</i>	
<b>AIAA-2019-3266: Thrust command based Integrated Reference Model with Envelope Protections for Tilt-rotor VTOL Transition UAV</b> .....	60
<i>Pranav Bhardwaj, Stefan A. Raab, Jiannan Zhang, Florian Holzappel</i>	
<b>AIAA-2019-3267: Consideration of Control Effector Dynamics and Saturations in an Extended INDI Approach</b> .....	75
<i>Stefan A. Raab, Jiannan Zhang, Pranav Bhardwaj, Florian Holzappel</i>	
<b>AIAA-2019-3268: Control Inceptor Design for Remote Control of a Transition UAV</b> .....	88
<i>Daniel Dollinger, Tim Fricke, Florian Holzappel</i>	
<b>AIAA-2019-3269: Control Optimization of a Novel eVTOL/Pusher Transport Aircraft with Known Faults</b> .....	100
<i>Collin Carithers, Kenneth Tucker, Maxwell Cobar, Carlos J. Montalvo</i>	
<b>AIAA-2019-3270: Control of a Quadrotor Formation Carrying a Slung Load Using Flexible Bars</b> .....	113
<i>Segun Ariyibi, Ozan Tekinalp</i>	

## V/STOL AND VTOL DESIGN METHODOLOGIES, ISSUES, AND ASSESSMENTS

<b>AIAA-2019-3473: Robust Environmental Life Cycle Assessment of Electric VTOL Concepts for Urban Air Mobility</b> .....	124
<i>Nicolas André, Manfred Hajek</i>	
<b>AIAA-2019-3474: Hybrid Lagrangian-Eulerian Approach for Modeling Aerodynamic Interactions</b> .....	138
<i>Eui Sung Bae, Peter Rand, Chengjian He</i>	
<b>AIAA-2019-3475: Development of a Safe, Quiet, Certifiable Personal VTOL System</b> .....	160
<i>Lauren Schumacher, Patrick I. McNamee, John Haug, Ron Barrett</i>	
<b>AIAA-2019-3476: Sensitivity Analysis and Uncertainty Quantification of a Coaxial Rotor System</b> .....	168
<i>Phuriwat Anusonti-Inthra, Ethan Corle, Brendan Smith, Zackery Nieto</i>	
<b>AIAA-2019-3477: Model Development for a Comparison of VTOL and STOL Electric Aircraft Using Geometric Programming</b> .....	183
<i>Christopher Courtin, R John Hansman</i>	
<b>AIAA-2019-3478: Lift Fan Assessment for Conceptual Design of Aircraft Forebody</b> .....	201
<i>Leighton Myers, Ryan Czerwec, Zachary Napolillo</i>	
<b>Author Index</b>	