

Adaptive Structures

Papers Presented at the AIAA SciTech Forum and Exposition
2020

Orlando, Florida, USA
6 – 10 January 2020

ISBN: 978-1-7138-1072-8

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 Uwytkug'Xcmg{'Ftkxg.'Uwky'422, Reston, VA 20191, USA.

TABLE OF CONTENTS

ADAPTIVE AIRCRAFT SURFACES AND STRUCTURES FOR SONIC BOOM MITIGATION

NEAR-FIELD PRESSURE SIGNATURE SPLICING FOR LOW-FIDELITY DESIGN SPACE EXPLORATION OF SUPERSONIC AIRCRAFT	1
<i>Christian R. Bolander, Douglas F. Hunsaker</i>	
IDENTIFYING OPTIMAL EQUIVALENT AREA CHANGES TO REDUCE SONIC BOOM LOUDNESS	17
<i>Troy Abraham, Douglas F. Hunsaker, Jonathan M. Weaver-Rosen, Richard J. Malak</i>	
STRUCTURALLY FEASIBLE MORPHING OF A LOW-BOOM SUPERSONIC TRANSPORT	32
<i>Jacob A. Schrass, Pedro B. Leal, Darren J. Hartl</i>	
SONIC BOOM PERFORMANCE OF LOW-BOOM AIRCRAFT IN NON-STANDARD ATMOSPHERES	41
<i>David S. Lazzara, Todd Magee, Hao Shen, James H. Mabe</i>	

MORPHING STRUCTURES I

DISPLACEMENT CONTROLLED 2D COMPLIANT MECHANISMS FOR USE IN MORPHING STRUCTURES	58
<i>Evan M. Munroe, Rubens Bohrer, Il Yong Kim, Wajid Chishty</i>	
CONTROL FORCE REQUIRED TO MORPH THE ELBOW AND WRIST IN GULLS	68
<i>Christina Harvey, Vikram B. Baliga, Daniel J. Inman</i>	
AN ANALYTICAL MODEL FOR GRANULAR JAMMING BEAMS WITH APPLICATIONS IN MORPHING AEROSTRUCTURES	77
<i>Juan D. Brigido, Steve Burrow, Benjamin Woods</i>	
ON-DEMAND STIFFENING OF DEFLECTED MORPHING SECTION VIA INTERNAL BISTABLE ELEMENT	94
<i>Jose R. Rivas-Padilla, David M. Boston, Andres F. Arrieta</i>	
AEROSTRUCTURAL AND AEROACOUSTIC EXPERIMENTAL TESTING OF SHAPE MEMORY ALLOY SLAT COVE FILLER	105
<i>Andrew Leaton, William Scholten, Kevin Lieb, Darren J. Hartl, Thomas Strganac, Travis L. Turner</i>	

MORPHING ROTOR BLADES

NUMERICALLY EFFICIENT THREE-DIMENSIONAL FLUID-STRUCTURE INTERACTION ANALYSIS FOR COMPOSITE CAMBER MORPHING AEROSTRUCTURES	115
<i>Andres E. Rivero, Jonathan E. Cooper, Benjamin Woods</i>	
SHAPE MEMORY ALLOYS COMPACT ACTUATORS FOR AERODYNAMIC SURFACES TWISTING.....	143
<i>Salvatore Ameduri, Bernardino Galasso, Monica Ciminello, Antonio Concilio</i>	

WIND TUNNEL COMPARISON OF FLAPPED AND FISHBAC CAMBER VARIATION FOR LIFT CONTROL.....	154
<i>Andres E. Rivero, Stephane Fournier, Marinos Manolesos, Jonathan E. Cooper, Benjamin Woods</i>	
PRELIMINARY DESIGN OF A TE MORPHING SURFACE FOR ROTORCRAFT	172
<i>Yasir Zahoor, Roeland De Breuker, Mark Voskuijl</i>	
NUMERICAL INVESTIGATION OF THE EFFECTS OF DYNAMIC CAMBER VARIATION ON THE AIRFOIL CHARACTERISTICS OF A PITCHING ROTOR AIRFOIL	185
<i>Amine Abdelmoula, Stefan Platzer, Manfred Hajek, Juergen Rauleder</i>	
PASSIVE ENERGY BALANCING FOR MORPHING ROTORCRAFT ACTUATION: INTEGRATION AND OPTIMISATION	202
<i>Chen Wang, Jiaying Zhang, Mohammadreza Amoozgar, Alex Shaw, Michael Ian Friswell, Benjamin Woods</i>	

DESIGN OF ADAPTIVE AIRCRAFT AND SPACECRAFT STRUCTURES

DESIGN AND ANALYSIS OF SELF-DEPLOYABLE, SELF-STIFFENING, AND RETRACTABLE ARRAYS	213
<i>Nathan A. Pehrson, Daniel C. Ames, Spencer P. Magleby, Brian Ignaut</i>	
MODELING AND CONTROL OF ROBOT-STRUCTURE COUPLING DURING IN-SPACE STRUCTURE ASSEMBLY	234
<i>Sean Shan-Min Swee, Ben Jenett, Nick B. Cramer, Kenneth Cheung</i>	
DEPLOYABLE TESSELLATED PARABOLOIDAL SURFACES WITH PANEL THICKNESS ACCOMMODATION.....	249
<i>Nicholas A. Michael, Brian P. Trease</i>	
COMBINING DENSITY-BASED APPROACH AND OPTIMIZATION REFINEMENT IN THE DESIGN OF MORPHING AIRFOIL STRUCTURES	265
<i>Zhenkai Zhang, Chen Song, Chao Yang, Vittorio Cavalieri, Alessandro De Gaspari, Sergio Ricci</i>	

ACTUATION AND CONTROL OF ADAPTIVE STRUCTURES

DESIGN, FABRICATION AND TESTING OF AN ACTIVE CAMBER ROTOR BLADE TIP	278
<i>Etana Ferede, Farhan Gandhi</i>	
DESIGN, DEVELOPMENT AND EFFECTIVENESS OF D_{31} -MODE AND D_{33} -MODE MULTILAYERED SURFACE BONDABLE PIEZOELECTRIC ACTUATORS FOR ACTUATION OF LARGE AND STIFF STRUCTURES	297
<i>Shivashankar P, Santan Kumar, Gopalakrishnan Srinivasan</i>	
PHASE BASED CONTROL OF A NOVEL BEAM-SHAPE MRE-BASED ADAPTIVE TUNED VIBRATION ABSORBER	309
<i>Armin Rasooli, Masoud Hemmatian, Ramin Sedaghati</i>	

MORPHING STRUCTURES II

TOWARDS THE DEVELOPMENT OF A SPAN-WISE EXTENDING UNMANNED AERIAL SYSTEM	319
<i>Francis R. Phillips, Todd Henry, John T. Hrynuk, Robert Haynes, Erich Bain, Jeffrey Westrich</i>	
EFFECT OF SPANWISE TRAILING EDGE GAPS ON AERODYNAMIC PERFORMANCE	331
<i>Piper Sigrest, Daniel J. Inman</i>	
AERODYNAMIC EFFICIENCY ANALYSIS OF MORPHING WINGS RELATIVE TO NON-MORPHING WINGS.....	341
<i>Zachary S. Montgomery, Douglas F. Hunsaker, James J. Joo</i>	
MODAL ANALYSIS OF A MORPHING WING FOR UNSTEADY FLOW CONDITIONS	365
<i>Christian G. Vazquez, Kamlesh Joshi, Samik Bhattacharya, Jeffrey L. Kauffman</i>	
STRUCTURAL AND SYSTEMS MODELLING OF A FLUID-DRIVEN MORPHING WINGLET TRAILING EDGE	375
<i>Srinivas Vasista, Maik Titze, Michael Schäfer, Oliver Bertram, Johannes Riemenschneider, Hans P. Monner</i>	

SHM AND SMART MATERIALS

PHASE TRANSFORMATION CHARACTERISTICS OF HIGH-TEMPERATURE SHAPE MEMORY ALLOY UNDER TENSION, COMPRESSION, AND BENDING ACTUATION CYCLING	394
<i>Daniel Martin, Lei Xu, Dimitris C. Lagoudas</i>	
CARBON NANOTUBE ENHANCED SHAPE MEMORY POLYURETHANE FOR IMPROVED MECHANICAL PROPERTIES AND SHAPE RECOVERY	409
<i>Siddhant Datta, Todd Henry, Asha Hall, Aditi Chattopadhyay</i>	

Author Index