

# **Advanced Vehicles Systems**

Papers Presented at the AIAA Propulsion and Energy Forum  
2021

Online

9 – 11 August 2021

ISBN: 978-1-7138-4330-6

**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

## **SPACE EXPLORATION USING SLS**

NASA SPACE LAUNCH SYSTEM COMPLETES GREEN RUN TESTING, BEGINS ASSEMBLY.....	1
<i>John Honeycutt, Joseph C. Cianciola, John Blevins, Johnny Heflin, Bruce Tiller, David C. Reynolds</i>	
CAPABILITIES FOR A 2033 CREW MARS FLYBY MISSION LAUNCHED WITH THE NASA SPACE LAUNCH SYSTEM .....	12
<i>Ben B. Donahue</i>	
MARS POLAR ICE ROBOTIC LANDER LAUNCHED BY THE SLS HEAVY LIFT LAUNCHER .....	28
<i>Ben B. Donahue</i>	
FUTURE MISSIONS FOR THE NASA SPACE LAUNCH SYSTEM .....	36
<i>Ben B. Donahue</i>	

## **INNOVATIVE DESIGNS FOR SPACE UTILIZATION**

MAPLEAF: A COMPACT, EXTENSIBLE, OPEN-SOURCE, 6-DEGREES-OF-FREEDOM ROCKET FLIGHT SIMULATION FRAMEWORK .....	48
<i>Henry Stoldt, Declan Quinn, Jake Kavanagh, Craig T. Johansen</i>	
AR SPACECRANE FAMILY OF LUNAR LANDER VEHICLES: A COMMON ARCHITECTURE FOR ENHANCED MISSION FLEXIBILITY AND AGILITY .....	69
<i>Peter D. Kinsman, Claude R. Joyner, Timothy S. Kokan, Daniel J. Levack, Dennis E. Morris</i>	
HUMAN LANDING SYSTEM ARCHITECTURE OPTIONS UTILIZING THE XLR-132 ROCKET ENGINE .....	99
<i>Christopher B. Reynolds, Timothy S. Kokan, Daniel J. Levack, Dennis E. Morris, Rodney Noble</i>	
PRELIMINARY DESIGN CONCEPT OF LOCUST INSPIRED JUMPING MOON ROBOT SWARM.....	111
<i>Brenden Herkenhoff, Sara Lancot, Trent Bjorkman, Nathaniel Serda, Mostafa Hassanalian</i>	

## **SPACE SYSTEM ENHANCEMENTS**

FLIGHT DYNAMICS ANALYSIS USING HIGH ALTITUDE & MACH NUMBER FOR GENERIC AIR-BREATHING HYPERSONIC VEHICLE.....	127
<i>Om Prakash, Ritesh Singh</i>	
MAGNETOHYDRODYNAMIC ENHANCED ENTRY SYSTEM FOR SPACE TRANSPORTATION (MEESST) AS A KEY BUILDING BLOCK FOR FUTURE EXPLORATION MISSIONS .....	140
<i>Elias Bögel, Manuel A. La Rosa Betancourt, Marcus R. Collier-Wright</i>	

DEVELOPMENT OF SAFETY PROCESSES FOR DESIGN AND MANUFACTURE OF  
SMALL LIQUID PROPELLANT ENGINES AND LAUNCH VEHICLES ..... 148  
*Frank O. Chandler, Alexander S. Bowen*

A COMPARATIVE STUDY ON ORBITAL LAUNCH SYSTEMS FOR HUMAN MISSION TO  
MOON AND MARS ..... 165  
*Malaya Kumar Biswal M, Ramesh Kumar V, Noor Basanta Das*

**Author Index**