

2020 AIAA/IEEE Electric Aircraft Technologies Symposium (EATS 2020)

**New Orleans, Louisiana, USA
26 – 28 August 2020**



**IEEE Catalog Number: CFP20P39-POD
ISBN: 978-1-7281-8647-4**

**Copyright © 2020, American Institute of Aeronautics and Astronautics (AIAA)
All Rights Reserved**

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP20P39-POD
ISBN (Print-On-Demand):	978-1-7281-8647-4
ISBN (Online):	978-1-62410-605-7

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

DYNAMIC SYSTEM MODELING AND STABILITY ASSESSMENT OF AN AIRCRAFT DISTRIBUTION POWER SYSTEM USING MODELICA AND FMI	1
<i>Stavros Konstantinopoulos; Hamed Nademi; Luigi Vanfretti</i>	
OPTIMAL WEIGHT POWER SYSTEM DESIGN AND SYNTHESIS FOR MORE ELECTRIC AIRCRAFT	13
<i>Angel A. Recalde; Serhiy Bozhko; Jason Atkin</i>	
A MODEL BASED APPROACH TO ANALYZE THE IMPACT OF DIFFERENT AMBIENT TEMPERATURES ON EMERGENCY FLIGHT TIME	23
<i>Murat Keskin; Oguz Kagan Keles; Mustafa Bagriyanik</i>	
A STUDY OF LARGE SCALE POWER EXTRACTION AND INSERTION ON TURBOFAN PERFORMANCE AND STABILITY	34
<i>Jeffryes W. Chapman</i>	
ASSESSMENT OF THE IMPACT OF AN ADVANCED POWER SYSTEM ON A TURBOELECTRIC SINGLE-AISLE CONCEPT AIRCRAFT	51
<i>Sydney L. Schnulo; Jeffryes W. Chapman; Patrick Hanlon; Hashmatullah Hasseeb; Ralph H. Jansen; David Sadey; Emre Sozer; James Jensen; Daniel Maldonado; Keerti Bhamidipati; Nic Heersema; Kevin Antcliff; Zachary J. Frederick; Jason Kirk</i>	
ANALYTICAL MODEL AND DESIGN SPACE STUDIES FOR A NON-SUPERCONDUCTING AND SUPERCONDUCTING ELECTRIC MACHINE FOR AN AIRCRAFT APPLICATION	69
<i>Stephen Du; Jagadeesh Tangudu; Parag Kshirsagar</i>	
ELECTROMAGNETIC ANALYSIS OF FULLY SUPERCONDUCTING SYNCHRONOUS MACHINES FOR FUTURE TURBO ELECTRIC PROPULSION SYSTEMS	79
<i>Yutaka Terao; Yusuke Ishida; Hiroyuki Ohsaki; Daniel A. Heideman; Keiichi Okai; Hideyuki Taguchi</i>	
DESIGN AND EVALUATION OF A HIGH POWER DENSITY 5 MW, 6000 RPM FULLY-SUPERCONDUCTING GENERATOR	87
<i>John Voccio; Jagadeesh Tangudu</i>	
REDUCING MISSION CRYOGENIC LOAD VIA HTS DYNAMO	97
<i>Kent A. Hamilton; Dale A. Carnegie; Rodney A. Badcock</i>	
SUPERCONDUCTING DC POWER DISTRIBUTION NETWORKS FOR ELECTRIC AIRCRAFT	105
<i>Peter Cheetham; Bhanuprakash Darbha; Srikar Telikapalli; Chul H. Kim; Michael Coleman; Sastry Pamidi</i>	
PREDICTING FLEET-LEVEL CARBON EMISSION REDUCTIONS FROM FUTURE SINGLE-AISLE HYBRID ELECTRIC AIRCRAFT	112
<i>Samarth Jain; William A. Crossley</i>	
PARALLEL HYBRID PROPULSION & SECONDARY POWER SYSTEM ARCHITECTURE EXPLORATION AND EVALUATION	127
<i>Charles Lents; Zubair Baig; Russell Taylor</i>	
MULTI-POINT DESIGN OF PARALLEL HYBRID AERO ENGINES	134
<i>Michael Sielemann; Clément Coïc; Xin Zhao; Dimitra Eirini Diamantidou; Konstantinos Kyprianidis</i>	
INTEGRATED PROPULSIVE AND THERMAL MANAGEMENT SYSTEM DESIGN FOR OPTIMAL HYBRID ELECTRIC AIRCRAFT PERFORMANCE	152
<i>Philip Abolmoali; Adam Donovan; Soumya S. Patnaik; Patrick McCarthy; Dominic Dierker; Nick Jones; Robert Buettner</i>	
COMMERCIAL HYBRID ELECTRIC AIRCRAFT THERMAL MANAGEMENT SENSITIVITY STUDIES	169
<i>Jonathan M. Rheume; Charles E. Lents</i>	
HIGH EFFICIENCY MEGAWATT MOTOR RISK REDUCTION ACTIVITIES	175
<i>Ralph H. Jansen; Justin Scheidler; Thomas Tallerico; Peter Kaszak; Andrew Woodworth; Andrew D. Smith; Rodger Dyson; William Sixel; Jerald Thompson; Erik Stalcup; Yaritza De Jesus-Arce; David Avanesian; Kirsten Duffy; Paul Passe; Gerald Szpak</i>	
CO-DESIGN OF AN INTEGRATED DIRECT-DRIVE ELECTRIC MOTOR AND DUCTED PROPELLER FOR AIRCRAFT PROPULSION	187
<i>Thanatheepan Balachandran; John David Reband; Jianqiao Xiao; Samith Sirimmana; Ranbir Dhilon; Kiruba S. Haran</i>	
NASA ELECTRIC AIRCRAFT TESTBED (NEAT) RECONFIGURATION TO ENABLE ALTITUDE TESTING OF MEGAWATT-SCALE ELECTRIC MACHINES	198
<i>Joseph M. Haglage; Thomas W. Brown</i>	

INDUCTION GENERATOR BASED ELECTRICAL POWER GENERATION SYSTEM FOR MORE ELECTRIC AIRCRAFT APPLICATIONS	211
<i>Shilei Jiao; Raj R. Krishna; Kaushik Rajashekar; Yijiang Jia</i>	
OUTER STATOR MAGNETICALLY-GEARED MOTORS FOR ELECTRIFIED URBAN AIR MOBILITY VEHICLES	220
<i>Thomas F. Talerico; Zachary A. Cameron; Justin J. Scheidler; Hashmatullah Hasseeb</i>	
MULTIDISCIPLINARY SYSTEMS ANALYSIS OF A SIX PASSENGER QUADROTOR URBAN AIR MOBILITY VEHICLE POWERTRAIN	245
<i>George L. Thomas; Jeffryes W. Chapman; Jonathan Fuzaro Alencar; Hashmatullah Hasseeb; David J. Sadey; Jeffrey T. Csank</i>	
ENERGY MANAGEMENT FOR ELECTRIC AIRCRAFT VIA OPTIMAL CONTROL: CRUISE PHASE	267
<i>Mengyuan Wang; Mehran Mesbahi</i>	
DESCENT ANGLE CONTROL BY REGENERATIVE AIR BRAKE USING OBSERVER-BASED THRUST CONTROL FOR ELECTRIC AIRCRAFT	282
<i>Kentaro Yokota; Hiroshi Fujimoto; Yoichi Hori</i>	
BATTERY EVALUATION PROFILES FOR X-57 AND FUTURE URBAN ELECTRIC AIRCRAFT	295
<i>Jeffrey C. Chin; Eliot D. Aretskin-Hariton; Daniel J. Ingraham; Dustin L. Hall; Sydney L. Schnulo; Justin S. Gray; Eric S. Hendricks</i>	
INTEGRATED POWER MODELING FOR A SOLAR-POWERED, COMPUTATIONALLY-INTENSIVE UNMANNED AIRCRAFT	308
<i>Or D. Dantsker; Mirco Theile; Marco Caccamo</i>	
WIRELESS POWER TRANSFER WITH HELICOPTER ROTOR BLADE ICE PROTECTION	329
<i>M. Brunetti; S. Chatterton; N. Toscani; M. Mauri; M. S. Carmeli; F. Castelli-Dezza</i>	
PUTTING UNIVERSITIES IN CHARGE YIELDS EARLY SUCCESS FOR NASA AERONAUTICS	340
<i>Koushik Datta; John A. Cavolowsky; Richard Barhydt</i>	
THERMAL MANAGEMENT SYSTEM DESIGN FOR ELECTRIFIED AIRCRAFT PROPULSION CONCEPTS	352
<i>Jeffryes W. Chapman; Hashmatullah Hasseeb; Sydney Schnulo</i>	
DESIGN AND ANALYSIS OF THE THERMAL MANAGEMENT SYSTEM OF A HYBRID TURBOELECTRIC REGIONAL JET FOR THE NASA ULI PROGRAM	375
<i>Mingxuan Shi; Mitchell Sanders; Alan Alahmad; Christopher Perullo; Gokcin Cinar; Dimitri N. Mavris</i>	
OUTER MOLD LINE COOLED ELECTRIC MOTORS FOR ELECTRIC AIRCRAFT	399
<i>Thomas F. Talerico; Andrew D. Smith; Jerald T. Thompson; Emma L. Pierson; Cullen A. Hilliker; David Avanesian; Wesley Miller; Kyle W. Monaghan</i>	
ANALYSIS OF SELF-COOLING METHOD OF A ROTOR USING BUOYANCY DRIVEN CONVECTION	426
<i>Rifat Kabir; Obed Y. W. Abotsi; John P. Kizito</i>	
COMPUTATIONAL EVALUATION OF AN OML-BASED HEAT EXCHANGER CONCEPT FOR HEATHER	437
<i>Emre Sozer; Daniel Maldonado; Keerti Bhamidipati; Sydney L. Schnulo</i>	
SOLID-STATE EXERGY OPTIMIZED ELECTRIC AIRCRAFT THERMAL AND FAULT MANAGEMENT	459
<i>Rodger W. Dyson; Luis Rodriguez; Mary Ellen Roth; Paul Raitano</i>	
FEASIBILITY ASSESSMENTS OF A HYBRID TURBOELECTRIC MEDIUM ALTITUDE LONG ENDURANCE UNMANNED AERIAL VEHICLE	475
<i>Gokcin Cinar; Alexander A. Markov; Jonathan C. Gladin; Elena Garcia; Dimitri N. Mavris; Soumya S. Patnaik</i>	
POWER DISTRIBUTION AND THERMAL MANAGEMENT MODELING FOR ELECTRIFIED AIRCRAFT	492
<i>Saakar Byahut; Alejandra Uranga</i>	
A BRÉGUET RANGE EQUATION FOR HYBRID-ELECTRIC JET AIRCRAFT SIZING AND ANALYSIS	507
<i>Gabrielle E. Wroblewski; Phillip J. Ansell</i>	
INITIAL STEPS IN MODELING OF CHEETA HYBRID PROPULSION AIRCRAFT VEHICLE POWER SYSTEMS USING MODELICA	531
<i>Meaghan Podlaski; Luigi Vanfretti; Abhijit Khare; Hamed Nademi; Phillip Ansell; Kiruba Haran; Thanatheepan Balachandran</i>	
ANATOMY OF A 20 MW ELECTRIFIED AIRCRAFT: METRICS AND TECHNOLOGY DRIVERS	547
<i>Parag Kshirsagar; Jeff Ewanchuk; Bart Van Hassel; Russell Taylor; Suman Dwari; Jonathan Rheaume; Charles Lents</i>	

MATHEMATICAL CORRELATIONS, METHOD FOR THE PRELIMINARY SIZING, DESIGN AND TESTS OF AN ULTRALIGHT ALL-ELECTRIC AIRCRAFT	556
<i>José A. Posada-Montoya; Fabián Vargas-álvarez</i>	
TRADESAPCE EXPLORATION OF ELECTRIFIED PROPULSION AND MORE-ELECTRIC AIRCRAFT GENERATORS.....	575
<i>Michelle Boyd; Kevin J. Yost; Soumya S. Patnaik</i>	
ASSEMBLY AND QUALIFICATION OF A SLOTLESS STATOR ASSEMBLY FOR A MW-CLASS PERMANENT MAGNET SYNCHRONOUS MACHINE	588
<i>Thanatheepan Balachandran; Samith Srimmana; Aaron Anderson; Xuan Yi; Nate Renner; Kiruba S. Haran</i>	
DEMAGNETIZATION SIMULATIONS OF HIGH-POWER ELECTRIC MOTORS FOR RELIABLE ELECTRIC AIRCRAFTS.....	598
<i>Saeed Jahangirian; Arash Hassanpour; Sreedevi Krishnan</i>	
DESIGN OF ELECTRIC MACHINE FOR ELECTRIC AIRCRAFT: A CASE STUDY OF ROTOR-STATOR CONFIGURATIONS AND MAGNET ARRANGEMENTS.....	610
<i>Hiroshi Mitsuda; Yoshihiro Miyama; Kazumasa Ito; Masaki Yamada; Hisatoshi Fukumoto</i>	
ASSESSMENT OF DETECTION METHOD USING MECHANICAL WAVES GENERATED BY SERIAL ARC FOR AIRBORNE APPLICATION.....	622
<i>Jean Rivenc; Antoine Loehrmann; Didier Chassaigne; Ludovic Ybanez; Gilles Peres; Jean-Marc Prosper</i>	
INSULATION DESIGN AND OPTIMIZATION OF LAMINATED BUSBAR FOR MORE ELECTRIC AIRCRAFT MOTOR DRIVE UNDER HIGH ALTITUDE AND DEPRESSURIZED ENVIRONMENTS	640
<i>Zhao Yuan; Yalin Wang; Asif Imran Emon; Zhongjing Wang; Balaji Narayanasamy; Amol Deshpande; Hongwu Peng; Fang Luo</i>	
CONCEPTUAL DESIGN OF A 10-PASSENGER THIN-HAUL ELECTRIC AIRCRAFT.....	649
<i>Boning Yang; Fangyuan Lou; Nicole L. Key</i>	
AN UPDATE ON SIZING AND PERFORMANCE ANALYSIS OF A HYBRID TURBOELECTRIC REGIONAL JET FOR THE NASA ULI PROGRAM.....	667
<i>Christopher Perullo; Mingxuan Shi; Gokcin Cinar; Alan Alahmad; Mitchell Sanders; Dimitri N. Mavris; Mike J. Benzakein</i>	
CONCEPTUAL DESIGN AND OPERATING COSTS EVALUATION OF A 19-SEAT ALL-ELECTRIC AIRCRAFT FOR REGIONAL AVIATION.....	684
<i>Matheus Medeiros Maciel Monjon; Cesar Monzu Freire</i>	
DESIGN SPACE EXPLORATION STUDY AND OPTIMIZATION OF A DISTRIBUTED TURBO-ELECTRIC PROPULSION SYSTEM FOR A REGIONAL PASSENGER AIRCRAFT	700
<i>Stefan Biser; Mykhaylo Filipenko; Martin Boll; Nir Kastner; Georgi Atanasov; Martin Hepperle; Dennis Keller; Dennis Vechtel; Mathias Noe</i>	
EFFECTS OF DISTRIBUTED ELECTRIC PROPULSION ON THE PERFORMANCE OF A GENERAL AVIATION AIRCRAFT	727
<i>Murilo A. Gallani; Luiz C. S. Góes; Luiz A. R. Nerosky</i>	
MODULAR THREE-LEVEL T-TYPE POWER ELECTRONICS BUILDING BLOCK FOR AIRCRAFT ELECTRIC-PROPULSION DRIVES	743
<i>A. Deshpande; Y. Chen; B. Narayanasamy; Z. Yuan; F. Luo</i>	
MODEL BASED OPTIMIZATION OF PROPULSION INVERTER FOR MORE-ELECTRIC AIRCRAFT APPLICATIONS USING DOUBLE FOURIER INTEGRAL ANALYSIS	751
<i>Mustafeez Hassan; Zhao Yuan; Hongwu Peng; Asif Imran Emon; Yingzhuo Chen; Fang Luo</i>	
HIGH-EFFICIENCY TURBOELECTRIC PROPULSION DRIVE BASED ON MEDIUM-VOLTAGE SIC INDIRECT MATRIX CONVERTER	758
<i>Benjamin Luckett; Jiangbiao He; Rodger W. Dyson</i>	
A CRYOGENICALLY-COOLED MW INVERTER FOR ELECTRIC AIRCRAFT PROPULSION	765
<i>Ruirui Chen; Jiahao Niu; Ren Ren; Handong Gui; Fred Wang; Leon Tolbert; Benjamin Choi; Gerald Brown</i>	
A NOVEL APPROACH FOR NOISE REJECTION AND PARTIAL DISCHARGE IDENTIFICATION IN ELECTRIC DRIVES FOR AEROSPACE.....	775
<i>P. Cheetham; M. Bosworth; G. C. Montanari; R. Ghosh; P. Seri</i>	
ELECTROMAGNETIC REDESIGN OF NASA'S HIGH EFFICIENCY MEGAWATT MOTOR	784
<i>Thomas T. Tallerico; Justin J. Scheidler; Dongsu Lee; Kiruba Haran</i>	
DESIGN, ANALYSIS, AND TESTING OF THE HEMM CRYOCOOLER LINEAR MOTOR.....	799
<i>Kirsten P. Duffy; Paul J. Passe; Rodger W. Dyson; Ralph H. Jansen; Yaritza De Jesus-Arce; Aaron D. Anderson</i>	
HIGH EFFICIENCY MEGAWATT MOTOR THERMAL STATOR PRELIMINARY DESIGN.....	810
<i>Gerald Szpak; Andrew Smith; Jerald Thompson; Andrew Woodworth; Ralph Jansen</i>	
SELECT VARIABLES AFFECTING THERMAL SYSTEM DESIGN OF A LIQUID-COOLED STATOR.....	837
<i>Andrew A. Woodworth; Andrew Smith; Ralph Jansen; Gerald Szpak</i>	
Author Index	