

XPONENTIAL 2017

All Things Unmanned

Dallas, Texas, USA
8 - 11 May 2017

Volume 1 of 3

ISBN: 978-1-5108-4657-9

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.

Copyright© (2017) by Association for Unmanned Vehicle Systems International

All rights reserved.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact Association for Unmanned Vehicle Systems International at the address below.

Association for Unmanned Vehicle Systems International
2700 South Quincy Street
Suite 400
Arlington, VA 22206
USA

Phone: (703) 845-9671

Fax: (703) 845-9679

www.auvsi.org

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
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

CAUAS

AMAZON PRIME AIR: SAFE AND FAST AND ECONOMIC AND SCALABLE AND ENVIRONMENTALLY SOUND	1
<i>S. Cassidy</i>	
THE THIRD AUVSI/AIAA WORKSHOP ON CIVIL APPLICATIONS OF UNMANNED AERIAL SYSTEMS (CAUAS).....	13
<i>M. Francis</i>	
CIVILIAN APPLICATIONS OF UAS 2017	23
<i>D. Brooks</i>	

REMOTES PILOT COUNCIL

AUVSI REMOTE PILOTS COUNCIL	26
<i>J. Morra</i>	

TEXAS UAS SUMMIT

THE OFFICE OF INFRASTRUCTURE PROTECTION	41
<i>M. Barger</i>	
RELLIS – RESEARCH & PARTNERSHIP OPPORTUNITIES	43
<i>J. Barton</i>	
AETOS OVERVIEW	55
<i>A. Cook</i>	
UNMANNED AERIAL SYSTEMS PROJECT FOR PRECISION AGRICULTURE AND HIGH THROUGHPUT FIELD PHENOTYPING	57
<i>D. Cope, B. Avant, J. Jung, S. Shaflan</i>	
CORPUS CHRISTI FIRE DEPARTMENT - AERO TEAM	62
<i>J. DeVisser</i>	
CBBIC PATH TO SUCCESS	68
<i>R. Franques</i>	
FAA - INTEGRATION OF UNMANNED AIRCRAFT SYSTEMS (UAS)	70
<i>M. Gibson</i>	
BNSF RAILWAY UAS PROGRAM	76
<i>T. Graetz</i>	
BRINGING UAS TO AMERICA'S SKIES!	91
<i>J. Hendrix</i>	
PERSPECTIVES ON COUNTER UAS AND DETECTIONS	98
<i>J. Hendrix</i>	
THE SELECTABLE HYPERSPECTRAL AIRBORNE REMOTE SENSING KIT (SHARK) USED IN UAS FOR PRECISION AGRICULTURE	110
<i>R. Holasek</i>	
UAS DATA PROCESSING	135
<i>J. Jung</i>	
LANDBROS OVERVIEW	145
<i>N/A</i>	
MAKING GNSS ROBUST AGAINST INTERFERENCE IN UNMANNED AERIAL SYSTEMS	146
<i>G. Lopez</i>	
LSUASC AND TEEX ECONOMIC DEVELOPMENT PARTNERS	166
<i>E. Martinez</i>	
UAS CENTRE OF EXCELLENCE SUPPORTING THE QUEBEC UAS COMMUNITY	170
<i>M. Moffatt</i>	
SERVING TEXAS.....WITH GLOBAL REACH	179
<i>J. Mogford</i>	
UAS IN PUBLIC SAFETY	181
<i>B. Moore</i>	
EVAA - WHAT IS IT & LESSONS LEARNED	184
<i>A. Hitchcock, H. Morgan</i>	
TEXAS A&M ENGINEERING EXTENSION SERVICE (TEEX) ECONOMIC & WORKFORCE DEVELOPMENT DIVISION	190
<i>L. Mutchler</i>	
A GREEN LIGHT TO GREATNESS	192
<i>K. Namuduri</i>	

TEXAS AUTOMATED VEHICLE PROVING GROUNDS PARTNERSHIP	194
<i>C. Poe, C. Bhat, M. Brown</i>	
ECONOMIC DEVELOPMENT	205
<i>N. Ruiz</i>	
URBAN SEARCH & RESCUE ROBOTIC CORE CAPABILITIES	209
<i>J. Saunders</i>	
UAS INTEGRATION RESEARCH PLANNING	213
<i>S. Saunders-Hodge</i>	
FIELD RESEARCH APPLICATIONS OF UAS	218
<i>S. Shafiq, N. Rajan, D. Cope, M. Bagavathiannan, L. Malambo, S. Popescu, B. Rooney</i>	
UAS CAPABILITIES ENABLING TRANSPORTATION SAFETY AND OPERATIONAL IMPROVEMENTS	226
<i>C. Stevens</i>	
2017 ANNUAL POSTER COMPETITION	N/A
<i>M. Willis</i>	

UNMANNED AERIAL SYSTEM WEATHER FORUM

COLLECTION AND USE OF UAS-SENSED INFORMATION	240
<i>B. Argrow</i>	
WEATHER NEEDS FOR UAS	246
<i>J. Burns</i>	
OPERATIONS IN HARSH ENVIRONMENTS	254
<i>C. Cahill</i>	
14 CFR PART 107: THE SMALL UAS RULE	262
<i>A. Frazier</i>	
SAFELY ENABLING UAS OPERATIONS IN LOW-ALTITUDE AIRSPACE	272
<i>T. Prevot, M. Johnson, J. Rios, P. Kopardekar</i>	
UAS SUPPORT FOR BATTLEFIELDS: CURRENT AND FUTURE WEATHER CAPABILITIES AND NEEDS	277
<i>D. Knapp</i>	
UAS-BASED INSPECTION OF INFRASTRUCTURE	287
<i>C. Theisen</i>	
NATIONAL & INTERNATIONAL REGULATIONS FOR AIRSPACE INTEGRATION – WEATHER REQUIREMENTS	292
<i>A. Thurling</i>	

DEFENSE, GOVERNMENT, & INDUSTRY ENGAGEMENT SERIES

COMBATTING THE DIVERSION OF SMALL UNMANNED AERIAL SYSTEMS INTO EXTREMIST CONTROL	299
<i>B. Preston, H. Moore</i>	
EXPORT COMPLIANCE: UNMANNED AERIAL VEHICLES	307
<i>N/A</i>	
MARINE CORPS INSTALLATIONS COMMAND (MCICOM) - INSTALLATIONS MANAGEMENT AND PROTECTION	318
<i>C. Bolden</i>	
MANEUVER BATTLE LAB	323
<i>E. Davis</i>	
MANEUVER CENTER OF EXCELLENCE UNMANNED SYSTEM CAPABILITIES	330
<i>N/A</i>	
MANEUVER WARFARE IN AMPHIBIOUS OPERATIONS IN THE 21ST CENTURY	337
<i>J. Jenkins</i>	
INSIGHT INTO THE NAVY'S UAS PROGRAMS	344
<i>R. Kimble</i>	
SEARCH FOR SYNERGIES BETWEEN MILITARY AND COMMERCIAL UAS TECHNOLOGY AND DEVELOPMENT	349
<i>R. Melville</i>	
BRIEF TO AUVSI Xponential THE ADF UAS ROADMAP: LOOKING FORWARD	359
<i>K. Joyce</i>	
ASSESSING UAS OBSERVING STRATEGIES FOR NOAA EARTH OBSERVATIONS	367
<i>R. Hood</i>	
UAVS IN SIMULATED U.S. ARMY TRAINING EXERCISES	377
<i>P. Madden, N. Bier</i>	
UNMANNED LOGISTICS SYSTEMS: AUTONOMOUS AERIAL TRANSPORTATION SUPPORTING DISPERSED TACTICAL MANEUVER	384
<i>J. Gottschall</i>	
U.S. DEPARTMENT OF THE INTERIOR UAS PROGRAM OVERVIEW	387
<i>B. Koeckeritz</i>	
USGS APPLICATIONS OF UNMANNED AIRCRAFT SYSTEMS (UAS)	398
<i>B. Quirk</i>	

USMC UAS REQUIREMENTS & CHALLENGES, TODAY & TOMORROW	406
<i>N. Spataro</i>	

PANEL SESSION

U. S. AIRSPACE CLASSES AT A GLANCE	423
<i>N/A</i>	
AIRSPACE INTEGRATION: FROM SMALL UAS TO URBAN MOBILITY	425
<i>P. Kopardekar</i>	
ESTABLISHING THE EUROPEAN ROADMAP FOR THE SAFE INTEGRATION OF DRONES IN ALL CLASSES OF AIRSPACE	461
<i>N/A</i>	
VEHICLE RELATED CONSIDERATIONS - DESIGN, SAFETY, AND VEHICLE OPERATIONS - LESSONS LEARNED AND NEXT STEPS	468
<i>L. Glaab</i>	
DAA RESEARCH FOCUS AREA	473
<i>M. Askelson, H. Cathey</i>	
PM7: MINORITY OUTREACH – UAS AS A STEM MINORITY OUTREACH LEARNING PLATFORM FOR K-12 STUDENTS	477
<i>H. Cathey, J. Kahn</i>	
UAS AIRBORNE COLLISION SEVERITY EVALUATION	479
<i>T. Aldag</i>	
FAA UAS COE TASK A4 AND A11 GROUND COLLISION SEVERITY BRIEF TO STAKEHOLDERS 28 APRIL 2017	482
<i>D. Arterburn</i>	
A6: SURVEILLANCE CRITICALITY - EXECUTIVE SUMMARY	485
<i>K. Snyder</i>	
A7: UAS HUMAN FACTORS CONSIDERATIONS	487
<i>N/A</i>	
A10 - HUMAN FACTORS CONSIDERATIONS OF UAS PROCEDURES & CONTROL STATIONS	490
<i>R. Stansbury</i>	
INFORMING UAS POLICY THROUGH RESEARCH	492
<i>M. Rogers</i>	
DRIVING AUTONOMY THROUGH PRECISE NAVIGATION	496
<i>A. Bandiwdekar</i>	
AIRBUS ZEPHYR	505
<i>N/A</i>	
DRONES IN THE WIRELESS INDUSTRY: USE CASES AND PERSPECTIVES ON AN EMERGING MARKET	508
<i>A. Glaser, A. Pregler, R. Dalgleish, R. McCoy, S. Bakadir, S. Whitby</i>	
EMBEDDED MPU5 MODULE	511
<i>L. Sutherland</i>	
HIGH RESOLUTION 3D FLASH LIDAR CAMERAS	516
<i>T. Laux</i>	
IMPROVING REAL-TIME POSITIONING FOR NAVIGATION, GUIDANCE, AND GEOREFERENCING IN LIMITED GNSS AVAILABILITY	524
<i>I. Clarke</i>	
LARGE SCALE UNMANNED SYSTEMS AND COMMERCIAL MARKET	534
<i>N/A</i>	
EMERGING COMMERCIAL UAS OPERATING ENVIRONMENTS (OE)	541
<i>N/A</i>	
DON'T COUNT OUT LARGE UAS IN THE COMMERCIAL UAS GAME	543
<i>A. Thurling</i>	
NEW ADVANCES IN IN-FIELD ANALYTICS FOR AGRICULTURE	546
<i>M. Ritter</i>	
OTA: TRANSFORMING ACQUISITION	553
<i>N/A</i>	
ACCEPTING INNOVATION - HOW SHOULD UAS OEMS DEAL WITH THE RAPIDLY EVOLVING STARTUP INDUSTRY?	564
<i>N. Tel-Oren</i>	
BULDING A CONSTELLATION OF DRONES ACROSS NORTH AMERICA	574
<i>N. Lamothe</i>	
DETECTION OF FUNGAL DISEASE	588
<i>N/A</i>	
SAE INDUSTRY EXPERT PANEL DISCUSSION: BREAK THROUGH THE BARRIERS TO WORK WITH OEMS AND GOVERNMENT – A HOW-TO	607
<i>C. Nehls</i>	

VOLUME 2

SAE INDUSTRY EXPERT PANEL DISCUSSION: BREAK THROUGH THE BARRIERS TO WORK WITH OEMS AND GOVERNMENT – A HOW-TO - AN APPLIED R&D PERSPECTIVE	611
<i>R. Lamm</i>	
SIKORSKY AUTONOMY VISION	614
<i>C. Buiten</i>	
SOFTWARE DEVELOPMENTS DRIVING THE NEXT GENERATION OF DRONE AND ROBOT TECHNOLOGY	618
<i>B. Kinnaman, I. Smith, M. Wagner, N. Paez, N. Gupta</i>	
FAA INT'L PARTNERSHIPS & HARMONIZATION EFFORTS	622
<i>N/A</i>	
TRANSPORT CANADA	624
<i>N/A</i>	
RPAS PANEL OBJECTIVE & SCOPE	625
<i>N/A</i>	
SCHLUMBERGER - TECHNOLOGY RELIABILITY EFFICIENCY INTEGRATION	627
<i>N/A</i>	
AUTONOMOUS DRILLING SYSTEMS	633
<i>J. Macpherson</i>	
SUBSEA ROBOTICS – TOTAL VISION USV APPLICATION	638
<i>M. Rivero</i>	
TRUMBULL UNMANNED - DATA VIA DRONES	642
<i>Dyan</i>	
DRILLING - UNDERSTANDING THE CHALLENGES AND OPPORTUNITIES	649
<i>M. Anderson</i>	
UNMANNED MARITIME SYSTEMS: ADVANCES IN REGULATION AND RELATED TECHNOLOGY	669
<i>R. LeBouvier</i>	
UNMANNED MARITIME SYSTEMS: ADVANCES IN REGULATION AND RELATED TECHNOLOGY - UK PERSPECTIVE	672
<i>J. Fanshawe</i>	
UNMANNED MARITIME SYSTEMS AND THE LAW: REGULATION, LIABILITY, INSURANCE	683
<i>A. Weigel</i>	
AUTONOMY FOR UNMANNED SURFACE VEHICLES	699
<i>R. Brizzolara</i>	

POSTER SESSION

A COUNTER-UAV SYSTEM BASED ON RF DETECTION AND VIDEO ANALYTICS	707
<i>I. Gomez, J. Rodriguez, P. Gonzalez, J. Malek, D. Gonzalez</i>	
COLLABORATION BETWEEN UNMANNED AERIAL AND UNDERWATER VEHICLES	723
<i>H. Singh, T. Sherman, M. Wallace, C. Cao, J. Herrera, S. Bhandari, S. Boskovich, Z. Aliyazicioglu, D. Tang, J. Caffrey</i>	
DEMONSTRATING THE UNMANNED CAPABILITIES OF THE FIRST AERIAL AND SUBMERSIBLE DRONE WITH SEAMLESS WATER AIR TRANSITION	733
<i>M. Maia, F. Diez</i>	
DEVELOPMENT OF COMPUTER AIDED DESIGN TOOLS FOR THE DESIGN OF NOVEL BUOYANCY DRIVEN AUTONOMOUS UNDERWATER VEHICLES FOR EDUCATION AND RESEARCH	741
<i>C. Hockley, S. Cronin, B. Butka</i>	
DEVELOPMENT, TESTING AND USE OF AN INSTRUMENTED UNMANNED AERIAL SYSTEM TO INVESTIGATE CHANGES TO THE NEAR-SURFACE METEOROLOGY WITHIN A WIND FARM	750
<i>K. Adkins, J. Olds, C. Ellis</i>	
DURABLE OPTICAL COATINGS FOR ROBUST PERFORMANCE IN HARSH ENVIRONMENTS	790
<i>M. Fredell, N. Castine, W. Cote, I. Barrett, S. Chanda, T. Rahmlow, R. Johnson</i>	
HYBRID UNMANNED AERIAL VEHICLE (HUAUV)	796
<i>M. Alam, Y. Jahagirdar, C. Satheesh, M. Dinesh</i>	
A THEORETICAL CONSTRUCT FOR PROGRESSIVE CONSTRUCTION SITE SAFETY IMPLEMENTING SITUATIONAL AWARENESS IN UNMANNED AIRCRAFT SYSTEMS TO IMPROVE DECISION-MAKING AND SAFETY	807
<i>W. Baker, G. Bullock</i>	
DISTRIBUTED ONLINE COLLABORATIVE RESEARCH IN THE UNMANNED SYSTEMS FIELD	821
<i>B. Terwilliger, D. Ison, J. Westberry, S. Martorella, J. Bonner</i>	
POWERLINE INSPECTION WITH UPWARD LOOKING SENSOR USING UAS	832
<i>D. Olsen, D. Dvorak, K. Lemler, M. Dunlevy, C. Vinger, I. Nordeng, J. Neubert</i>	
RECENT ADVANCES IN LOW SWAP FOR POSITION, NAVIGATION AND TIMING AND FREQUENCY SOURCES FOR MILITARY COMMUNICATION SYSTEMS	844
<i>L. Perdue</i>	
RESEARCH AND DEVELOPMENT OF A NEW SAFETY BEACON FOR UNMANNED AIRCRAFT FLIGHT IN VICINITY OF LOW FLYING PILOTED AIRCRAFT	863
<i>W. Woldt, J. Smith</i>	

SUAS COMMERCIAL OPERATIONS IN THE UTILITY INDUSTRY	870
<i>A. Gates, K. Swift, C. Bielmeier</i>	
SOLID-STATE PROPULSION FOR ROTARY- AND FIXED-WING AIRCRAFT	878
<i>O. Bilgen</i>	
THE IMPLICATIONS OF UNMANNED VEHICLES AT ALL LEVELS OF WAR	886
<i>S. McCafferty</i>	

SHOW FLOOR THEATERS

AN INTRODUCTION TO VIGILANT AEROSPACE SYSTEMS - INTELLIGENT FLIGHT MANAGEMENT SYSTEMS	897
<i>C. Snow</i>	
BELL HELICOPTER: AUTONOMOUS FLIGHT FOR TOMORROW	917
<i>J. Drennan</i>	
SAFETY CERTIFICATION FOR UNMANNED SYSTEMS	926
<i>J. Breitenbach</i>	
AMIMON HIGH-DEFINITION WIRELESS	933
<i>U. Baron</i>	
GETTING IT RIGHT THE FIRST TIME - BUILDING SUPPORT FOR A PUBLIC SAFETY SUAS PROGRAM	940
<i>N/A</i>	
CAN YOUR CONNECTIVITY PROTOCOL DEFEAT CYBER ATTACKS?	949
<i>N/A</i>	
CAPITALIZING ON UNMANNED ARIEL SYSTEMS AND THE WAY FORWARD	958
<i>N/A</i>	
COMMERCIAL UAS: ACCESS, ECOSYSTEM AND MARKET OPPORTUNITY - FOR AUUSI'S Xponential	963
<i>R. Stearns</i>	
COMPETING WITH COWBOY OPERATORS - HOW TO TELL A SAFETY STORY	971
<i>J. Ziering</i>	
DON'T GET GROUNDED - PROTECT YOUR INTELLECTUAL PROPERTY POSITION	983
<i>J. Wechkin, M. Henson, D. John-Larkin</i>	
ELECTRICAL SAFETY OF BATTERY POWERED COMMERCIAL UAVS AND UL 3030	995
<i>J. Bablo, B. Davis</i>	
FINDING CUSTOMERS FOR YOUR COMMERCIAL DRONE BUSINESS - MARKETING, SELLING, AND MAXIMIZING REPEAT BUSINESS	1006
<i>M. McNabb</i>	
GET READY TO SCALE: HOW TO SET YOUR DRONE BUSINESS UP FOR SUCCESS FROM DAY ONE	1018
<i>J. Evans</i>	
MISSOURI DRONE JOURNALISM	1026
<i>R. Shaw</i>	
GETTING STARTED WITH THE AUUSI UNMANNED SYSTEMS & ROBOTICS DATABASE - YOUR RESOURCE FOR UNMANNED VEHICLES WORLDWIDE	1052
<i>D. Klein</i>	
GPS/GNSS HIGH ACCURACY SYSTEMS FOR LIDAR AND GPS TESTING	1061
<i>F. Boynton</i>	
HOW DRONE OPERATIONS WILL BENEFIT FROM AVIATION RISK MANAGEMENT	1080
<i>J. King, M. King</i>	
DRONES: OVERCOMING CHALLENGES FACING NEW OPERATIONS	1094
<i>H. Wolf</i>	
KEY SENSOR TECHNOLOGIES FOR THE ROBOTIC REVOLUTION	1103
<i>N/A</i>	
UNMANNED SYSTEMS STATE OF THE CAPITAL MARKETS	1121
<i>J. Rubin</i>	
MATCHING UAV TECHNOLOGIES WITH SCIENTIFIC AND ENGINEERING RESEARCH	1138
<i>S. Stuver, R. Bowers, A. Smith</i>	
MAXIMIZING PERFORMANCE IN A LAND VEHICLE	1149
<i>S. Dixon</i>	
MULTISPECTRAL IMAGING: MORE THAN JUST A PICTURE	1164
<i>D. Longval</i>	
SELECTING CRITICAL UAV SUBSYSTEMS: COMMUNICATIONS, STABILIZATION, AND COLLISION AVOIDANCE	1181
<i>S. D'Arcy</i>	
SHIPWRECKS, SHARKS, AND TSUNAMIS UNMANNED MARITIME VEHICLES IN OCEAN SCIENCE	1190
<i>J. Manley</i>	
EFFICIENT PROCESSING OF UAV PROJECTS	1207
<i>F. Riendeau</i>	
SURFACE TO SEAFLOOR : TELEDYNE MARINE UNMANNED SYSTEMS IN ACTION	1212
<i>A. Steingrimsson</i>	

VOLUME 3

THE COMMERCIAL DRONE ECOSYSTEM: MARKET OVERVIEW AND OPPORTUNITIES	1233
<i>M. Blades</i>	
SAAB SEAEYE - THE FUTURE OF DEEP OCEAN E-ROBOTICS	1241
<i>C. Roper</i>	
THE FUTURE OF INDUSTRIAL INSPECTION: AUTOMATED INDUSTRIAL INSPECTION USING DRONES	1256
<i>C. Hickey</i>	
WORLD VIEW - MAKING SPACE ACCESSIBLE TO EVERYONE WITH ADVANCED BALLOON TECHNOLOGIES	1269
<i>J. Poynter, M. Kelly, T. Pirrone, T. MacCallum, A. Stern, J. Langlois</i>	
TRUMBULL UNMANNED	1274
<i>J. Gibbens, C. Cotey</i>	
ON-DEMAND AVIATION	1279
<i>M. Moore</i>	
UAS TRAFFIC MANAGEMENT (UTM)	1285
<i>N/A</i>	
SELF-PILOTED ELECTRIC AIRCRAFT	1290
<i>N/A</i>	

TECHNICAL SESSION

ADVANCING AUTONOMY WHILE BUILDING TRUST IN UNMANNED AND AUTONOMOUS SYSTEMS	1294
<i>J. Pels, S. Myers, J. Lukos, D. Lange</i>	
ADVANCED PLATFORM FOR UUV TECHNOLOGY DEVELOPMENT, INTEGRATION AND TESTING	1306
<i>R. Rumpf</i>	
AN OPEN ARCHITECTURE FOR COMMERCIAL AUTONOMY	1310
<i>A. Malone</i>	
APPLYING FLASH LIDAR FOR REAL TIME COLOR 3D MODELS	1319
<i>J. Mooney, B. Peace</i>	
AUTONOMOUS MARITIME VEHICLE-TO-VEHICLE DOCKING FOR POWER, DATA, AND PAYLOAD TRANSFER	1328
<i>A. Jones, W. Liu, J. Pels, M. Tall</i>	
BABCOCK RANCH AUTONOMOUS SHARED MOBILITY ELECTRIC VEHICLE PROGRAM UPDATE	1341
<i>J. Lambert</i>	
BRAIN-IN-A-BOX: A UNIFIED PERCEPTION AND NAVIGATION FRAMEWORK FOR DRONES	1344
<i>J. Wurbs</i>	
BRIDGING THE GAP BETWEEN "MAN AND MACHINE" THROUGH THE HAPTIC/HUMAN MACHINE INTERFACE (HHMI) AND A NOVEL ACCELERATED LEARNING SYSTEM	1356
<i>J. Curcio, J. Daniels</i>	
COORDINATED LOGISTICS WITH A TRUCK AND A DRONE - USC ISE	1369
<i>J. Carlsson, Y.-Y. Chiang</i>	
TECHNOLOGIES TO DETECT AND MITIGATE THE THREAT FROM CONSUMER DRONES	1374
<i>N/A</i>	
DEVELOPMENT OF THE EMBRY-RIDDLE AERONAUTICAL UNIVERSITY WAVE ADAPTIVE MODULAR VESSEL AS AN INTEGRAL PART OF A HETEROGENEOUS INTELLIGENT TEAMING SYSTEM	1384
<i>T. Zuercher, E. Coyle, P. Carrier</i>	
DEFEAT AND CONTROL: THE FUTURE OF COUNTER UAS TECHNOLOGIES	1392
<i>T. Sheehy</i>	
DESIGNING FOR THE FUTURE: CONSIDERATIONS FOR HUMAN-CENTERED GROUND CONTROL STATIONS	1397
<i>S. Michelson</i>	
DEVELOPMENT AND TESTING OF A HYBRID ELECTRIC MULTI-ROTOR UAS WITH EXTENDED ENDURANCE	1410
<i>B. Fredericks, W. Lewis, B. Stewart, D. Paden, M. Ricci, V. Varahamurthy</i>	
DOWN FROM THE CLOUDS: USING GPUS AND DRONES TO CREATE REAL-TIME 3D MODELS ON THE FLY	1426
<i>M. Jones</i>	
DOWNING DRONES: IT TAKES A VILLAGE	1444
<i>J. Poss</i>	
DRONES ON THE GO TEAM: UAS TO SUPPORT ACCIDENT INVESTIGATION	1449
<i>B. English</i>	
EMERGING TECHNOLOGY FOR SUAS MARITIME WIDE AREA SURVEILLANCE	1464
<i>C. Schnappinger, M. Sprague</i>	
ENABLING BEYOND LINE OF SIGHT WITH THE FAA PATHFINDER PROGRAM: EXTENDED VISUAL LINE OF SIGHT	1479
<i>A. Ferguson</i>	

RADAR VISION PLATFORM FOR THE AUTONOMOUS ERA	1492
<i>N/A</i>	
FROM BIG WAVES TO COLD WATER – UNIQUE MISSION REQUIREMENTS AND RESULTS FROM UNMANNED SURFACE VEHICLES	1504
<i>K. Keller, R. Jha</i>	
GNSS THREATS TO UAVS - THE POKEMON GO FACTOR	1513
<i>G. Buesnel, A. Price</i>	
HUMAN MACHINE TEAMING IN FUTURE MARINE CORPS OPERATIONS	1522
<i>E. Powers</i>	
INCREASING PERFORMANCE AND REDUCING COSTS FOR LASER SOURCES FOR LIDAR	1544
<i>R. Roos</i>	
INTRODUCING EELUME: A RESIDENT SUBSEA IMR VEHICLE	1557
<i>R. Mills</i>	
LINKING UNMANNED SYSTEMS, VISIBLE AND IR VIDEO, COMPUTER VISION, AND HUMANS TOGETHER FOR REAL-TIME, SQUAD-LEVEL, BATTLEFIELD SITUATIONAL AWARENESS: THREAT RECONNAISSANCE AND EXPLOITATION FROM AUDIO-VIDEO TARGET EXTRACTION (THREAT X)	1566
<i>K. Fieldhouse, A. Hoogs, E. Swears</i>	
LOCALIZATION FOR THE NEXT GENERATION OF AUTONOMOUS VEHICLES	1581
<i>C. Osterwood, F. Noble</i>	
LOSS OF CONTROL PREVENTION FOR FIXED-WING AND ROTARY-WING UAVS USING A SUPERVISORY AUTOPILOT	1595
<i>M. Abdulrahim, N. Weibley, J. Grzywna</i>	
MUM-T: CROSS DOMAIN INTEGRATION & ADVANCED CONCEPTS IN UAS	1616
<i>W. Prender</i>	
NAVAL UNMANNED SYSTEMS ENGINEERING - AN EVOLUTION	1621
<i>J. Pfeffer, S. Young</i>	
NEW FUEL CELL TECHNOLOGIES EXTEND MISSIONS FOR VERTICAL TAKE-OFF AND LANDING UNMANNED AERIAL VEHICLES	1632
<i>J. Sisco, P. Robinson, P. Osenar</i>	
NEXT-GENERATION AUTOMOBILES WILL LOOK LIKE MANNED AND UNMANNED AIRCRAFT	1649
<i>C. Downing</i>	
A CASE STUDY OF IMAGING A DUAL ARCH CONCRETE BRIDGE UTILIZING UAS FOR THE PURPOSE OF PREPARING A REHABILITATION PLAN FOR THE BRIDGE	1656
<i>E. Greutert</i>	
PRECISION NAVIGATION OF MOBILE AUTOMATED SYSTEMS WITHOUT GPS - BENEFITS OF A DOWNFACING CAMERA FOR LOCALIZATION	1673
<i>R. Lamm</i>	
PULSED ULTRA WIDEBAND RADAR FOR COLLISION AVOIDANCE IN UNMANNED VEHICLES	1680
<i>B. Dewberry, H. Mahler</i>	
GROUND BASED SENSE AND AVOID SYSTEM OVERVIEW	1692
<i>R. Stamm</i>	
ROBOTS AND DATA ANALYSIS: THE COMING REVOLUTION IN MOBILE SENSOR PLATFORMS: “DATA BECOMES THE NEW CURRENCY”	1698
<i>N/A</i>	
SELF-ORGANIZING AERIAL NETWORKS	1705
<i>K. Namuduri</i>	
SWARM 2: USVS IN HARBOR DEFENSE	1711
<i>C. Conti, L. Elkins, T. Bail</i>	
BENEFITS OF OPEN ARCHITECTURE - ADVANCED EXPLOSIVE ORDNANCE DISPOSAL ROBOTIC SYSTEM (AEODRS)	1731
<i>N/A</i>	
THE FORCE MULTIPLIER EFFECT: USING AUTONOMOUS SURFACE VEHICLES FOR HYDROGRAPHIC SURVEY	1738
<i>B. Anderson</i>	
THE VILLAIN’S GUIDE TO DRONES: HOW THE UNMANNED AIRCRAFT SYSTEM COMMUNITY CAN STAY AHEAD OF BAD ACTORS THROUGH RED TEAMING	1745
<i>L. Friese</i>	
REAL-TIME SCENE UNDERSTANDING OF UNMANNED AERIAL VEHICLE IMAGERY WITH AND BEYOND VISUAL SENSORS BY DEEP LEARNING	1755
<i>M. Rahnemoonfar, C. Sheppard, D. Bridges</i>	
UAS EXCOM SCIENCE AND RESEARCH PANEL (SARP) 2017 AUVSI Xponential UPDATE	1768
<i>D. Brooks, T. Lester</i>	
UAV PROPELLER DESIGN AND HOW NECESSARY IT IS FOR YOUR UAV PERFORMANCE	1781
<i>W. Anemaat</i>	
UAV-BASED MULTI-SENSOR SYSTEM WITH REAL-TIME DATA PROCESSING AND DOWNLINK FOR SURVEY OF NUCLEAR DISASTER LOCATIONS FOR FIRST-RESPONDER SUPPORT	1789
<i>T. Hinterhofer, M. Pfennigbauer, S. Schram, M. Hofstatter</i>	

THE USE OF A SATELLITE COMMUNICATIONS SYSTEMS FOR COMMAND AND CONTROL OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION SURROGATE UNMANNED AERIAL SYSTEM RESEARCH AIRCRAFT	1802
<i>C. Howell, F. Jones, B. Hutchinson, C. Joyce, S. Nelson, M. Melum</i>	
PROSUMER DRONES FOR MAPPING	1813
<i>N/A</i>	
UTILIZING UAS TO LOCATE NESTING SEABIRDS WITHIN THE CANOPY OF MATURE FORESTS	1827
<i>M. Pickett, B. Taggart, J. Rivers, L. Adrean, S. Nelson</i>	
Author Index	