

Association for Unmanned
Vehicle Systems International

Unmanned Systems North America Conference 2006

August 29-31, 2006
Orlando, Florida, USA

Volume 1 of 2

Printed from e-media with permission by:

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

ISBN: 978-1-60560-458-9

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

Copyright (2006) by the Association for Unmanned Vehicle Systems International

All rights reserved.

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

Association for Unmanned Vehicle Systems International
2700 S. Quincy Street
Suite 400
Arlington, Virginia 22206
USA

Phone: 703 845 9671
Fax: 703 845 9679

info@auvsi.org

Association for Unmanned
Vehicle Systems International

Unmanned Systems
North America Conference
2006

TABLE OF CONTENTS

Volume 1

Helikites for Lifting Persistent Radio-Relay for Unmanned Systems	1
<i>Sandy Allsopp</i>	
Kinematic Design of an All-Wheel Drive Articulated Unmanned Ground Vehicle	32
<i>Sean Baity</i>	
Hurricane Navigation with a Small UAV: Practical Experience and Future Strategies	55
<i>Jon Becker, Joseph Cione, Po-Hsiung Lin, Greg Holland</i>	
Small Unmanned Aerial System Advanced Concept Technology Demonstration	62
<i>Dan Bernard</i>	
Queuing Theory Applied to UGV Operator Workload	73
<i>Barry A. Bodt</i>	
Army Unmanned Systems AUVSI August 2006	84
<i>John D. Burke</i>	
Demonstrated Benefits of a Modular Framework for Mission Management and Control of Unmanned Vehicles	111
<i>Geoffrey Butler, Nigel Cox, Rex Helton, Robert McSwiggen, Robert Settle, Judi Taylor</i>	
Sensors for Unmanned Systems	135
<i>Jeffrey N. Callen, Matthew E. DiGioia, Michelle L. Sickenberger</i>	
Safety Implications of Unmanned Systems	152
<i>John Canning, Clif Ericson</i>	
Passive Acoustic Non-Cooperative Collision Alert System (PANCAS) for UAV Sense and Avoid	165
<i>Duane Cline, Steve Wilcox, Charles C. Ingalls</i>	
Remote Delivery of Unattended Ground Sensors (UGS) by UAV	182
<i>Geogory M. d'Arbonne, Richard Sterchele, Benjamin Smith</i>	
Joint Unmanned Aircraft System Center of Excellence	195
<i>N/A</i>	
Naval UAS Family of Systems	208
<i>Bob Dishman</i>	
Multi-Model Command and Control in Embedded Unmanned System Training	224
<i>Peter Drewes, Tim Roberts, Nicole Coeyman, Troy Dere, Pat Garrity, Ben Tirabassi</i>	
SAR Sensors for Small Tactical UAVs: Update on MiSAR	236
<i>M. Edrich</i>	
Object Recognition for an Autonomous Maritime Navigation System	264
<i>Les Elkins, Ali Farsaie, Joe Fuller, Eric Hansen</i>	

Countering the Emerging Mini Unmanned Aerial System (UAS) Threat to the American Homeland	277
<i>Wilson F. Engel</i>	
The Commercialisation of UAVs	286
<i>Bruno Esposito</i>	
Randomized Planning for Multi-Agent Teams	298
<i>Dave Ferguson, Anthony Stentz</i>	
Mixed Initiative Team Performance Assessment System (MITPAS)	306
<i>A. Freedy, G. Weltman, E. Freedy, E. DeVisser, N. Coeyman, M. Kalphat, D. Palmer</i>	
High Level Mission Programming Support for Autonomous Underwater Vehicles	321
<i>Gary Giger, Liping Xue, Sekhar Tangirala, Mahmut Kandemir</i>	
Discover Vision: A Framework for Building, Evaluating, and Testing Performance Based Machine Vision Applications	335
<i>Brian C. Becker, Daniel Barber, Fernando Gonzalez</i>	
UK UAV Activities	348
<i>Ray "Flash" Gordon</i>	
ARV Robotic Technologies (ART)--A Risk Reduction Effort for Future Unmanned Systems	366
<i>Stephen A. Hammond, Jeffrey F. Jaster</i>	
Measuring Unmanned Vehicle System Performance: Challenges and Opportunities	381
<i>J.L. Harbour, D.J. Bruemmer, D.A. Few</i>	
Autonomous UAV Swarms for Detection and Classification of Chemical and Biological Agents	391
<i>Chad Hawthorne, Eric Van Giesen, Dave Scheidt, Bob Chalmers, Chris Chiu</i>	
Integration of a PEM Fuel Cell into a Slow Speed UAV	414
<i>Christopher Herwerth, Charles Chiang, Alan Ko, Maj Mirmirani</i>	
Rotorcraft Unmanned Air Vehicle Navigation in Uncertain Urban Environments	429
<i>Jason K. Howlett, Matt Whalley, Peter Tsenkov, Greg Schuelein</i>	
Multi-Fuel Internal Combustion Engine Design to Improve UAV Reliability and Performance	451
<i>Russ Hunter, Keith Voigts</i>	
The Evaluation of Collision Avoidance Maneuver Performance for Tilt Rotor UAV	464
<i>Soojung Hwang</i>	
Sentinel: An Operator Interface for the Control of Multiple Semi-Autonomous UGVs	484
<i>Chris Jones, Scott Lenser</i>	
Target Tracking and Motion Estimation Using Imagery Provided by Low Cost UAVs	499
<i>Vladimir N. Dobrokhodov, Isaac I. Kaminer, Kevin D. Jones, Wolf Baer</i>	
Marine Corps Unmanned Aerial Vehicles Squadron	514
<i>P.J. Kerr</i>	
Army Science & Technology Unmanned Systems	528
<i>Thomas H. Killion</i>	
PDA Technology for Small UAV Operations	543
<i>Douglas H. Kliman, Peter A. Krawczak</i>	
Unmanned Aircraft Systems (UAS) Vulnerability Reduction Guide	552
<i>Mathias L. Kolleck, Booz Allen Hamilton</i>	

AUVSI's Unmanned Systems North America	562
<i>Michael Kostelnik</i>	
The Littoral Combat Ship (LCS) Multiple Vehicle Communications System(MVCS)	573
<i>Lloyd Decker, Joseph Krajnak, Thomas J. Sides, Thomas Staley, Lee Tennison</i>	
Active Materials for Wing Morphing Micro-Air-Vehicles	589
<i>O. Bilgen, D. Inman, A. Kurdila, R. Lind</i>	
Unmanned Systems North America 2006	605
<i>William Landay</i>	
Use of Mission Based Test Design in Integrated Testing To Reduce Cost & Schedule in UAS Acquisition	621
<i>Jeff Laugle</i>	

Volume 2

Towards an Unmanned Systems Master Plan	635
<i>Rand D. LeBouvier</i>	
Using Real-Time Vision to Control a Convoy of Semi-Autonomous Unmanned Vehicles	646
<i>Jon Anderson, D.J. Lee, Beau Tippetts, Robert Schoenberger</i>	
Developing Semi-Autonomous Battlefield Support Capabilities with the Army Corps of Engineers	661
<i>Paul J. Lewis, Sarah A. Gray, Bret T. Turpin</i>	
UAS Criticality Stratification for Entry into the National Airspace System	675
<i>Hoyt Lougee, Brian Bowe, Vince Dovydaitis, Garrett Thurston</i>	
Autonomous Detection and Geo-Positioning of Unexploded Ordnance	691
<i>Donald Mac Arthur, Carl Crane</i>	
Hunter UAV Evolution--From RQ-5A to MQ-5B	706
<i>Scott McCourt</i>	
Mixed-Initiative Adjustable Autonomy in Multi-Vehicle Operations	721
<i>Vera Zaychik Moffitt, Jerry L. Franke, Meghann Lomas</i>	
Inverting the Ratio: One Operator to Many Vehicles	735
<i>John Molberg, Terry Bandzul</i>	
Anatomy of a Midair Collision	751
<i>David J. Morrow, David C. Tess, Andrew J. Thurling</i>	
Underwater Positioning System Using Terrain Mapping	769
<i>Hiroshi Nagakura, Nobuya Yoshimoto, Shinichi Miyamoto, Yoichiro Asano</i>	
Risk-Aware Mixed-Initiative Dynamic Replanning (RMDR) Program Update	780
<i>Margaret Nervegna, Michael Ricard</i>	
Accurate Location Management for Unmanned Systems in Urban Environments	794
<i>Bob Woodward</i>	
Expanding the Missions of Unmanned Surveillance	803
<i>Scott Nyberg</i>	
Migrating Payload & Navigation Capabilities from Tactical UAS to the Man-Portable Class	836
<i>Ofer Ben-Dov, Elad Aharonson</i>	

Fuel Cells as High Energy Density Power Sources for Long-Endurance Small Unmanned Aerial Vehicles	861
<i>Paul Osenar, Jeff Baldic, Jennifer Humiston</i>	
Remote Video Terminal Level 3 Interoperability	871
<i>Shai Palti, Shimon Ein-Gal</i>	
The Use of Multi-Disciplinary Optimization Methods in the Design of Unmanned Vehicles	882
<i>Dominic J. Palumbo</i>	
Qualitative Design of Micro-Aerial Vehicles (MAVs)	891
<i>Mark Pierson, Andrew Kurdila</i>	
Area Dominance Munition	910
<i>Benjamin T. Plenge</i>	
Pulsed Doppler DSA Radar--Development Report	924
<i>Robert Bernier, Pierre Poitevin</i>	
Modeling, Simulation, and Analysis of Crew Performance of U.S. Army Unmanned Aerial Vehicles	936
<i>Regina A. Pomranky, Bruce P. Hunn</i>	
Overview of Requirements for Semi-Autonomous Flight in Miniature UAVs	947
<i>Kevin Pratt, Robin Murphy, Sam Stover, Chandler Griffin</i>	
Aerial Tethered Robotic System with Hovering-Hopping Agents for Security and Rescue Operations	960
<i>Danny Ratner, Phillip McKerrow</i>	
SPERWER TUAUV Second Tour in Afghanistan	975
<i>G. Rousseau</i>	
Legged Robot Motion with Explicit Stability Constraints: Theory and Application	987
<i>Adam K. Rzepniewski, Greg L. Andrews</i>	
Fully Automatic Control from Takeoff to Landing of a UAV Based on a Single-Antenna GPS Receiver	1002
<i>Sanghyo Lee, Am Cho, Jihoon Kim, Changdon Kee</i>	
Issues and Approaches for Implementing Small Aperture SATCOM Terminals on Unmanned Aircraft	1018
<i>Larry Sawyer, Don Wilcoxson</i>	
Earth Science Mission Requirements for Unmanned Aircraft Systems	1025
<i>Susan Schoenung, Matt Fladeland, Tim Cox, Randy Albertson, Steve Wegener, Mike Gaunce</i>	
Smart Area Weapons for UAVs	1038
<i>Richard Sterchele</i>	
Implications of Lessons Learned from Experience with Large Truck Autonomous Ground Vehicles	1055
<i>Cris Johnson, Deborah Braid, Venkataraman Sundareswaran</i>	
PEO Littoral and Mine Warfare	1072
<i>Jim Thomsen</i>	
Goodrich Corporation Surveillance and Reconnaissance Systems	1101
<i>David A. Toms</i>	

Developing an Intelligent and Integrated Unmanned Ground Vehicle System: A Case Study	1129
<i>Miles Walton, David Bruemmer, Douglas Few, Curtis Nielsen</i>	
DARPA Urban Challenge	1144
<i>Norman Whitaker</i>	
Creating Greater Opportunities for Unmanned Aircraft Flight Operations	1156
<i>Stephen B. Hottman, Glen Witt</i>	
Results of JAUS OPC Experiment 3.0	1168
<i>M.N. Clark, Parag Batavia, Jeff Wit</i>	
Global Hawk Automatic Contingency Generator Flight Test	1176
<i>Bill Norton, Steve Yamaguchi, Lejui Brand</i>	
NASA's Suborbital Science Program: Unmanned Aircraft Systems for Earth Science	1196
<i>Susan Schoenung, Cheryl Yuhas, Randy Albertson, Matt Fladeland, Anthony Guillory, Frank Cutler, Jeff Myers, Ian McCubbin</i>	
USDA Forest Service Small UAS Demonstration Series	1208
<i>Thomas Zajkowski, Everett Hinkley, Randell Berthold, Vince Ambrosia</i>	
Modeling for UAS Collision Avoidance	1222
<i>Andrew D. Zeitlin, Michael P. McLaughlin</i>	
Development of Lightweight 2-Stroke & 4-Stroke Heavy Fuel UAV Engines	1235
<i>Geoffrey Cathcart, Gavin Dickson, John Tubb, Bob Schmidt</i>	
Complex Task Allocation and Execution for Teams of Multiple Autonomous Vehicles	1250
<i>Robert Zlot, Anthony Stentz</i>	

Author Index