

### Introduction to Unmanned Systems: Air, Ground, Sea and Space

Technologies and Commercial Applications Dr (Col Ret) Jerry LeMieux



Introduction by Brian Binnie SpaceShipOne Test Pilot/Commercial Astronaut

www.uxvuniversity.com



### On Ramp to the UAS Profession

### Dr Jerry LeMieux UNMANNED EDUCATION

## **Only Institution** Dedicated to Unmanned Air, Ground & Sea & Space

1 E Washington St, 5<sup>th</sup> Floor Phoenix, AZ 85004 admissions@uxvuniversity.com Call > 602-759-7372 Fax > 602-532-7672 www.uxvuniversity.com

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## **On Ramp**



- Many unmanned systems leaders here today
- UVU building future leaders for next generation
- Applied courses, areo/mech/elec eng, "Aeromechatronics"
- On campus and online
  - On campus starts Sept 30
- Certifications in systems engineering and/or project management with professional organizations
  - International Council on Systems Engineering
  - Project Management Institute (PMI)
- Average faculty, PhD & 25-40 years experience
  - Combined experience > 500 years



### **Commercial UAV Applications** Save Time, Money, Reduce Risk 200 Commercial Applications



	Precision Agriculture •	Ciner
	Plant Fertility Assess •	Virtu
	Plant Water Content •	Hydr
	Plant Disease Detect •	Geor
	Weed Mapping •	Flood
	Invasive Plants •	Law I
	Insect Attack Warning •	Pollu
	Vegetation Identification •	Phot
	Selective Harvesting •	Tidal
	Canopy Management •	Solar
	Herd Tracking •	Anti-
	Telecommunications •	Algae
3.5	High Altitude Imagery •	Rail 1
	Maritime Surveillance •	Ocea
	Media •	Saltw
	Traffic Monitoring •	Land
	Disaster Relief •	Illega
10	Real Estate Photography •	Emer
	Meteorology •	Terra
	Hurricane Monitoring •	Sand
	Cryospheric Research •	Hydr
	Bridge Inspection •	Traff
-	Transmission Line Inspect•	High
	HAZMAT Inspection •	Parki
	Emergency Medical Supply	FedE
	Aerial Surveying •	Insta
-	Damage Assessment •	Adve
	Insurance Claim Appraisal•	Coas
	Shark Watch •	Pave
	Concert Security •	Anim
	Sports Video •	Preve
	Runway Inspection •	Ant-

Virtual Tours

Coffee Harvest

matography al Tours ologic Modeling • norphic Model d Risk Enforcement tion Monitor ogrammetry Zone Mapping Panel Inspect Piracy e Proliferation Frack Bed Inspect in Research vater Infiltration Imark Inspection • al Ship Bilge Venting rgency Com ain Mapping Bank Shift ometric Mapping . ic Accident Analysis way Design ing Utilization x Unmanned Cargo nt Consumer Grat. ertising stline Surveillance . ement Roughness nal Rights Groups ent Extinction -Whaling Meteorology Flood Warning

Entomology Forestry Inspection **Fisheries Management** Species Conservation Wildlife Inventory Mineral Exploration Remote Aerial Survey Forest Fire Surveillance Forest Fire Mapping Volcano Monitoring Remote Aerial Mapping **Oil Spill Tracking** Snow Pack Avalanche Ice Pack Monitoring Poaching Patrol Insurance Claims Public Safety Firefighting Golf Resort Market Search and Rescue Training Meteorology Stadium Events **Inspect Pipelines** Power Restoration Newspaper Delivery Fire Prevention Wind Turbine Blade Fire Risk Assess Marine Sanctuary River Discharge Ship Collision Maritime Mammals Train Crashes

Pipeline Inspection Chimney Inspection Inspect HAZMAT Motion Pictures Inspect Landmarks Aerial Photography Manage Fisheries **Transmission Line** Inspect Icebergs Real Estate Marketing . **Crop Dusting** Aerial Land Survey Volcano Monitoring Surveillance Predict Hurricane Predict Earthquake Wildlife Research Archaeology Food Delivery Com Relay Crop Dusting **Oil Rig Inspection** Predict Earthquake Crime Investigation Landslide Prediction Predict Earthquakes Railroads Forest Management Cloud Measurement Aerosol Measurement . Coastal Water Quality . Maritime Surveillance . Work Documentation . Geophysical Survey

Wildlife Research Archaeology Com Relay Crop Dusting Monument Inspect Windmill Inspect Dam Inspection Nuclear Inspection **Runway Inspection** Urban Planning **Gravel Pit Inventory** Preserve Culture Petroglyph Preservation• **Oil Discovery** Predict Landslides **Discover Faults Highway Design** Traffic Flow Analysis Crash Reconstruct Prevent Graffiti **Poaching Patrol** Sports Event Mineral Exploration Journalism Meteorology Sea Level Rise Roof Inspection Fishing Enforce Wind Turbine Brake Oil Spill Detect/Monitor• Forest Health Tree Illness Monitor Criminal Car Tracking Nuclear Radiation Meas• Crowd Control Training Traffic Accident **VIP** Security **Topographic Maps** News Coverage HAZMAT **Biological Agent Detect Event Security** Port Security Construction Forensic Photography Air Sampling Entomology Avalanche Monitor Medical Supply Delivery Customs & Border Atmospheric Profile **Cloud Properties** Coastal Patrol Ozone Chemistry **Highway Roughness** Hurricane Genesis **Coastal Change** Boston Marathon Seismology Archeology Bank erosion **Climate Monitoring** Internal Tornado Measure Forest Regeneration Volcano Ash Measurement Tree Growth

Construction Document



## **UVU Phoenix Campus**









## **Targeted** Jobs



- UAV Program/Project Manager
- UAV Systems Engineer
- UAV Flight Test Manager
- UAV Systems Researcher
- UAV Internal/External Pilot
- UAV Systems Analyst
  - A student took only our UAV Fundamentals course
  - Applied for and was hired as a UAV analyst at AAI Corp
  - No prior experience
  - Used UAV Fundamentals Certificate
  - Salary: \$100,000



### **Unmanned** Jobs



Project Manager C4I Systems-Unmanned Aerial System General Dynamics - IT \*\*\*\*\* 87 reviews - California, MD Provide integration support for unmanned aerial systems about designated aviation compatible ships including the FireScout UAV, Navy Unmanned Combat Air System... days ago - save iob - email - more...

#### NAVSEA SR. PROGRAM MANAGER-UNMANNED UNDERSEA VEHICLES Jo

CACI International Inc \*\*\*\*\* 102 reviews - Washington, DC Lead delivery of complex consultancy services to NAVSEA clients involving the full spectrum of strategic planning and acquisition support for unmanned undersea...

con CACI International - 30+ days ago - <u>save too</u> - <u>omail - mo</u>

<u>Sr Project Engineer - Unmanned Systems</u> Global Network Recruiting - Maryland <u>Apply</u> for Sr Project Engineer - Unmanned Systems. Any experience with the following ouwl be a PLUS ... unmanned systems, aircraft systems and computerized... Start days ago - save job - email - more...

#### Unmanned Systems Engineer Sr Staff - UAV UGV Robotics Contro...

Global Network Recruiting - Texas Team orientation/creative partnering to solve problems. Depth and breadth of industry/marketplace/competitor knowledge within the design disciplines.... 30+ days ago - <u>save iob - email - more...</u>

#### AERO-MD-PA-12:183: Air Vehicle Operator/Mission Commander - new

Wyle **\*\*\*\*** <u>3 reviews</u> - Patuxent River, MD Current unmanned Mission Commander or Tactical Coordinator qualifications. Formerly qualified as a Tier II Plus or higher unmanned aerial system operator.... 14 hours ago - <u>save job</u> - <u>email</u> - <u>more...</u>

#### Engineering Intern - new

AeroVironment, Inc. - Monrovia, CA - <u>+1 location</u> Additional Details AeroVironment is a technology solutions provider that designs, develops, produces and supports an advanced portfolio of **Unmanned** Aircraft... 2 hours ago - <u>save job</u> - <u>email</u> - <u>more...</u>

#### Software Developer I - new

General Atomics - ASI Unit - Poway, CA This system consists of ground based workstations that function as pilot and crew interface to the aircraft as well as the airborne software that controls all... 10 hours ago - <u>save iob</u> - <u>email - more...</u>

#### Software Developer I - new

Aeronautical Systems **\*\*\*\* \*** <u>11 reviews</u> - Poway, CA This system consists of ground based <u>workstations</u> that function as pilot and crew interface to the aircraft as well as the airborne software that controls all... 14 hours ago - <u>save job</u> - <u>email</u> - <u>more</u>...

### Unmanned Maritime System Logistician SP12-0975-0031

Whitney, Bradley, & Brown, Inc. - Panama City, FL Experience tailoring logistics for Unmanned Maritime Systems. Description WBB is seeking an Unmanned Maritime System Logistician.... 3 days ago - save job - email - more...

#### Unmanned Systems Software Engineer

The Johns Hopkins Applied Physics Laboratory \*\*\*\*\* <u>4 reviews</u> - Laurel, MD - +1 lo BS in computer science, computer engineering, electrical engineering, mathematics, mechanical engineering or closely related field with 2+ years of relevant... 9 days ago - save job - email - more...

#### Unmanned Maritime System Test & Evaluation Engineer SP12-097...

Whitney, Bradley, & Brown, Inc. - Panama City, FL Unmanned Maritime System Test & Evaluation Engineer. Experience with planning and executing <u>Unmapped Maritime System performance</u> verifications....

ays ago - <u>save job</u> - <u>email</u> - <u>more...</u>

### Unmanned Aerial System Lead Test Engineer

Modern Technology Solutions, Inc. - Lawton, OK developmental test and evaluation policy and procedures, operational test and evaluation policy and procedures, DoD/DHS acquisition management, CONOPS...

vs age - save job - email - more ...

#### Unmanned Air Systems Analyst, Senior Job

Booz Allen \*\*\*\* <u>164 reviews</u> - Dayton, OH 3+ years of experience with UAS airspace integration development. Experience with cockpit and payload evaluation.... From Booz Allen Hamilton - 11 days and save lob - email - more...

#### Unmanned Aircraft System Simulation Manager

Embry-Riddle - Daytona Beach, FL Once you have created your account, you will be able successfully <u>apply</u> for the vacancy of your choice.... 18 days ago - save job - email - more...

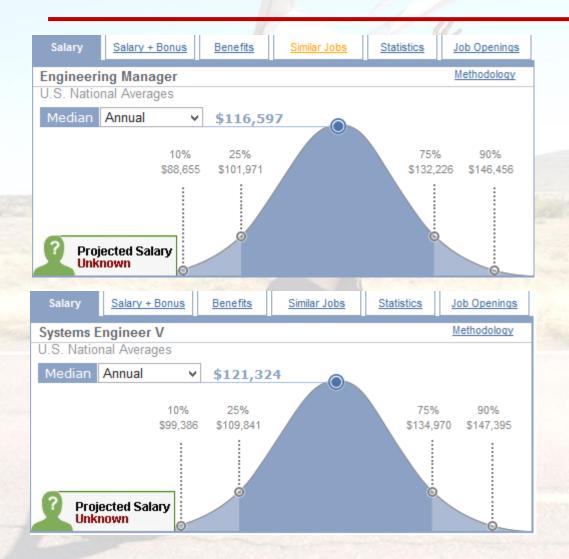
#### Software Developer - Unmanned Aircraft Products

Dynetics, Inc \*\*\*\*\* 2 reviews - Huntsville, AL Responsibilities will include contributing to design and implementation for client processing to display information through web-deployed applications,... 24 days ago - <u>save job</u> - <u>email</u> - <u>more...</u>



### Salary.com National Average





Program Manager \$88,000 - \$146,000

Systems Engineer \$99,000 - \$147,000



## **Dr Robert Jacobs**



- 35 years exp as technical, program and executive manager
- BS Sys Eng UCLA, MS Ops Research USC, Ph.D. Human Factors
- Focus Areas:
  - HMI design, sim for engineering development and training
  - AI for crew system decision aiding and automation
- Aerovironment: Global Observer user interface design
- DARPA SIMNET, 236 networked crew simulators
- Systems engineer and AI study manager for GCS
- Commercial instrument, multiengine, CFI with 1500 hours

### Teaches SYS 601 Fundamentals of Modern Systems Engineering



## Mr John Sauter



- 30 yrs R&D experience in autonomous systems, PM/PI
- 25 papers, three patents on agent-based technologies
- Analysis & control of complex adaptive agent-based sys
- Pioneering work in stigmergic algorithms

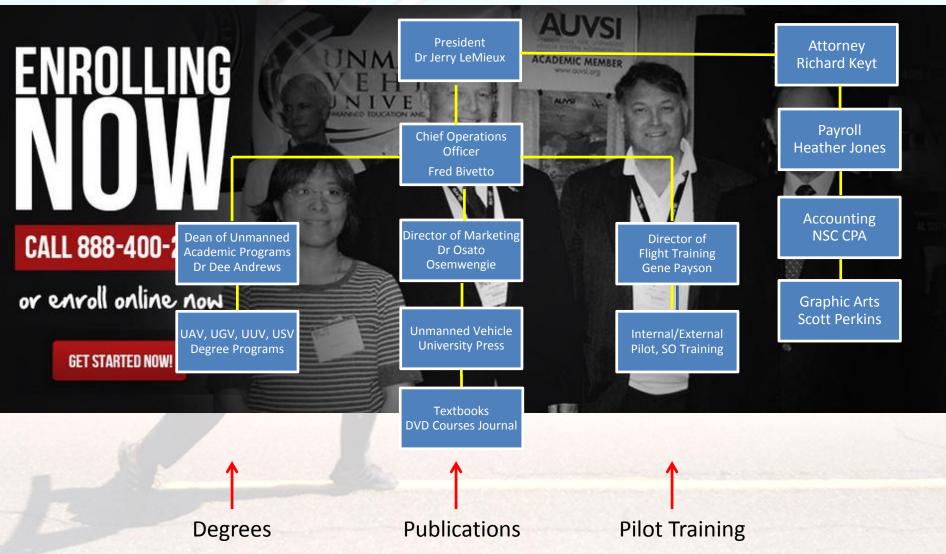
   Use fine-grained agent-based systems
- Demonstrated swarming algorithms controlling multiple ground and air vehicles
- Applications: Persistent surveillance, target tracking, fast boat surveillance, and perimeter protection

Teaches UXV 803 Autonomous Unmanned Systems



**UVU Org Chart** 







### **Academic Programs**

Air, Ground, Sea and Space Vehicles



- Doctorate, Masters, Professional Certificate
- Unmanned Aircraft Vehicle Systems Engineering
- Unmanned Ground Vehicle Systems Engineering
- Unmanned Underwater Systems Engineering
- Unmanned Space Vehicle Systems Engineering

Entrance Requirements Graduate Degree = Bachelors + calculus Professional Certificate = High school diploma or other degree



## **University** Goals



1000's of companies, 100s of Thousands of Jobs Coming

- Education and training in unmanned systems
- Focus on engineering not operations
  - Vehicles are very complex in terms of technology
  - Systems engineering approach
    - For efficiency and safely
  - Integrate engineering into courses
    - Not teach separately

World Class Programs for Unmanned Air, Ground, Sea and Space Vehicle Engineering



### A Movement to Transform Engineering Educati

Manifesto

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Editor's note: This entry is a guest post from Dr

Vehicle University, www.uxvuniversity.com. I had

2 MANNED

TEL

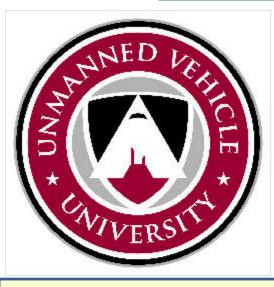
(Col Ret) Jerry LeMieux, President, Unmanned

### Innovator's Notebook: A New Approach to Unmanned Systems Engineering Education

NOVEMBER 30, 2012 BY DAVID GOLDBERG

Blog

LEAVE A COMMENT



the privilege the other day of talking to Jerry about his vision, and I was

struck by the number of innovations in scope, delivery, faculty, and approach of Unmanned Vehicle University, especially as a vehicle for graduate education delivery. The Innovator's

Notebook solicits stories of educational innovation of possible interest to readers of the Big Beacon blog. Send your ideas (short paragraph) or submissions (350-700 words) to Dave Coldhard (dea Obiahansan ara)



Recent Posts

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NOT Teachers But Facilitators / Mentors

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## **Unmanned Aircraft Systems**

### Thousands of New Companies





## Master's in Unmanned Aircraft Systems Engineering



UAV 601 Unmanned Aircraft System Fundamentals	6	
MAT 701 Numerical Analysis	6	
UAV 801 UAV Aerodynamics and Flight Stability	9	
UXV 803 Unmanned Systems Autonomy	9	
SYS 601 Fundamentals of Modern Systems Engineering	6	
UAV 701 UAV Optical, Infrared and Radar Sensors	6	
SYS 701 Project Management of Complex Systems	6	
UAV 702 Unmanned Aircraft Flight Test and Evaluation	6	
Total Credits		



Certificate in Unmanned Aircraft Systems Project Management



UAV 601 Unmanned Aircraft System Fundamentals6UAV 603 Small UAV Design & Construction6UAV 701 UAV Visible, Infrared, Laser and Radar Sensors6SYS 701 Project Management of Complex Systems6Total Credits24

One year program high school diploma required for entry Unmanned Aircraft System Project Manager

Low level project manager employment



# Small UAV Design & Construction







- Assemble the airframe
- Install external pilot controls
- Range test the external pilot controls
- Bench test motor and power system
- Install motor and power system
- Bench test autopilot and sensors
- Install autopilot and sensors
- Become familiar with GCS software
- Run hardware in the loop simulation
- Tune autopilot
- Bench test video payload
- Install video payload
- Install autopilot telemetry modem



### **Driverless** Cars

### **Unmanned Ground Vehicles**







### Masters in Unmanned Ground Vehicle Systems Engineering



UGV 602 Unmanned Ground System Fundamentals	6	
MAT 701 Numerical Analysis	6	
UGV 801 Autonomous Intelligent Control Systems		
UGV 806 Advanced Motion Planning	6	
UXV 701 Optical Infrared & Radar Sensors	6	
UXV 804 Introduction to Robotics		
SYS 601 Fundamentals of Modern Systems Engineering		
SYS 701 Project Management of Complex Systems		
UXV 805 Human Robot Interface		
Total Credits		



## Francis Govers



- 20 yrs exp, designed over 20 UUV, UGV and UAV
- Director of the Advanced Simulation Laboratory
- Head of Flight Sim for F-35 Joint Strike Fighter
- Inventor of the Decision Support Center
- Deputy Chief Engineer for Army FCS
- Participant in first DARPA Grand Challenge Race
- Chief Engineer for Elbit Systems of America
- Board of Directors of the National Space Society

Teaches UGV 601 Unmanned Ground System Fundamentals



## Dr Rob Finkelstein



- 40 years exp intelligent systems & robotic vehicles
- PhD in Systems Theory & bCybernetics George Washington Univ
- Authored over 200 technical reports and studies
- Patent for Energetically Autonomous Tactical Robot (EATR),
- Co-Director of the Intelligent Systems Laboratory, Univ of Maryland
- Board of Directors for AUVSI
- Books include
  - Unmanned Vehicle Systems: Military and Civil Robots for the 21st Century and Beyond, Pasha Publications (1994),
  - Defense Year-Book 1992 ("Combat Robotics: From the Kaiser to the New World Order"), Brassey's Publications
  - Military and Civil Robotics: Intelligent Machines in War and Peace

### Teaches UGV 801 Autonomous Intelligent Control Systems





### **Student Testimonial**

Charles Greene, North Carolina BS in Mechanical Engineering Masters Degree in Unmanned Ground Vehicle Systems Engineering

No pay, no extra credit, student did not know questions beforehand, no rehearsal



## Unmanned Vehicle University Press



### Introduction to Unmanned Systems: Air, Ground, Sea and Space

**Technologies and Commercial Applications** 

Dr (Col Ret) Jerry LeMieux



Introduction by Brian Binnie SpaceShipOne Test Pilot/Commercial Astronaut

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First Textbook on Unmanned Systems. Includes Questions Written by UVU Faculty Universities Evaluating

Describes Unmanned Air, Ground, Sea and Space Vehicles

Describes Common Technologies

Into by Brian Binnie, SpaceShipOne Test Pilot and Commercial Astronaut





## **Courses on DVD**



amazon.com

- UAV Fundamentals (Most Popular)
- Small UAV Fundamentals (Explain Parts)
- Small UAV Design & Construction (Build)
- Unmanned Systems Autonomy
- UAV Aerodynamics & Flight Stability
- Driverless Car Design



## Live On-Site

**Certificate** Courses



- UAV Fundamentals (Most Popular)
- Small UAV Fundamentals (Explain Parts)
- Small UAV Design & Construction (Build)
- Micro Air Vehicle Design
- Unmanned Systems Autonomy
- Driverless Car Design
- Unmanned Ground Vehicle Fundamentals
- Unmanned Underwater/Surface Fundamentals



International Journal on Unmanned Systems Engineering



- Website isuseng.com
- Dedicated to unmanned systems engineering
- Promotes the advancement of the applied science
- Dissemination of original research
- Significant advances in
  - Design, development, test & operation

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### International Journal on Unmanned Systems Engineering



### Special Issue on

Unmanned Maritime Systems Engineering: Recent Advances and Future Research

### UVU Official Journal

This special issue is expected to be an effective channel for researchers to report the latest findings in all aspects of autonomous maritime system technologies, while proposing new ideas and directions for future development.

Schedule for Special Issue Deadline for papers: Wednesday 31<sup>st</sup> July 2013 Peer-review and editing: August & September 2013 Publication of special issue: October 2013 Instructions for authors: Visit www.ijuseng.com



Further information and manuscript submission, please contact: Dr Pascual Marqués, Unmanned Vehicle University (UK). editor@ijuseng.com





1<sup>st</sup> World Congress on Unmanned Systems Engineering (*WCUSEng*)

July – August, 2014 - Oxford, United Kingdom

### Call for Abstracts & Full Papers Air Systems Ground Systems Maritime Systems Space Technologies

Submissions & Registration: www.ijuseng.com

A forum for researchers, scientists and business professionals World-wide to present the latest innovations and future research directions in Unmanned Systems Technology









## **Recent** Media



- ABC Nightline News
- Smithsonian Air & Space Magazine
- Fox News
- Italy Newspaper Le
- Over 100 interviews & articles





EDITORS' PICKS:	KUHNER:	Hollywood	Hillar
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### Drone U. rides flight boom

Pilot founds first university dedicated to unmanned systems

COMMENTS (70) A SIZE: + / - A PRINT



By Ben Wolfgang - The Washington Times

Sunday, August 26, 2012

RADIO

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E-N



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Retired Air Force Col. Jerry LeMieux, founder of the Unmanned Vehicle University, ... more >

For all of the skeptics and detractors it has produced, the drone industry also has its vocal supporters.

Few are louder than Jerry LeMieux, a retired Air Force colonel, commercial airline pilot, college lecturer and, most recently, the founder of the world's first university dedicated solely to unmanned systems education.

"At the end of the day, I'm just trying to do something good for the unmanned systems community," he said at the drone sector's Las Vegas trade show earlier this month.

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"It's something that I look at as very important. What's my motivation for doing this? Everybody has a little bit of a teacher in them. Now, I'm finally able to do it on a larger scale."

Col. LeMieux's school is one of several trying to get off the ground, literally and figuratively, with colleges and universities across the country seeking a piece of what is expected to be a business boom in the drone market in the coming years.



## REVIEW-JOURNAL

TO GROW YOUR BUSINESS

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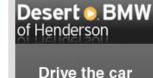
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you've been dreaming about.



## 'Drone U' aims to build leaders in a soaring field

TRAVEL

OPINION

News

BY KEITH ROGERS LAS VEGAS REVIEW-JOURNAL

Comments (2) | Add a comment

Posted: Sep. 1, 2012 | 2:02 a.m.

They don't have a football team yet, and their mascot might as well be a triangularshaped drone, like the white flying wing featured in the school's maroon-and-gray logo.

But Unmanned Vehicle University, or UVU as President Jerry LeMieux calls it, has a faculty, students and an online curriculum that offers unmanned systems engineering classes, and master's degrees and doctorates.

And they're heading into fall classes with hopes of soon publishing their first textbook and building a campus in Lake Havasu City, Ariz.

"We're rolling ahead here," LeMieux, a retired Air Force colonel and former Delta Air Lines pilot, said in a telephone interview this week.

"You can't find another school like this on the planet."





FOR MORE INFORMATION www.uxvuniversity.com/

### RELATED CONTENT

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## **ABC Nightline Interview**

April 24, 2013

