

Notes From Thursday UAS Workshop June 8 2017

June 8, 2017

We need a list of competencies and skills for UAS technicians. Different types of careers related to UAS will be covered. We will also start a listserv for Q and A to start a community of practice. Jonathan Beck will share DACUM. All different numbers of credits are required in different states for certificates.

Careers:

Construction/development of UAS, Maintenance of Vehicles, data acquisition and Analyst, Ag (precision), UAS Pilot, UAS Cinematographer, Drone Management, sUAS service technician.

Resources:

Text for UAS: Small Unmanned Aircraft Systems Guide Exploring Designs, Operations and Regulations & Exconimics, ASA-UAS-SUAS Terwilliger, et al.,

Flying: Use of a 12x12x40 batting cage. Use small, inexpensive UAV and progress to more complex vehicles as you move through program. Use a golf cage, batting cages, so much be completely enclosed.

Association of Unmanned Vehicles Systems international (AUVSI) – join this group to meet more industry use.

Competencies, Skills, Qualifications from presentations: hard to have all topics for different applications

- 1) 107 licensure qualified for those wishing to fly UAS.
- 2) SATCOM/Radio Theory
- 3) Composite structures
- 4) Computer Networking/database
- 5) Avionics
- 6) UAS Troubleshooting
- 7) UAS Maintenance Operations
- 8) Certifications MCAT
- 9) Safety protocol
- 10) Check lists (for pre-flight)
- 11) FCC rules
- 12) FAA Airframe License
- 13) NCTC UAS Certificate
- 14) Imagery Analysis
- 15) Data collection methods
- 16) For Precision Ag – need agronomic skills, process and interpret RS data
- 17) Use and fly UAS without GPS and with autonomous technology (GPS)

Competencies, skills, qualification from open discussion:

It is a very diverse group of topics, disciplines, careers. There is a lot of differences. Ken said there is a core of things that are the same but applications are different.

- 1) Part 107
- 2) Data processing – general overview
- 3) remote sensing for UAS (or adding UAS into general remote sensing course)
- 4) image processing for UAS
- 5) remote sensing for UAS in agriculture
- 6) imagery for other applications (real time, videography, photography)
- 7) stitching imagery together
- 8) creating 3D imagery
- 9) photogrammetry
- 10) field operation of UAS
- 11) flight planning – autonomous or hands on flight
- 12) types of UAS and factors in its use
- 13) Safety check list
- 14) FAA Regulations for pilots and flying
- 15) Building UAS
- 16) Maintaining UAS
- 17) Ethics
- 18) Writing and presentation of UAS data and imagery
- 19) Applications of UAS and imagery in different workforce domains
- 20) Ground truthing

Course and Programs

Minimum would be 3 courses, with Part 107 course. About 9 credit hours. This would be two core courses with 3 options for the 3rd course – Maintenance, Videography, UAS topics (data analysis and image analysis). Might have electives. So most like the short, long or degree. If there are three courses:

- 1) Intro to UAS – lecture and lab
 - a. Introduction to flight - maneuvers
 - b. Data processing and collection and visualization
 - c. Drone safety
 - d. Basic laws and intro to 107
 - e. Regulations – rules – difference between hobby and commercial)
 - f. Anatomy of a Drone – hardware and software
 - g. Basic physics of flight.
 - h. Different Apps for drones (introduction to different software)
 - i. Sensors and capabilities (including cameras)
 - j. Ethical considerations
 - k. Insurance needs
 - l. Types and capabilities of different drones
 - m. GPS and guidance
 - n. How Drones are used (applications)
 - o. Flight planning
- 2) Part 107 – Lecture course for 1 or more credits

- a. Organizational structures and standard operating procedures
 - b. Wavers and applications
 - c. Navigation charts
- 3) Data acquisition and image analysis - lecture with lab
- a. Basics of remote sensing (spatial, temporal, radiometric, resolutions), EM
 - b. Sensors, mounts, cameras, platforms
 - c. Aerial imagery
 - d. Basic analysis of imagery, processing, types of software,
 - e. 3-D, images/point clouds/stitching
 - f. Ground truthing, georeferencing, georectification, coordinates, projections
 - g. Photo interpretation
 - h. Videography and photography
 - i. Hazard flight conditions
 - j. 1st person view
 - k. Basic photography

Talks:

- 1) Jonathan Beck, Northland C&T Aerospace and Agriculture. Had aviation maintenance program was having problems with low student enrollment. Director went to a UAV conference and found UAS and got a DOL Award. Set program with Industry focused needs for skill sets using innovation. Has a foundation 501(c)(3) non-profit. Absorbs the risk and different obstacles to clear up issues of income/expenses and purchasing, matching dollars, etc. Standard from Mississippi “share” program to develop Certification for maintenance. How to develop curriculum for use by different workforce domains. They have A&P degree program with 84 credits. Have to have 1980 hours from FAA to meet the program. Originally students were all former military – now standard students are doing program and doing well. Also a GeoINT program. Trying to work through USGIF Accreditation program. U of M accepts all 60 units from their GeoINT program. PAET (precision agriculture Education Technology) program Intro to Ag Concepts etc. sUAS small UAS program including maintenance, FAA Ground School Operations Training, Free electives, 600 hours/ 30 credits. Works with a small town (2800) on Ag with sUAS projects. Lots of partnerships to help support program and students. Need to understand what you see from your UAS and use the data in innovative ways. Use a very hybrid method where online use interactive technology for student interaction. Has a DroneTECH Summer Camp. Build, fly, collect data, etc. also DroneTECH Educator workshop.
- a. Q – how many students – 100 students at one campus, maintenance is summer with 15 students, geospatial has fewer students. A lot of students have degrees but a big mix. Working on 2 + 2 agreements so traditional students can go on. Q – what workforce Titles for jobs they have gotten – he will get that information as they have been segmented. Grants – don’t sleep, do more but not easy.
- 2) Chris Cruz – West Valley in CA. Program is Park Management including geospatial, UAS, etc. Fish and Wildlife use UAS and remote sensing to track Sandhill Cranes at night. Wants to develop program to use UAS in public land management. Has an Advisory Board from Industry. Partner with others on campus that have interests and skills that combine to create a new program.

Developed a video for UAS program outreach. Working on high school to university partnerships. Video is on Facebook page.

- 3) Parkland college Jenni Frigen, Mandy Briggs. Number 1 feeder to U of I. Champaign, IL, Institute for Aviation at Willard Airport. Tuition is paid by in or out of District. Institute of Aviation is \$5,000 to \$8,000. In Division of Agriculture and of Aviation and is partnering on UAS. Can have student in Parkland Pathway to University of IL. The U of IL doesn't accept AS degree. Aviation was "moved" from U to Parkland as it did fit mission and Parkland took it over. They have an NSF PACE Project for Precision Ag Curriculum Enhancement project. Updated curriculum for Precision Ag and is expanding curriculum to high school. Hard to get U of I to see PrecAg as a good type of program. So what is useful to farmers from UAS and precision Ag. Used RS things from GeoTech Center and iGETT. Students had to learn to fly and not just use program flight. They also have dual enrollment for high school for precision Ag. It is a 1 credit hour course with optional hands on course. What they found out that student/public don't know what precision Ag is and counsellors don't either. How do you get out to students, parents and counselors what precision Ag is – need another grant. UAS might be the ticket to get the students interested. There are no articulation agreements in the state for P-Ag. One point is that technology changes so fast that it is costly and need to update is essential. Universities are not "up to date" or doing industry needed skill set building. Want students to do both automated and hands on flying. Tried to get Part 107 courses through "community education" outside of academic programs – mainly for industry. There needs to be more research on how P-A can be used for different ROI for a farmer.
 - a. Q – Separate 107 course take out academic students – no, because they don't have any academic program. More an issue of student application process versus community service non-academic process. How did they get the right to provide the exam for 107 on site? They already were a testing center onsite. It isn't easy to become a testing site for FAA.
- 4) Wing and Ken – UAS Conference in Palomar Drone Conference 17– 120 people with weight list of 30 people. Palomar has had a certificate for UAS for a year and debated what to call it. UAS or Drone – UAS Certificate in curriculum but marketing as "Drone." First course students learn how to fly and collect basic data. In second course they do projects. Palomar has a stackable certificate methods – short (2 semester), long (3 semesters), AS degree (4 to 5 semesters). Driving force for grant was the national need to use the technology. Went with ATE program focus of business and entrepreneurship. So grant includes what is needed to use the technology but al to start and run a business. This helped focus the curriculum and perhaps student interest. Providing PD to faculty in other departments to get them interested in Drones and give their students some experience on drones. A local high school has a program to build quad copter using a 3D printer. They had a competition to fly a load and do a course. The Plan is to introduce Drones in high school, get their 107 and go into that as a career or use it in other career paths. Kids and parents get excited. First course in new program is a MOOC. Summer youth program teaches basics of UAS and then has them work with partners in the communities to do interesting and beneficial projects.
 - a. Q – do you anticipate any problems with your curriculum committee with adding the business entrepreneurship? His curriculum committee said has already agreed to be cross discipline participation and courses.