Recent experiments demonstrated UAS use for autonomously detecting and mapping ocean features, and also directing ASVs and AUVs to locate and sample them. We review current methods for multiple autonomous system 3D feature detection and mapping of atmospheric plumes, turbulence and ambient anomaly fields, including at the sea surface. Key legal issues on use of AUVs, ASVs and UAS are reviewed in relation to the most recent US and international regulations.
Structure of the talk:

• Survey of UAS Legal doings in some countries
• UAS Legal doings in EU
• UAS Legal doings in USA w FAA
• Recent UAS tech developments of note
• What/where the biz is/are...and,
• Latest Solar UAS tech re Stanford projects
Survey of UAS Legal doings in some countries: Australia

• 3/28/14: Australia rescue helo has near miss w unknown UAS...’test of regulations in eyes of world’: [link]

• 3/21/14: Australia cropduster almost hits UAS operating legally over mine: [link]

    Miscommunication: cropduster notified but anticipating manned aircraft. Findings were that better community awareness of UAS operations was needed.

• 3/17/14: Australia establishes UAS 4-tier privacy legislation: [link]

    Recommendations by Australian Certified UAS Operators, Inc.(ACUO): broad legislative structure already in place, no major changes required, only need to tailor existing legislation, and enforce on a national basis.

    Four tier legislation:
    1-Geographic separation of UAS and human activities avoids privacy violations;
    2-Greatest risk of privacy violations is from illegal UAS ops, so prosecute them;
    3-‘Sharpen’ “prowler” laws (aka for stalking, paparazzi): more work needed;
    4-Adopt Oz Privacy Commissioner’s “Privacy Impact Assessment” criteria, ie real impact or not?
Survey of UAS Legal doings in some countries: Australia

- 2/24/14: ACUO joins UVS International, established in 1995 in Netherlands and run out of Paris [President: Peter van Blyenburgh, pvb@uvs-international.org] (see: http://uvs-international.org/), gets seat on International RPAS Coordination Council*, started in 2008, based in Paris, with member countries including Austria, Belgium, France, Germany, Italy, the Netherlands, Norway, Spain & UK to date with possible inclusion of Middle East, Asian and South American countries coming: http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=fef534ebc0&e=9bb7d5959c

- The Australian branch of UVS Intl is in Brisbane, headed by UAS industry rep Peter La Franchi. ACOU head is Joe Urli, president@acuo.org.au

Survey of UAS Legal doings in some countries (cont’d)

- 3/8/14: 14 Central & So. American countries have UAS, but only Brazil has UAS legislation: [link]
- 2/12/14 Malaysia to adopt UAS for maritime domain awareness...by 2020!: [link]
- 1/16/14: UN UAS crashes in Congo: [link]
- 1/2/14: Israel OKs 2 COTS UAS (Israeli companies): [link]
- 12/6/13: UN OKs UAS ops in Congo along border: [link]
- 11/1/12: US, Iceland sign UAS agreement for cooperation (US FAA and other federal agencies); UAS Iceland head Sigudur Hrafnsson contracts w UAF UAS program to fly ScanEagles in Iceland (Arguably this could go under EU or US...)
UAS Legal doings in EU

• 2/17/14: France 1st country to establish UAS civil airspace legislation from French Civil Aviation Authority (“DGAC”) by mid-2014 in association with Federation Francois de Drones: [http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=ece30c3685&e=9bb7d5959c](http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=ece30c3685&e=9bb7d5959c). UAS Legislation is to be based on:
  1) the notion of avoiding ‘populated areas’;
  2) training requirements;
  3) enforcement of laws against violators;
  4) enforcement of existing privacy regulations (still TBD legally re UAS);
  5) Enforcement of Airworthiness Certification per 12/24/13 French law.

• 1/28-30/14: Spain…Spanish ASEA (Spain’s CAA) and AERPAS (Spanish RPAS Association) Workshop to establish RPAS legislation. Meeting was joint with EUROCONTROL & JARUS and included DGAC, see: [http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=8a761a0e8c&e=9bb7d5959c](http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=8a761a0e8c&e=9bb7d5959c)
UAS Legal doings in EU

• 2/3/14: ULTRA project (Unmanned Aerial Systems in European Airspace) funded by the European Commission 7th Framework Programme to propose, based on currently available technology, a way forward for the short term insertion of civil Light RPAS in European Airspace. Project finalized in Dec. 2013, plan presented at RPAS CivOps 2013 conference in Brussels, Belgium. Plan under “Deliverables” at: http://www.ultraconsortium.eu

• This study identifies gaps, suggests existing technology solutions, and identifies and addresses social concerns with a goal to speeding UAS (RPAS) use in EU civil airspace.

• This is an offshoot/extension of the earlier JARUS effort (see next slide).
UAS Legal doings in EU


• JARUS (Joint Authorities for Rulemaking on Unmanned Systems) is a group of experts drawn from national aviation authorities from around the world, including the European Aviation Safety Agency (EASA) and EUROCONTROL. Its purpose is to recommend a single set of technical, safety and operational requirements for the certification and safe integration of Remotely Piloted Aircraft Systems (RPAS) into airspace, see: http://www.jarus-rpas.org/
UAS Legal doings in USA w FAA (and Canada)

• 3/31/14: FAA announces bids for UAS Center of Excellence for Unmanned Aircraft Systems to be selected within the next year, for criteria, etc., see:

http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=ddc755434d&e=9bb7d5959c

Given they just selected 6 UAS Research Centers, unclear what exactly this is intended to be, although there was ‘comment’ that it was ‘surprising’ that Oklahoma’s strong UAS program did not get accepted as a Research Center, so maybe this is a way to throw them some money...or...???

This is a hypothesis given a key CoE selection criteria of having “established a national UAS Air Transportation program,” which U. Oklahoma has done.
3/18/14: FAA Awards UAS grant to Rutgers University to develop UAS, currently used by the military, for civilian use. FAA plan is to take results from the project to Congress to create more concrete parameters for UAS system designs, with a goal to create reliable UAS that can be integrated into civilian airspace with communication capabilities and airworthiness standards as important factors for certification: [http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=47b42eea94&e=9bb7d5959c](http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=47b42eea94&e=9bb7d5959c)

This would address the issue that currently most FAA certified UAS are military, and standards are needed for certifying non-military UAS, but the FAA doesn’t itself alone want to draw up standards.
UAS Legal doings in USA w FAA (and Canada)

• 3/10/14: FAA loses $10K fine case against Swiss citizen Raphael Pirker for filming at UVA Med Center. Judge held FAA was acting only under “Guidelines” and not federal law.

• FAA (personal communication) felt evidence was compelling but case was not well presented; plan to appeal & reiterated intention to prosecute commercial UAS use w/o COAs.

See: [http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=563d2d5acc&e=9bb7d5959c](http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=563d2d5acc&e=9bb7d5959c)

• 12/24/13: Pirker case establishes Kramer Levin Naftalis & Frankel LLP Unmanned Aircraft Systems Practice Group: [http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=a9208a8abc&e=9bb7d5959c](http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=a9208a8abc&e=9bb7d5959c)
2/7/14: FAA announces that a contract has been let to Unmanned Experts LLC (UMEX) and Solentus to perform support services for UAS research within the FAA Office of Advanced Concepts & Technology Development for simulations at the NextGen Integration and Evaluation Capability (NIEC) lab to provide responses to various UAS in NAS scenarios (e.g., acceptability of control latency, level of workload, and timeliness of collision avoidance manoeuvre).

This initial phase of work under this agreement is expected to be complete in April 2015.

Keep in mind FAA has a goal of UAS incorporation into NAS by 2015. To some degree.
UAS Legal doings in USA w FAA (and Canada)

- 3/4/14: FAA issues document “Myths about FAA & UAS”, notes “No gray areas; COTS UAS use any altitude without a COA is illegal, FAA will come after you.” [http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=eb61df0025&e=9bb7d5959c](http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=eb61df0025&e=9bb7d5959c)

- 2/17/14: Air Traffic Controllers to FAA: “We are ready for UAS, but UAS Sense & Avoid Systems are not ready for NAS integration.” [http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=d8541ad3b0&e=9bb7d5959c](http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=d8541ad3b0&e=9bb7d5959c)

- 1/30/14: FAA MOU w DoI for UAS use for science, SAR in Class G airspace (third federal agency with such an MOU, others NASA & NOAA) [http://www.uasvision.com/2014/01/30/us-dept-of-interior-faa-sign-moa-for-suas-ops/?utm_source=Newsletter&utm_medium=email&utm_campaign=693b06c467-RSS_EMAIL_CAMPAIGN&utm_term=0_799756aeb7-693b06c467-297552653](http://www.uasvision.com/2014/01/30/us-dept-of-interior-faa-sign-moa-for-suas-ops/?utm_source=Newsletter&utm_medium=email&utm_campaign=693b06c467-RSS_EMAIL_CAMPAIGN&utm_term=0_799756aeb7-693b06c467-297552653)

- 1/10/14: FAA reiterates: No gray areas for COTS UAS: [http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=e43bf3041d&e=9bb7d5959c](http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=e43bf3041d&e=9bb7d5959c)
UAS Legal doings in USA w FAA (and Canada)

• 2/4/14 & 12/30/13: FAA releases POCs and FAQ sheet for 6 UAS test sites to be operational 180 days from 12/30/13. Purpose: help answer NAS integration questions, eg "detect and avoid," command & control, ground control station standards, human factors, airworthiness, lost link procedures & interface with the air traffic control system.

  http://www.faa.gov/about/initiatives/uas/contacts/
  http://www.faa.gov/about/initiatives/uas/faq/

Six sites: Univ. Alaska (incl. Hawaii & Oregon); N.Dakota DOC; State of Nevada; Griffiss Intl. Airport, NY; Texas A&M Univ.; and, Va. Tech. Univ. (includes NJ test site locations).

UAS Legal doings in USA w FAA (and Canada)

• 11/8/13: FAA releases UAS integration roadmap, test site & privacy policy plan, includes operator requirements (eg training) for access to NAS “over the next 15 years” during which time COAs will still be granted on a case-by-case basis.


• 11/7/13: Natl. Res. Council Canada coordinates w COTS UAS maker Bricam Flight Systems on a Civilian UAS program, standardizing on their TD-100 UAS to develop ‘sense & avoid’ and anti-icing technologies.

http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=3c35c40b3a&e=9bb7d5959c
UAS Legal doings in USA w FAA (and Canada)

- FAA established the Remote Operating Area Working Group (ROAWG) to test protocols for insertion of UAS into NAS by 2015. It is decided after considerable discussion that the North Slope of Alaska will be the focus area.
- FAA issues COAs to Conoco-Phillips Oil company, USCG, NOAA and NASA for UAS operations in 2013 from Oliktok Pt and Wainright, Alaska, completes Hotwash Report, is planning 2014 ops now.
- FAA signs MOU with Canada CAA to permit UAS ops across Canada. This allows for possibility of trans-Arctic UAS flights.
Recent UAS tech developments of note

• 3/24/14: Thales Stratobus = half drone, half satellite. Prototype due in 5 years for surveillance, comms, public events, etc.. 70-100m long, 20-30m wide.

Recent UAS tech developments of note

• 3/14/14: ETH Inst. for Dynamic Systems & Controls, Zurich, develops algorithms to allow quadrotor continued operation even when one rotor fails...patent pending...:

  http://www.uasvision.com/2014/03/14/onboard-quadrocopter-failsafe-algorithm-demo/?utm_source=Newsletter&utm_medium=email&utm_campaign=f42f1ab055-RSS_EMAIL_CAMPAIGN&utm_term=0_799756aeb7-f42f1ab055-297552653

• 3/12/14: Singular Aircraft Co. successfully demos floating UAS:

  http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=7d61f480f8&e=9bb7d5959c
Recent UAS tech developments of note

• 3/10/14: China UAS for de-fogging airports uses parafoil wing:

http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=3291bbfadd&e=9bb7d5959c
Recent UAS tech developments of note

- 3/5/14: Taking a hint from Google-X LOON project, Facebook begins negotiations to buy Titan Aerospace for $60M to develop HALE (Hi-Altitude, Long Endurance) Solar UAS to act as ‘satellite’ to bring Internet to the ‘Unserved’

http://uasvision.us2.listmanage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=ccb289c7d0&e=9bb7d5959c
Recent UAS tech developments of note

• 3/6/14: VIRES Aeronautics raises $1M for moving surface wing; greater lift allows faster take-off and landing, longer endurance for UAS. Video at: http://www.viresaero.com/products.html

• 2/28/14: Hungarians at Etovos Lorand Univ, Budapest, program UAS to fly like flock of birds, demonstrate intelligent behavior. Impressive video at:
  http://www.uasvision.com/2014/02/28/hungarian-team-creates-flock-of-quadcopters/?utm_source=Newsletter&utm_medium=email&utm_campaign=7de84fdd40-RSS_EMAIL_CAMPAIGN&utm_term=0_799756aeb7-7de84fdd40-297552653

• 2/25/14: Pletek Consulting (UK) develops radar that can track small, slow-moving UAS, and distinguish that & birds, etc.: http://www.uasvision.com/2014/02/25/new-radar-technology-detects-small-uas/?utm_source=Newsletter&utm_medium=email&utm_campaign=79832e9637-RSS_EMAIL_CAMPAIGN&utm_term=0_799756aeb7-79832e9637-297552653
Recent UAS tech developments of note

• 2/10/14: Queensland Univ. Technol. (Brisbane), working w/ Boeing, develops 1st successful onboard UAS “Sense & Avoid” system under direction of Duncan Campbell:

http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=2ce9caa994&е=9bb7d5959c
Recent UAS tech developments of note

• 1/28/14: Mass. Co. UAS w legs demo’d as perching: [Link](http://www.uasvision.com/2014/01/06/automated-uas-battery-changer-lego-prototype-from-valhalla/?utm_source=Newsletter&utm_medium=email&utm_campaign=af97d0584e-RSS_EMAIL_CAMPAIGN&utm_term=0_799756aeb7-df79d0584e-297552653)


• 11/29/13: Simon Fraser U. demos UAS that responds to voice commands or hand gestures: [Link](http://www.cs.sfu.ca/~mori/research/papers/pourmehr-iro13.pdf)

• 4/21/13: U. Ill demos perching UAS: [Video](http://www.youtube.com/watch?v=2QqTcQ1BxIs)
Recent UAS tech developments of note

• 2/24/14: Horizon Energy Singapore & Israeli co. announce first ultra-light H2 fuel cell for UAS..COTS used on BLUEBIRD UAS:

http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=c50e2d9945&e=9bb7d5959c
What the biz is/are

• 2/27/14: Swedes ship Cybaero to China, reveal on 3/24/14 use = port & harbor security, restrict smuggling:  
  http://uasvision.us2.list-manage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=26b6476edd&e=9bb7d5959c

• 2/24/14:  Peru buys UAS fleet for archaeological surveys to speed building permits, build national archive.  Will add lidar:  
  http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=5d8ff483b6&e=9bb7d5959c

• 1/24/14: Swiss Co. RCHelijet makes UAS models of COTS manned/industry aircraft for wind tunnel, etc. testing:  
  http://uasvision.us2.list-manage1.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=f1ac1b289e&e=9bb7d5959c
Latest Solar UAS tech re Stanford projects

• 3/27/14: “SILENT FALCON” Solar UAS COTS in Latin, S. America & Asia. (6-12h endurance, parachute recovery):
  
  [Link](http://uasvision.us2.listmanage.com/track/click?u=a32b39b68dd99ad58d8db5aca&id=9559e0fe4c&e=9bb7d5959c)
Latest Solar UAS tech re Stanford projects