Scientific Committee for Oceanographic Aircraft Research UNOLS SCOAR

Report to the UNOLS Council
November 22 2019

Luc Lenain
Scripps Institution of Oceanography
San Diego, CA

Current Membership:

David Fisichella – Woods Hole Oceanographic Institution (WHOI)
Luc Lenain – Scripps Institution of Oceanography (SIO)
Hanumant Singh – Northeastern University (NEU)
Mike Starek – Texas A&M University (TAMU)
Chris Zappa – Lamont-Doherty Earth Observatory (LDEO)
Britton Stephens – National Center for Atmospheric Research, NCAR (new member)

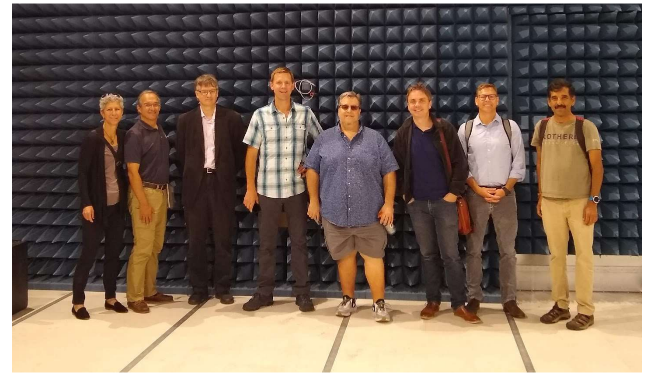
Steve Hartz – University of Alaska Fairbanks (UAF) (RVTEC Rep, ex-officio)
Haflidi Jonsson – NPS (ex-officio) retired October 2020, replacement TBN
Roy Woods – NPS (ex officio)

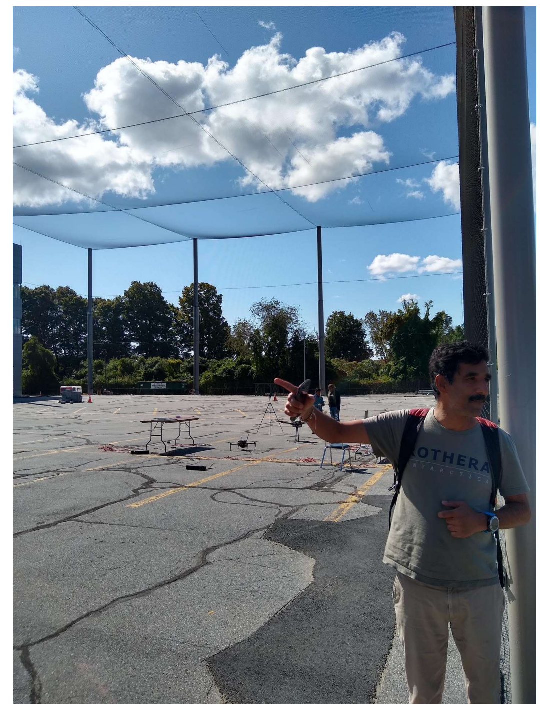
Goal: Keep a balance between **unmanned** and **piloted** aircraft research expertise

SCOAR meeting September 12-13 2019, Northeastern University, Boston, MA & Burlington UAS Laboratory

UNOLS
UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

SCOAR - Scientific Committee for Oceanographic Aircraft Research





Selection of presentations available on the SCOAR website:
https://www.unols.org/committee/scientific-committee-oceanographic-aircraft-research-scoar

- Federal agency reports (USCG, NOAA UAS and Aircraft programs, NASA, NPS, NSF and ICCAGRA)
- Science presentations from various research institutions
- NPS Twin Otter update
- Annex VIII to the UNOLS Charter review (now completed)
- Burlington UAS Laboratory visit

- Now that the Unmanned Aerial Systems (UAS) Operations from the Academic Research Fleet Operator's Handbook is completed, how do we advertise this capability to the broader research community, and make it standard on all research vessels?
  - Ocean Sciences 2020 Town Hall meeting (accepted)
  - Update UNOLS SCOAR website to provide aircraft information (manned and unmanned) along with science POCs
  - Create a roadmap for making UASs a standard part of the US ARF (likely joined effort between SCOAR & RVTEC)

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TH33F - Expanding the Reach of the Research Fleet: Autonomous (and Piloted) Airborne Systems in Support of Ocean Sciences

Wednesday, 19 February 2020

12:45 - 13:45

SDCC - 9, UL

Operation of unmanned aerial systems (UAS) from shore and ships can advance oceanographic research and expand capabilities of ocean observing systems. This town hall, hosted by the UNOLS Scientific Committee for Oceanographic Aircraft Research, will provide a forum for discussion of current and future methods and uses of unmanned and manned aircraft in support of ocean sciences. Unmanned and manned aircraft can assist in areas such as ocean-atmosphere interaction, remote sensing, satellite product validation, marine mammal and seabird populations, oceanographic mesoscale and submesoscale processes, as well as studies of sea ice, fisheries, and shipping. Further, the use of airborne systems in coastal and offshore waters can provide information for marine resource management and response to natural and shipping accidents. Discussion on aircraft in support of ocean sciences is timely because of advances in sensor capabilities and the increasing availability of UAS to the oceanographic community. This town hall discussion will also address UAS integration in the research fleet. Finally, the town hall will review the piloted aircraft available to the research community and provide resources on their use. Examples of airborne operations in support of oceanographic research will be highlighted. Community input on potential uses and needs is strongly encouraged.

Primary Contact

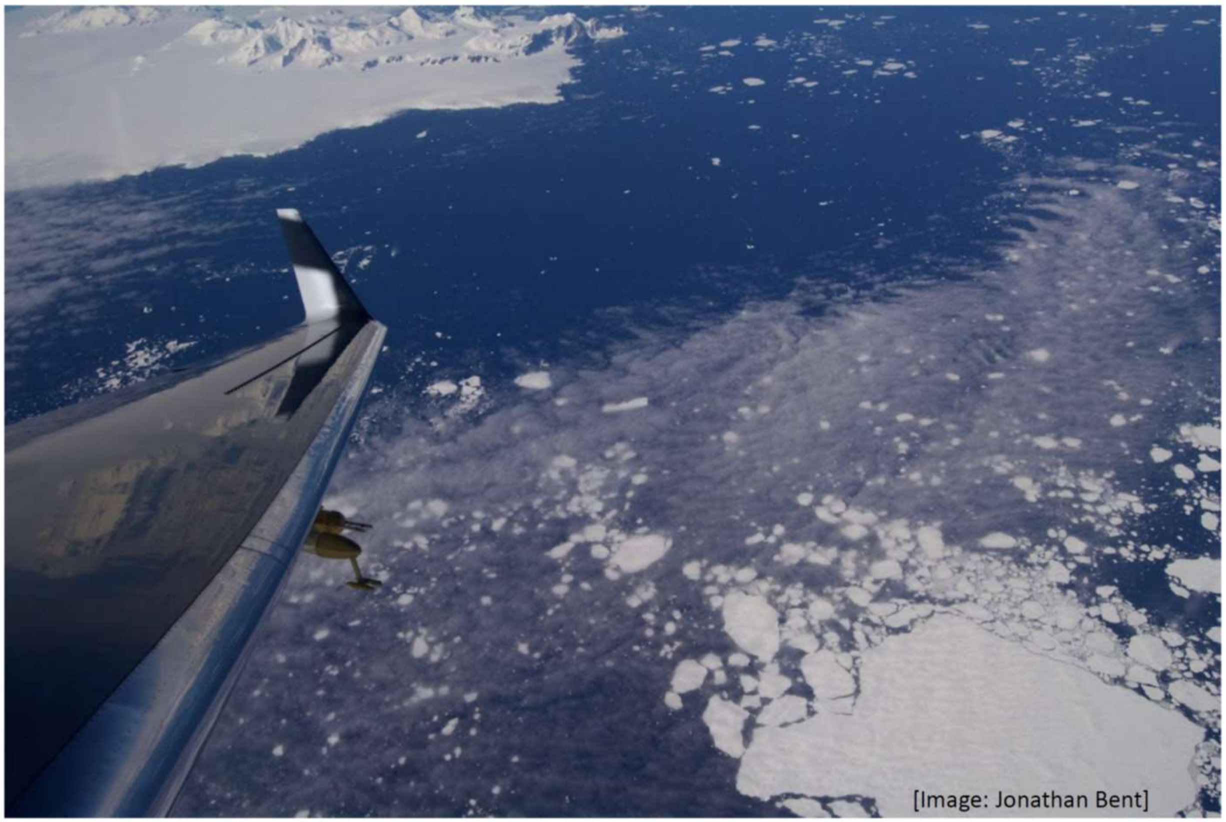
Christopher J Zappa
Columbia University, Lamont-Doherty Earth Observatory

Presenter

Luc Lenain
Scripps Institution of Oceanography

Opportunity to develop stronger ties between UNOLS & NCAR through Brit Stephens (NCAR), new member of the committee

Recent NSF Supported Airborne Oceanography Campaigns and Future Directions



[Image: Jonathan Bent]

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Britton Stephens, NCAR Earth Observing Laboratory / Research Aviation Facility

NSF

Burlington UAS Lab

Outdoor UAS Test Range

- Outdoor 150'x200'x60' netted enclosure for GPS enabled flight testing
- Equipped with enhanced kinematic GPS for extremely precise centimeter positioning
- Steady state/gust wind test capability for small drones for performance characterization
- Interconnected flight path between outdoor and indoor test ranges for seamless transition
- 60' observation deck in adjacent building for flight test viewing

Indoor UAS Test Range

- Large-scale Faraday cage/Anechoic Chamber (50'x50'x22')
- 64 antenna/SDR array for jamming, interference, spoofing, communications testing, and Global Navigation Satellite System (GNSS) Simulator
- EMP test capability (RS105)
- Networking for autonomy, swarms and massive MIMO
- Able to test large drones up to 1300+ lbs
- RF testing from 300MHz to 18+GHz
- 24 camera HD optical tracking system for precise positioning

Institute for the Wireless Internet of Things
at Northeastern

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'Sustained' drone attack closed Gatwick, airport says

By Tom Burridge
Transport correspondent, BBC News

20 February 2019

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Gatwick drone shutdown

Sussex Police, the government and Gatwick airport say that the severe travel disruption last year was caused by a "sustained" drone attack.

The situation caused disruption for tens of thousands of passengers. Gatwick's decision to close was taken after a risk assessment with police.

The New York Times

Newark Airport Traffic Is Briefly Halted After Drone Is Spotted

Flights bound for Newark Liberty International Airport were halted on Tuesday evening after a drone was spotted flying nearby. Julio Cortez/Associated Press

By Patrick McGeehan

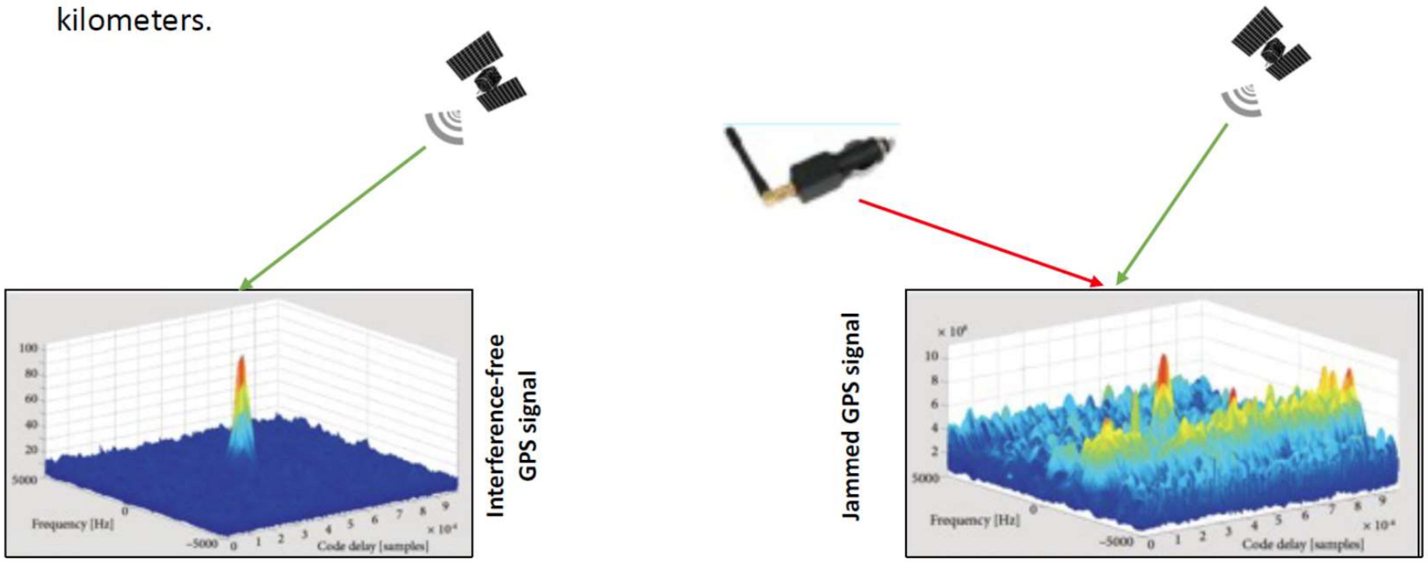
Jan. 22, 2019

[What you need to know to start the day: Get New York Today in your inbox.]

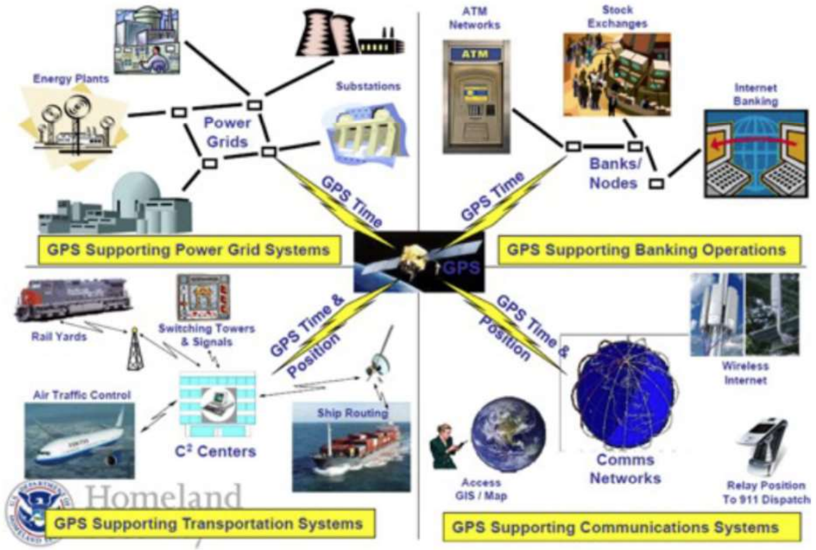
All flights bound for Newark Liberty International Airport were halted on Tuesday evening after two pilots reported seeing a drone flying

Hanu Singh (NE)

- Jamming signals are extremely simple to generate and broadcast.
- For instance, although illegal in some countries, it is fairly easy to buy a jamming device and cause Denial of Service (DoS) of GPS positioning and timing in an area of up to several kilometers.

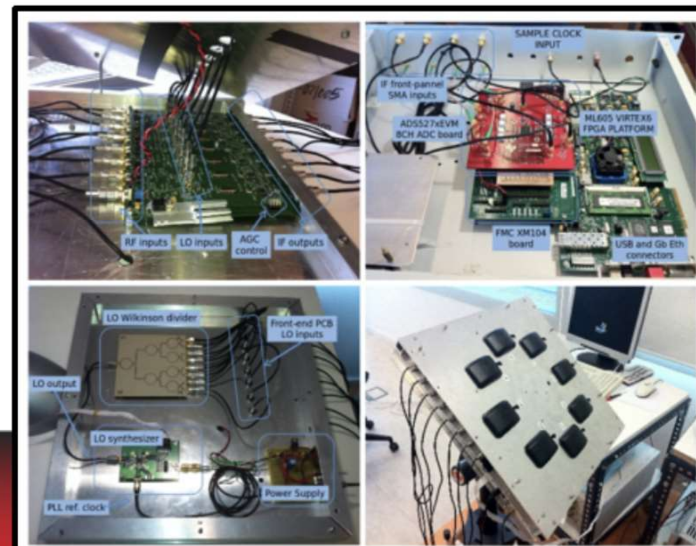


- In the case of GPS, this vulnerability can cause catastrophic consequences since, according to US DHS, “15 of the 19 Critical Infrastructure & Key Resources Sectors have some degree of GPS timing/positioning usage”.



J. Merrill, "Patriot Watch: Vigilance Safeguarding America," presented at the Presentation Telcordia-NIST-ATIS Workshop Synchronization Telecommun. Syst.(WSTS ’12), Mar. 20–22, 2012.

- Similarly, one could think of jamming attacks to other services (e.g., communications systems or radar) which could eventually lead to equally damaging effects.
- There is a need for **detecting and locating** sources of malicious transmissions, which are aimed at causing DoS of critical services and infrastructures.
- In high-grade applications, as those involving the security of critical infrastructure, interference sources are typically detected and located by **antenna array technology**. However, such approach is known to be
  - costly to prototype,
  - complex to implement,
  - power hungry, and
  - bulky to place in even mid-sized drones.



C. Fernández-Prades, J. Arribas and P. Closas, "Robust GNSS Receivers by Array Signal Processing: Theory and Implementation," in **Proceedings of the IEEE**, vol. 104, no. 6, pp. 1207-1220, June 2016.

Northeastern University
Electrical and Computer Engineering

Of obvious relevance to ARF as it directly applies to ship operations

Hanu Singh (NE)

Thank you!