WEBINAR SERIES ON ADVANCED MOBILITY
Acknowledgement

The presenter wishes to acknowledge the IEEE Vehicular Technology Society for their sponsorship of the Webinar Series on Advanced Air Mobility.
Air Corridors: Highways in the Airspace for Advanced Air Mobility Services

March 6th, 2023

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Advanced Air Mobility Services
Key Challenges to Implementing AAM Services

- Autonomy
- Traffic Management at Scale
- Communication Support
- Air-to-Air Conflict Management
- Security and Privacy
- Community Acceptance
- Regulations and Best Practices
Key Concepts in Airspace Management

• Air Corridors: Structured airspaces reserved (to some extent) for AAM services
• Geofences: virtual three dimensional “boundaries” each UAS flies within
• UAS-to-UAS Communications: An alternative solution for traffic coordination
Air Tracks and Air Corridors
Air Corridors / Skylanes

- EMERGENCY
- STANDARD EASTBOUND
- STANDARD WESTBOUND
- STANDARD SOUTHBOUND
- FAST LANE
Circular Intersection
(Roundabout)

CHECK FOR TRAFFIC

MERGE / CROSS

SLOW DOWN
Challenge: Detect And Avoid
Challenge: Collision Avoidance

Tactical Deconfliction (UAS-TO-UAS)
Challenge: Right of Way

Package Delivery Drone
Air Ambulance
Intersection
Modeling an Intersection
Modeling an Intersection
Modeling an Intersection
Modeling an Intersection

- Package Drone
- Air Ambulance
- Intersection
Modeling an Intersection
Modeling an Intersection
Modeling an Intersection
Modeling an Intersection

- Package Drone
- Air Ambulance
- Intersection

[Diagram of an intersection with Package Drone and Air Ambulance symbols]
Modeling an Intersection
Modeling an Intersection
Modeling an Intersection
Modeling an Intersection
Literature on Air Corridors: The Tube Model (2004-2009)


“The space is discretized into grids. Each grid has 10 nautical miles in width and 2 minutes in height. A grid can be looked on as a safety zone, which means only one flight is allowed in it.”
Recent and Relevant Literature (2021-2022)


Geofence

Definition: In the context of UAS, the term geofencing is used to describe virtual three dimensional “boundaries” each UAS flies within or avoids as a no-fly zone (NFZ)

First Flight Test in DFW Air Corridor (October 11th, 2022)
Designing Air Corridors in Dallas-Fort Worth, Texas, USA (Courtesy: NASA)

- Air corridor design required identifying airspace that was 2,500 ft laterally or 1,000 ft vertically separated from traditional traffic.
- The corridors were located only in Class B and Class D airspace and housed tracks or pre-defined routes that connected 34 potential vertiports in the region.
- All the corridor volumes were assumed to have a floor of 400 AGL and a ceiling of 600 with UAM flights planned to fly at 500 ft AGL or approximately 1,100 ft MSL.

Communication Support for AAM Services

- Communication support is required for traffic management, tracking, coordination, positioning (interference mitigation), BVLOS and BRLOS communications (relaying), routing, and others.

- Satellite, Cellular, and Direct V2V are three candidate technologies each with its own advantages and disadvantages offering various bandwidth, latency, coverage, reliability, and QoS tradeoffs.
  - Satellite: Unlimited coverage, large latency, and large Doppler effect
  - Cellular: Medium coverage, medium latency, and less availability
  - Direct: Limited coverage, low latency, and less reliability
In September 2022, The Radio Technical Commission for Aeronautics (RTCA) identified five use cases for UAS to UAS communications.

1. Collision Avoidance
2. Merging/spacing and sequencing of Traffic
3. Airborne Separation
4. Airborne Rerouting
5. Sensing and Sharing of Airspace Hazard Information

IEEE P1920.2 WG is developing a standard for UAS-to-UAS Communications which is expected to be released by the end of 2023.
Air Corridor Emulation on AERPAW

Air Corridors Emulation | IEEE DataPort (ieee-dataport.org)
https://ieee-dataport.org/documents/air-corridors-emulation

John Kesler, Mihail L. Sichitiu, Kamesh Namuduri, February 12, 2023, "Air Corridors Emulation"
Thank You!

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Please join us for next month's Webinar on Advanced Air Mobility featuring Professor Rui Zhang on the topic of “UAV Communications for 5G/6G” on April 3rd, 2023.
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3 APRIL

UAV COMMUNICATIONS FOR 5G/6G

MONDAY 3 APRIL

TIME 9 AM EST (UTC-5)

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