Distributed Sensing for Advanced Air Mobility in Varying Environments

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A sensor dataset was acquired from approximately 100 low-altitude flight operations across NASA Langley Research Center, NASA Armstrong Flight Research Center, and Castel Campagnano Italy to develop and advance distributed sensing techniques to enable widespread autonomous Advanced Air Mobility Operations. The objective of these experiments is to create a comprehensive database of Uncrewed Aircraft Systems (UAS) and Advanced Air Mobility (AAM)-like aircraft performing varying maneuvers in different sensing environments for evaluating the generalizability of sensors and tracking algorithm performance. Preliminary outputs of existing sensing algorithms are presented herein.

I. Introduction

The concept of low-altitude flight operations is being transformed through the confluence of multiple enabling technologies include innovations in autonomous systems, novel emerging vehicle designs, advancements in Electrical Vertical Take-Off and Land (EVTOL) capabilities, and business strategies to unlock new aviation market opportunities, commonly referred to as Advanced Air Mobility (AAM) [1]. The convergence of these innovations enables the airspace vision shown in Figure 1 and includes a variety of operation types and aircraft falling into three

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major categories: Urban Air Mobility (UAM), Low altitude Uncrewed Aircraft Systems (UAS), and Regional Air Mobility (RAM) [2]. Urban Air Mobility covers missions of up to 75 miles around cities potentially using vertiports located on rooftops of buildings, utilizing EVTOL aircraft for moving cargo and up to six people. UAS operations concern small delivery services such as package delivery or sensor payloads. Finally, RAM is intraregional autonomous missions for moving larger cargo and up to ~30 people up to 500 miles. Each of these flight operations categories have unique and shared technical and infrastructure challenges to achieve widespread autonomous flight operations.

The National Aeronautics and Space Administration's (NASA) Advanced Air Mobility (AAM) mission develops and advances technologies to enable the AAM vision. This work is conducted through seven key projects: Advanced Capabilities for Emergency Response Operations (ACERO), Air Mobility Pathfinders (AMP), Air Traffic Management-eXploration (ATMX), Convergent Aeronautics Solutions (CAS), Revolutionary Vertical Lift Technology (RVLT) [3], System-Wide Safety (SWS), and Transformational Tools and Technologies (TTT).

ACERO develops autonomous UAS and Small Uncrewed Aircraft Systems (SUAS) capabilities for teaming with piloted aircraft to improve wildfire response and protect human life and property [4]. AMP supports industry innovation in AAM aircraft systems development [5]. ATMX creates operational concepts for high-density flight operations, emphasizing airspace and infrastructure integration [6]. CAS advances new mobility-related concepts through rapid experimentation and preliminary analysis before integration into other aeronautics projects [7]. RVLT partners with industry and government to test cutting-edge eVTOL designs [8] [9], evaluating safety and reliability. SWS enhances flight operations and safety through data solutions that enable safe, scalable commercial airspace operations. TTT focuses on human-machine teaming for airspace surveillance, intelligent contingency management, and novel sensing strategies [10].

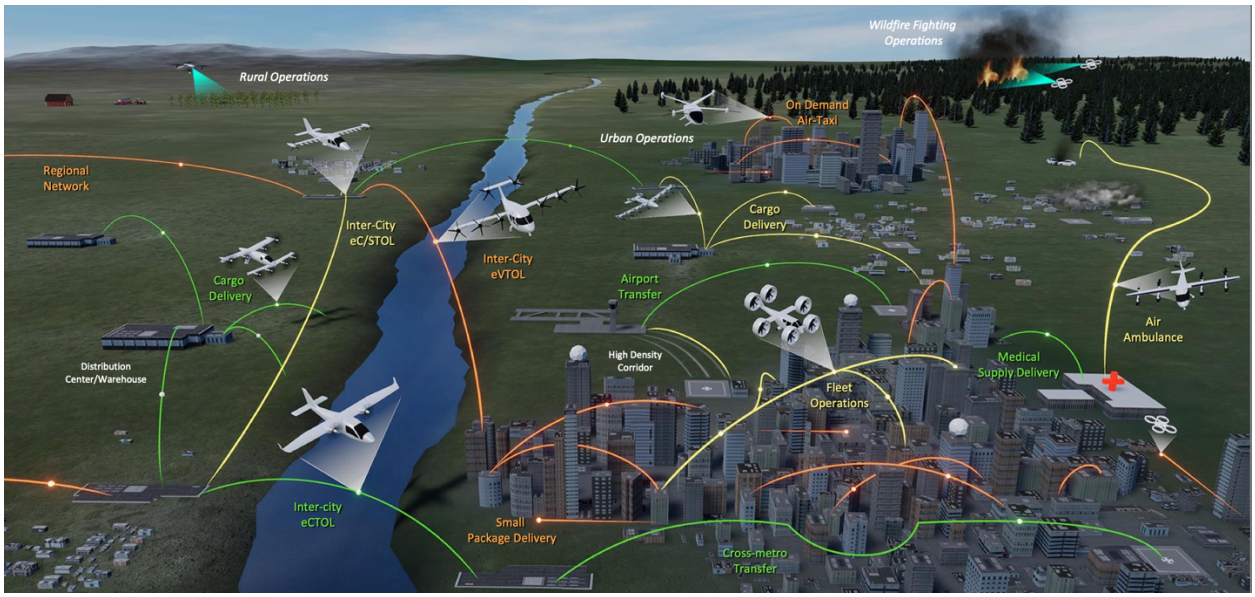


Figure 1: Advanced Air Mobility [2].

Within the airspace surveillance discipline of TTT, the distributed sensing team explores the challenges associated with real-time surveillance strategies in urban environments to enable AAM [11]. Areas of cross-pollinating research include:

- development and evaluation of techniques for airspace surveillance and conformance monitoring for vertiports and traffic corridors [12]
- precision navigation and timing with and without GPS [13]
- distributed detection of airborne hazards, onboard detect and avoid for UAS and SUAS [14] [15]
- simulation of AAM traffic to enable distributed sensing methodology [16]
- generating sensor datasets for the AAM community for development of algorithms [17] [18].

This work develops distributed sensing capabilities through three complimentary experiments generating a large dataset of diverse sensing locations for surveilling AAM airspace. A common challenge in sensing research is limited dataset size [19]. These experimental locations are selected to address the challenge of sparce data: the first collection location was NASA Langley Research Center where three SUAS performed complex flight maneuvers in an urban like setting and rural coastal terrain; second, Edwards Air Force Base in California's Mojave Desert, where a helicopter simulated full-scale AAM operations as a preparatory experiment for actual EVTOL UAS testing; and third, in Castel Campagnano, Italy's mountainous agricultural setting, where dense SUAS operations tested radar interference patterns between multiple radar systems operating in close proximity to simulate urban sensing challenges. These experiments yielded a large dataset with varied locations and aircraft types, which generates an evaluation framework for varying sensors against different aircraft for generalizability of distributed sensing strategies for AAM traffic surveillance. This paper provides a review of preliminary algorithmic output based on the aforementioned data with a more comprehensive analysis forthcoming.

II. Sensors and Algorithms

The sensor nodes are configured as detailed in Table 1 with additional details available in previous publications [15]. All nodes feature cameras equipped with Sony IMX253 or Sony IMX304 sensors as well as an Echodyne Echoflight radar system. All sensor node configurations are documented in the CAD drawings available here: [20]. One of the developed nodes features three cameras with a 1-degree overlap in their fields of view, creating a combined horizontal field of view of 139.9° and a vertical field of view of 36.1°. The 3-camera node utilizes a baseplate for rail mount or tripod mount. More generally, other nodes feature a single camera and are field deployable via a tripod. Finally, the payload node may be integrated to a SUAS and powered via a lithium polymer for attachment to SUAS or tripod mounted with a separate power supply (e.g. wall power, battery bank). The cameras typically acquire footage at 10 Hz and radar is updated at 9 Hz. For all experiments, the goal is to make the resulting labeled dataset publicly available to the maximum extent possible including vision, radar, GPS logs, and flight controller logs. A typical vision acquisition of each camera yields approximately 150 gigabytes per 10 minutes of data while other sensor data is on the order of several hundred megabytes. The GPS unit included in the node facilitates time synchronization across sensors and nodes along with the position of the node for reference.

Table 1: Node Sensor Configuration.

Node	Camera Resolution (pixels)	Horizontal and vertical Lens FOV (degrees)	Radar model	RADAR FOV (degree)	GPS	Datalogger(s)
3-Camera	3 x 4096 x 3000	47.3 x 36.1 Each lens	Echoflight	120 x 80	ZED-F9P (Ublox)	3 x Xavier Orin AGX
1-Camera Orin	4096 x 3000	62.5 x 47.8	Echoflight	120 x 50	ZED-F9P (Ublox)	Xavier Orin AGX
1-Camera Nuc	4096 × 3000	62.5 x 47.8	Echoflight	120 x 50	ZED-F9P (Ublox)	NUC 11
1-Camera Payload	4096 x 3000	62.5 x 47.8	Echoflight	120 x 60	ZED-F9P (Ublox)	Xavier Orin

A. Vision Sensing

The vision detection processing pipeline, as described in [15], follows a systematic approach to object identification and tracking as diagrammed in Figure 2. The pipeline is divided into two primary sections: detection and tracking. Initially, spatial and temporal object detectors extract objects of interest from the imagery. This is primarily done through classical computer vision techniques, including morphological detection, image differentiation, and background subtraction techniques. The resulting detections are then clustered using the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm [21] to prevent multiple tracks of the same

object. After detections are clustered, they are passed into the tracker, which uses a near-constant velocity model in its Kalman filter to provide robust and noise-resilient tracks. The tracker either associates new detections with existing tracks using an association algorithm or generates new tracks with Kalman filter parameters. Finally, tracks meeting established thresholds are reported as established tracks.



Figure 2: Visual tracking algorithm.

B. Radar Sensing

The radar operates at 24.55 GHz Frequency Modulated Continuous Wave (FMCW) with a maximum field of view of 120° in azimuth and 80° in elevation. The radar provides three channels for offsetting to reduce radar interference. A search while track mode is engaged to allow improved localization by using the radar's built-in tracker. Analysis in this work utilizes detections associated with the radar's built-in tracker as described in [22].

III. NASA Langley Experiments

A suite of 17 experiments with 46 SUAS test flights were executed on July 12th, 20th, and 26th, 2025 using three aircraft for distributed airspace sensing at NASA Langley's City Environment for Range Testing Autonomous Integrated Navigation (CERTAIN) Range [23] as summarized in Table 2. These tests generated datasets to advance UAS safety via surveillance systems research for vertiports and air traffic corridors, helping mature traffic management strategies, autonomous operations, and GPS-denied precision tracking technologies.

A. Sensor placement

An overview of the flight pattern and sensor locations is shown in Figure 3, and Figure 4 shows the perspective of the sensors in position. Two SUAS flew autonomous Beyond Visual Line of Sight (BVLOS) missions shown in Figure 3 by the green line from the CERTAIN Range (A in figure 3) to Langley's fire department roof and building 1247, and returned via the same route. Flight patterns tested well-clear definitions using either co-altitude with 500ft horizontal spacing or 100ft vertical separation. BVLOS operations were controlled from the Mission Operations and Autonomous Integration Center (MOSAIC) [24] in building 1268 as shown in Figure 5a while VLOS operations were controlled in the field as shown in Figure 5b. A third radar and camera-equipped SUAS observed the BVLOS flights from two separate and distinct routes: from the hangar via Lindbergh Way (E in Figure 3) to the fire department and from East Reid Street over the hypersonic wind tunnel to the softball field (D in Figure 3). In total, sixteen sensors monitored operations, including K/S/L-band radars on the LandIR facility (A in Figure 3), aircraft hangar (building left of E in Figure 3), buildings 1268 (F in Figure 3), and building 1232 (B in Figure 3), in addition to nine strategically placed ground cameras across campus.

Table 2: Dataset Summary.

Test #	Date	Alta Location	Alta 8 Profile	Alt. Alta X [ft]	Alta X Speed (kts)	Alt. Alta 8 Leader [ft]	Alt. Alta 8 Follower [ft]	Alta 8 Speed (kts)	Skydio Y/N
1	7/12/2025	South	NA	Check flight	8	NA	NA	NA	N
2	7/12/2025	South	NA	N	X	Check flight	NA	15	N
3	7/12/2025	South	NA	Check flight	7	150	150	8	N
4	7/12/2025	South			4	150	150	8	N
5	7/12/2025	South	Co-alt	150	4	150	150	17.5	N
6	7/12/2025	South	Co-alt	150	9	150	150	25	N
7	7/20/2025	North	NA	Check Flight	17.5	NA	NA	14	N
8	7/20/2025	North	Co-alt	175	10	150	150	14	N
9	7/20/2025	North	Co-alt	150	10	150	150	14	N
10	7/20/2025	North	Co-alt	125	10	150	150	14	N
11	7/20/2025	North	Co-alt	200	10	250	150	14	N
12	7/20/2025	North	Co-alt	200	10	250	150	14	N
13	7/26/2025	South	Co-alt	125	10	150	150	14	N
14	7/26/2025	South	Co-alt	175	10. 7	150	150	14	Y
15	7/26/2025	South	Stacked	200	10, 7	150	250	14	Y
16	7/26/2025	South	Stacked	125	10, 7	150	250	14	Y
17	7/26/2025	South	Stacked	175	10	150	250	14	Y

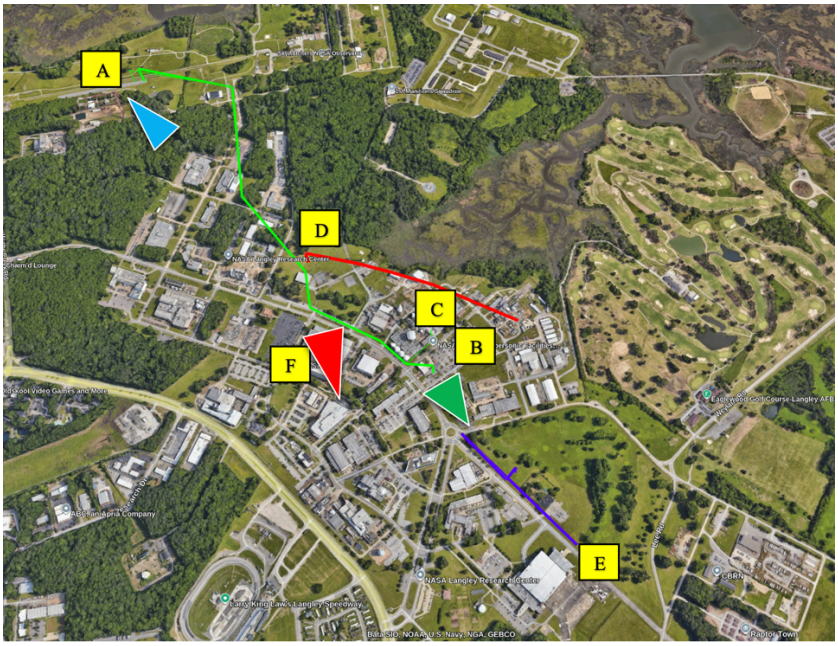


Figure 3: SUAS waypoint patterns: Alta 8 start their mission at the vertiport located at A and fly to rooftops denoted by B and C while being observed by Alta X maneuvering in positions D or E. F shows the building with MOSAIC control room for Alta 8s. The triangles show the approximate location and Field of View of gantry (blue), 1268 (red), and 1232 (green).



(a) (b) (c) (d)

Figure 4: Sensor in locations: a) 1232 rooftop b) 1268 rooftop c) gantry d) on SUAS.



(a) (b)

Figure 5: Alta 8 control location in MOSAIC (a) and ground control station for Alta X (b).

B. SUAS operations logistics

The experimental team used three vehicles operating simultaneously along with ground units placed throughout the flight range to capture the dataset. This involved a mixture of BVLOS and Visual Line of Sight (VLOS) operations supported by eleven operations personnel and numerous researchers. All operations occurred on the CERTAIN UAS test range located at NASA Langley which features a mixture of urban and rural environments. Flight paths are shown in Figure 4. The green line shows the missions flown by the two BVLOS Alta 8 vehicles. The red and blue flight paths show the two options for flight paths of the VLOS Alta X vehicle, which was equipped with the payload node.

Each scenario consisted of the BVLOS vehicles flying from the north takeoff point, known as Vertiport 1, landing on an assigned rooftop, then taking off again to return to Vertiport 1. Approximately 30 seconds of buffer between the vehicle departure times was used to maintain a minimum safe separation of 100 feet vertically or 500 feet laterally. These missions occurred between 10 to 20 knots with each BVLOS vehicle traveling the same speed. Missions were either flown at co-altitude or with 100ft altitude separation. If the vehicles were co-altitude, the first vehicle to takeoff would lead the second along the route to maintain lateral separation. Operations conducted with a 100ft separation took off at the same time, allowing for one vehicle to conduct its mission directly on top of the other vehicle.

Simultaneously, while the BVLOS missions occurred, the VLOS vehicle would repeatedly fly on either the red path or blue path (Figure 3) depending on the scenario. The mission altitude of the VLOS vehicle was either 125ft, 150ft, or 175 ft. Scenarios would begin with the VLOS vehicle taking off, establishing its mission altitude, and beginning its flight plan. While on the flight plan, the vehicle maintained its heading towards the path of the BVLOS vehicles to ensure they were in the payload's field of view. On the red path (Figure 3), the VLOS vehicle began to follow the BVLOS vehicles in parallel as they flew over the street and focused on the rooftop as they land. On the blue path (Figure 3), the VLOS vehicle with the sensor payload held position at the top of blue line to surveil the BVLOS vehicles land as they take off and land from the rooftops (B & C Figure 3). In the other flight path scenarios in Table 2, the VLOS vehicle with the sensor payload continued to loop its flight plan to surveil the BVLOS on their routes between vertiport and the buildings.

C. MOSAIC and Crew Overview

NASA Langley conducts BVLOS operations from the MOSAIC remote operations facility, which consists of six workstations used by the required crew and a video wall at the front of the room which mirrors workstation screens for situational awareness. BVLOS operations require a variety of roles, including Remote Pilots in Command (RPICs), a Range Safety Officer (RSO), a Mission Commander (MC), a Radar Operator (RO), an Airspace Monitor (ASM) and a MOSAIC Operator (MO). Figure 6 demonstrates how these roles were laid out within MOSAIC. RPICs are responsible for one BVLOS vehicle at a time, ensuring the mission is executed as planned. RPICs work with the Vehicle Service Crew (VSC) in the field to complete the preflight check list prior to takeoff. At least one VSC is located at each takeoff and landing location for BVLOS vehicles. The RSO ensures that all missions are conducted within NASA safety policies according to the briefed plan. An MC is required for complex operations and is used to coordinate the BVLOS and VLOS operations. The RO ensures that the radar systems supporting BVLOS operations are operational without any warnings or errors. The ASM is responsible for monitoring the airspace during BVLOS operations to check for potential airspace conflicts between UAS and crewed aircraft. Finally, the MO configures MOSAIC and resolves any issues crew members may encounter with the workstations. This operation utilized two RPICs, one person serving as the RSO, MC, and ASM, and one person serving as the RO and MO.

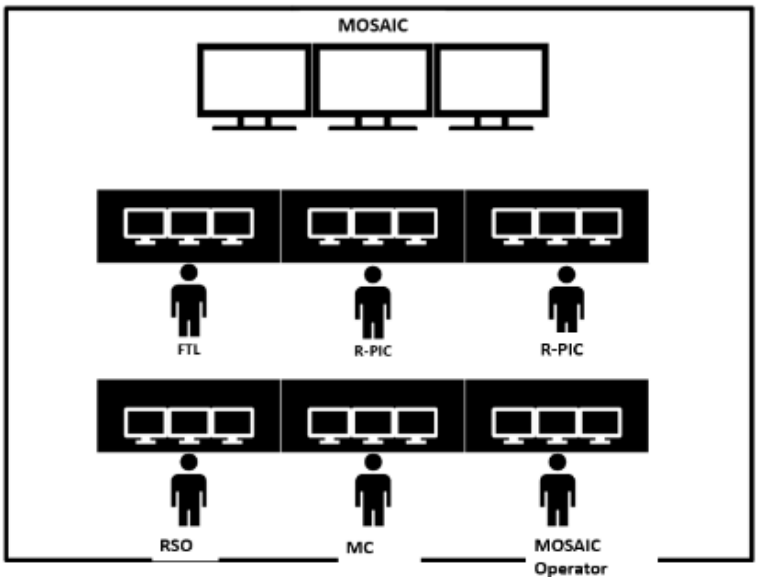


Figure 6: Location of Roles in MOSAIC.

For the VLOS operations, a crew of a Pilot in Command (PIC), Ground Control Station Operator (GCSO), and a Visual Observer (VO) was required. The PIC is responsible for the safety of the aircraft during its operation and can manually control the vehicle through an RC link. The GCSO supports the RPIC by reading telemetry information from the vehicle through a ground control station. They also program the autonomous missions and issue mission commands, such as updating current waypoints. The main responsibility of the VO is to observe the airspace around the vehicle and inform the PIC of incoming traffic that may interfere with the operation of that vehicle. This role is not required for the BVLOS operations because it is achieved through surveillance devices and the ASM. In BVLOS, the role of the PIC and GCSO are filled by the RPIC, who controls the vehicle remotely from MOSAIC at a ground control station.

D. Supporting Operational Systems

Numerous support systems were required to successfully execute these operations, including surveillance systems for tracking air traffic, systems for communication with the vehicles controlled by the RPICs, and systems for voice communications throughout the distributed team. For aircraft tracking, NASA utilized two GA9120 radars, an LSTAR radar for non-ADS-B emitting traffic, and PingStation ADS-B receivers for ADS-B emitting traffic. To track participating UAS, NASA utilized Flight Alarm (FLARM) transceivers for position with ground receivers. This allows the ASM to view a complete picture utilizing Traffic Awareness and Ubiquitous Real-time Airspace Surveillance TAURAS, a NASA-developed integrated airspace display [23]. The TAURAS system ingests numerous surveillance data feeds and displays them in real time inside the MOSIAC laboratory. RPICs had two data links available to

communicate with the BVLOS vehicles: a 900MHz data link and a Long-Term Evolution (LTE) cellular data link. Multiple connections allow for redundancy if one data link fails. The 900MHz links were placed on top the Landing and Impact Research Facility (LandIR), a structure that is roughly 250 feet tall within the CERTAIN flight operations range. RPICs were able to interface with these devices through the NASA network, enabling remote connection to the device from MOSAIC. The LTE link utilized a cloud-based network connection, allowing secured direct connection directly through the vehicle if cell signal was available at the location of the vehicle. Communication within the team was achieved through the Clear-Com voice over Internet Protocol (IP) system due to the spatial separation of operations and research personnel. Clear-Com allows for multiple users to communicate over different channels utilizing internet capable devices that can connect into the Clear-Com matrix, hosted at NASA Langley. For this operation, the team utilized a desktop version of the clear-com interface for the team in MOSAIC and a cell phone version for field-deployed members. Clear-Com allows for multiple channels to be active for communications. Through their interface, users may select which channels to listen to and which they will transmit communications on. Each take-off and landing location was allocated their own channel to conduct preflight checks. A channel was set up for general flight operations communication, and another channel was created for safety related calls, such as off-nominal situations. The safety channel was set to force listen for all personnel to ensure they received critical communications. This allowed the team to maintain continuous communication as they prepared and executed the operations.

E. Sample results

Sample results of the vision pipeline are shown in Figure 7. Initial inspection of the visual detection pipeline demonstrates strong detection of SUAS during take-off and landing, as well during the traversal of NASA Langley's campus from the 1232 rooftop location as highlighted by the green cone in Figure 4. Future work includes in depth analysis of SUAS performance throughout Langley's campus using multiples sensors and locations.

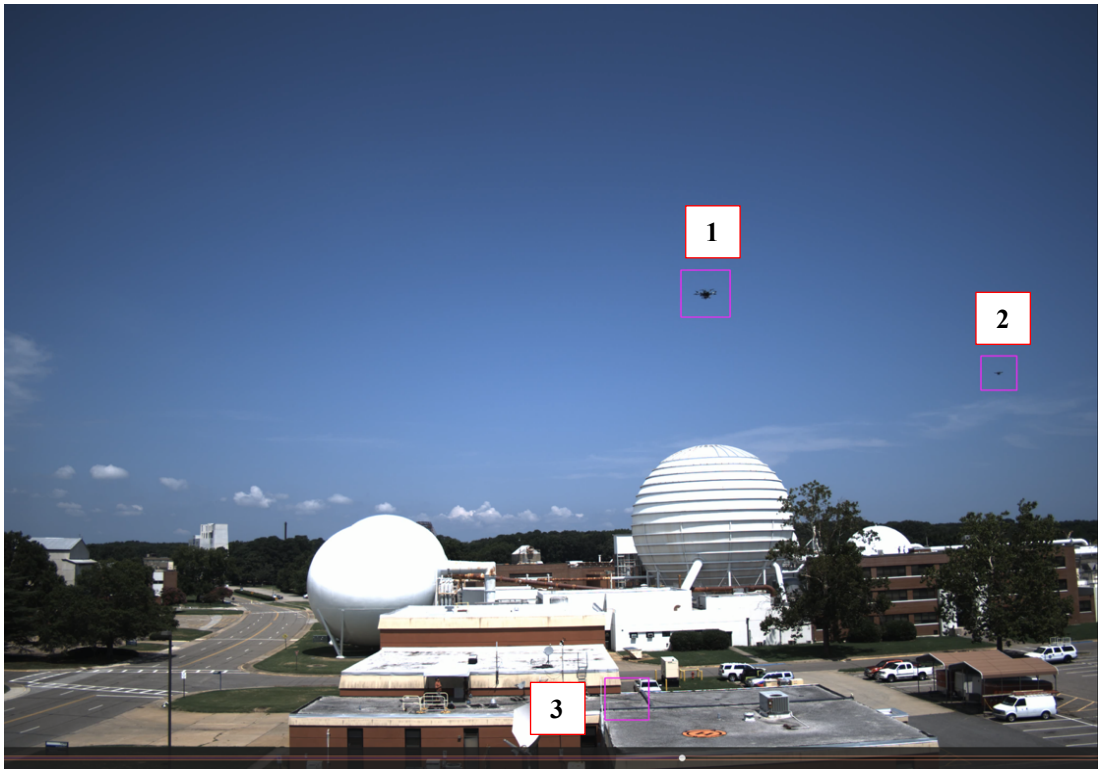


Figure 7: Sample output of Vision Pipeline where the number 1 indicates the location of the lead SUAS, 2 the follower SUAS, and 3 the shadow of the lead SUAS on the building of the rooftop takeoff

IV. NASA Armstrong Experiments

Experiments were conducted at Edwards Air Force Base (home to NASA Armstrong Flight Research Center) the week of March 12th, 2025, over the northern portion of Rogers Dry Lakebed. A Robinson R44 helicopter served as a proxy for an AAM aircraft. The experimental program originally planned to collect sensor data during Joby S4 eVTOL flight tests; however, mechanical and weather challenges kept the S4 grounded during the deployment period. The R44 was selected as an alternative subject because Joby operates it as a safety chase aircraft with flight performance characteristics similar to the S4, enabling formation flight operations. While not the intended target aircraft, the R44 provided a representative AAM-scale aircraft for evaluating the distributed sensor network.

The R44 pilot flew a proficiency flight to maintain currency and obtain flight experience in the local airspace, completing one flight with three loops as shown in Figure 8. The NASA team opportunistically collected data during this flight without directing the flight profile. Environmental conditions included partly cloudy skies with bright mid-day sun and strong winds that generated dust from the dry lakebed.

The helicopter was not equipped with a dedicated GPS logger for these operations. Ground truth data for algorithm evaluation was obtained from ADS-B messages transmitted by the helicopter based on its onboard GNSS and sensor systems. ADS-B data were collected from two independent sources and time-tagged with GPS time for synchronization across all sensors. The independent sensors were: (1) a NASA THOR (Triggering Hardware and Observation Recorder) receiver with an antenna positioned near the takeoff/landing area (red points in Figure 8), and (2) data downloaded from ADSB Exchange (adsbexchange.com), which aggregates transmissions from a distributed antenna network (blue points in Figure 8). ADS-B reception required line-of-sight to the aircraft, resulting in some data gaps, particularly when the helicopter was on or near the ground where buildings and other aircraft caused obstructions.

Four sensor nodes were deployed at the ground positions numerically labeled in Figure 8. Each node was equipped with the sensors described in Section II, acquiring camera data at 10 Hz and radar data at 9 Hz. Figure 9 shows the radar FOV coverage across the monitored airspace. A sample result of the vision tracker output is shown in Figure 10. Visual inspection of the output sequence shows approximate ~100% tracking while the helicopter is within the sensor field of view.

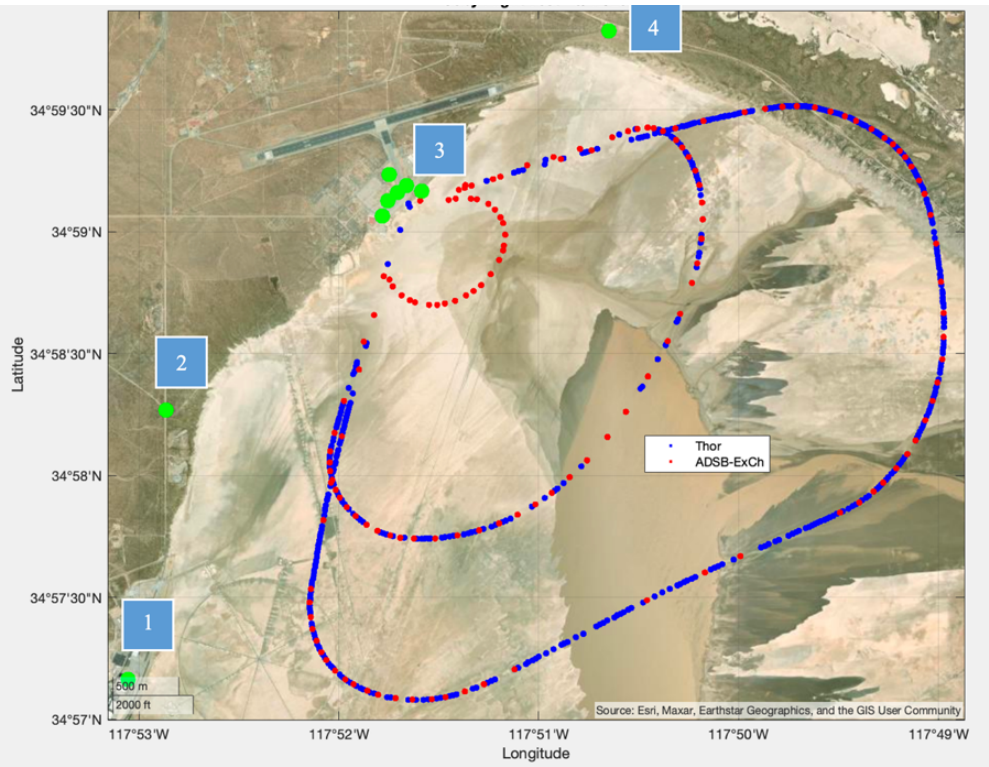


Figure 8: Path of helicopter as shown from Robinson R44 helicopter.

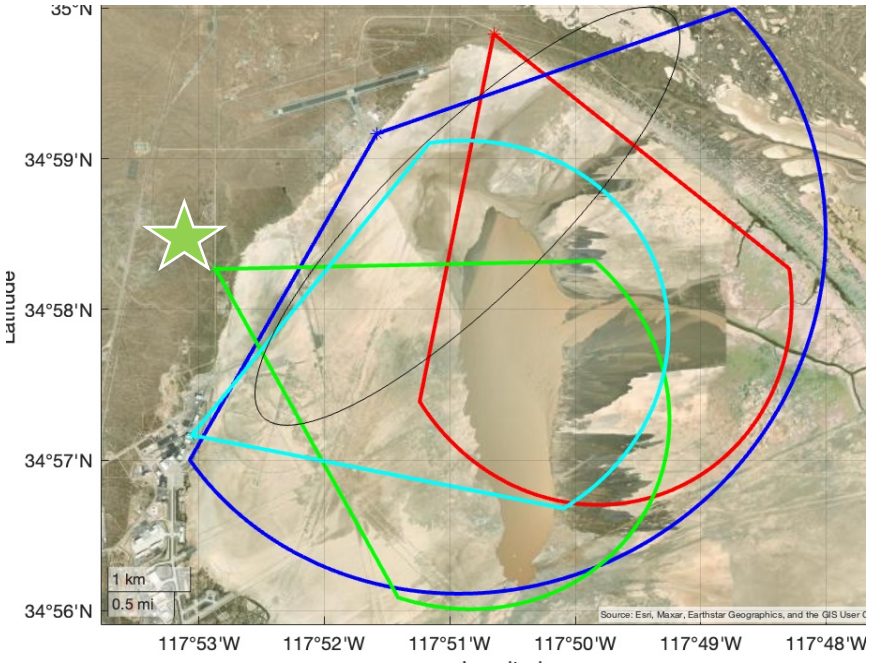


Figure 9: Radar FOV coverage with green star the location of the node for preliminary visual analysis in this work.



Figure 10: Sample Vision system output as shown by the purple box detection of the helicopter.

V. Experiments at the University of Naples "Federico II"

On May 14th, 2025 in Castel Campagnano, Caserta, Italy researchers from NASA and the University of Naples "Federico II" (UNINA) coordinated a series of field experiments with three SUAS flying dense waypoint patterns to validate the standardization of sensor acquisition methodology with four NASA and UNINA nodes distributed and oriented to surveil an airspace volume. The experimental setup is shown in Figure 11. The UNINA sensing node also integrates an Echoflight radar with a coupled 3.1 megapixels RGB camera, both performing acquisitions with a 10 Hz frequency, and a F9P Ublox GNSS receiver. The SUAS fleet, shown in Figure 12, includes two customized DJI M100 platforms ("Eagle" and "Athena") and one DJI M300 platform, manually piloted to fly in formation and emulate approaching maneuvers with respect to each other as well as with respect to the ground nodes. Both M100 platforms were used to also record visual data imaging with front-looking RGB cameras. The tests included three flights operations. The trajectories flown by the SUAS during the first flight are shown in Figure 13. During the first flight, the M300 was flown on a trajectory which would emulate an inspection mission, thus having the SUAS flying over a specific area in a repeated pattern. The Eagle SUAS was operated to maximize the presence of the other two SUAS in its camera FOV. The Eagle SUAS was kept at an altitude of approximately 20 meters above ground level (AGL), placing itself in between Athena (flying at an attitude of 10 meters AGL) and the M300 (flying at 35 meters AGL).

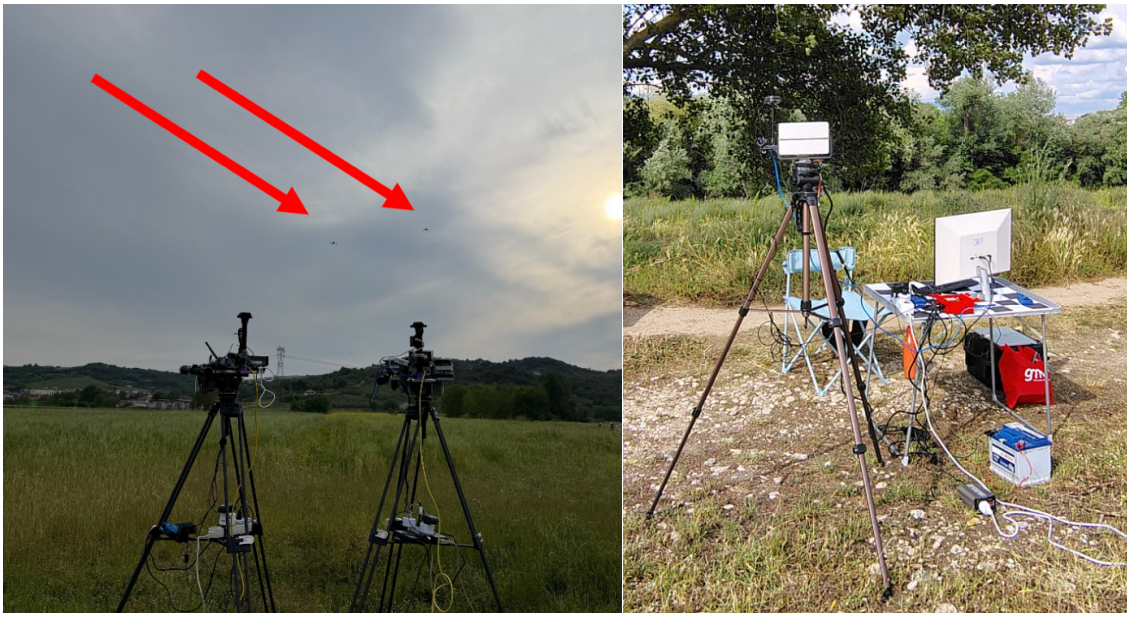


Figure 11: NASA distributed sensing nodes with 2 SUAS shown by the red arrows (left). UNINA sensing node (right).



Figure 12: SUAS flown during tests. DJI M300 (left), DJI M100 "Eagle" (center), DJI M100 "Athena" (right).

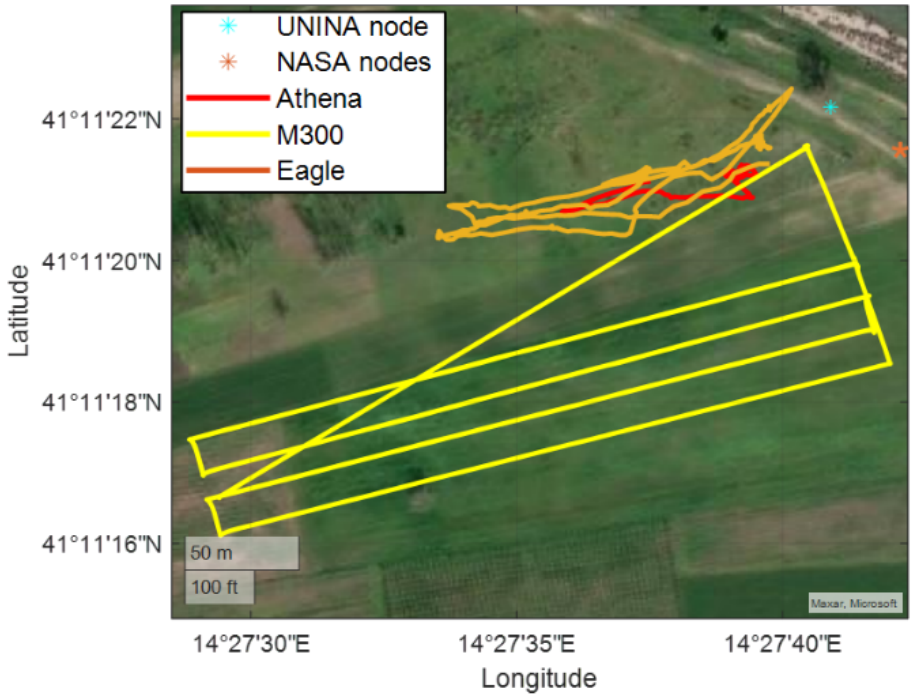


Figure 13: Trajectory flown by the SUAS during flight 1.

Preliminary analysis of radar data demonstrates robust coverage. A sample is shown in Figure 14 where measurements of range captured by the UNINA radar are depicted. Measurements are filtered using the range rate information, also collected by the radar, thus only retaining detections of targets whose measured range rate is higher than 1 m/s. This allows removing clutter generated by static targets (e.g., ground and nearby obstacles). In Figure 14 right, the range estimated using a Global Navigation Satellite System (GNSS) based benchmark is also reported, thus showing good accordance with the measurements reported on the left. The benchmark exploits Carrier Phase Differential GNSS (CDGNSS) for Eagle. Visual analyses are ongoing with expected similar performance. In this regard, Figure 15 presents a frame captured by the camera onboard the UNINA node, showing the three SUAS in colored boxes. One advancement in this experiment is the configuration and placement of radar to avoid interference when operating four radars in a small airspace towards AAM densities in urban environments.

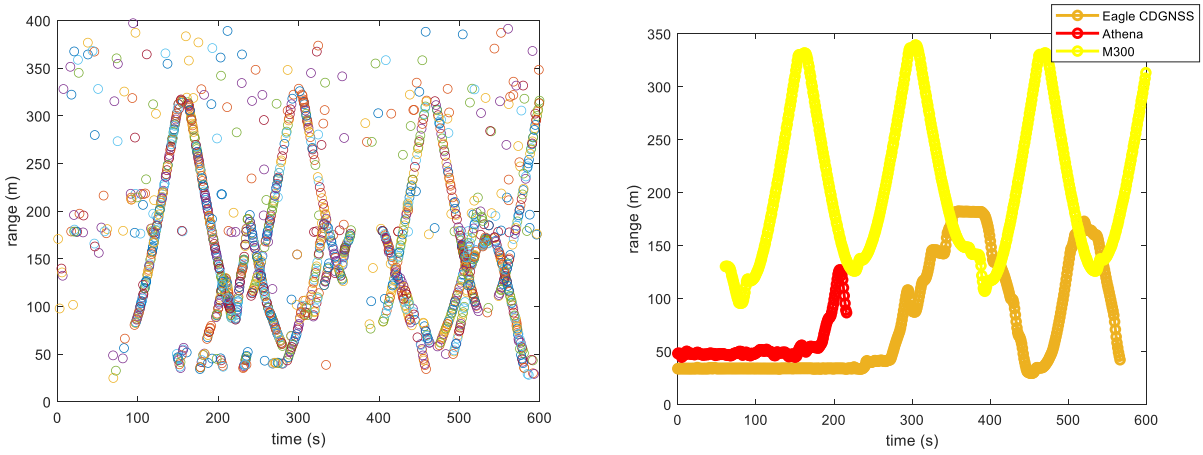


Figure 14: Output of UNINA radar data filtering showing SUAS measurements (left). The circles are filtered measurements showing the SUAS. Range estimated through a GNSS-based benchmark (right).

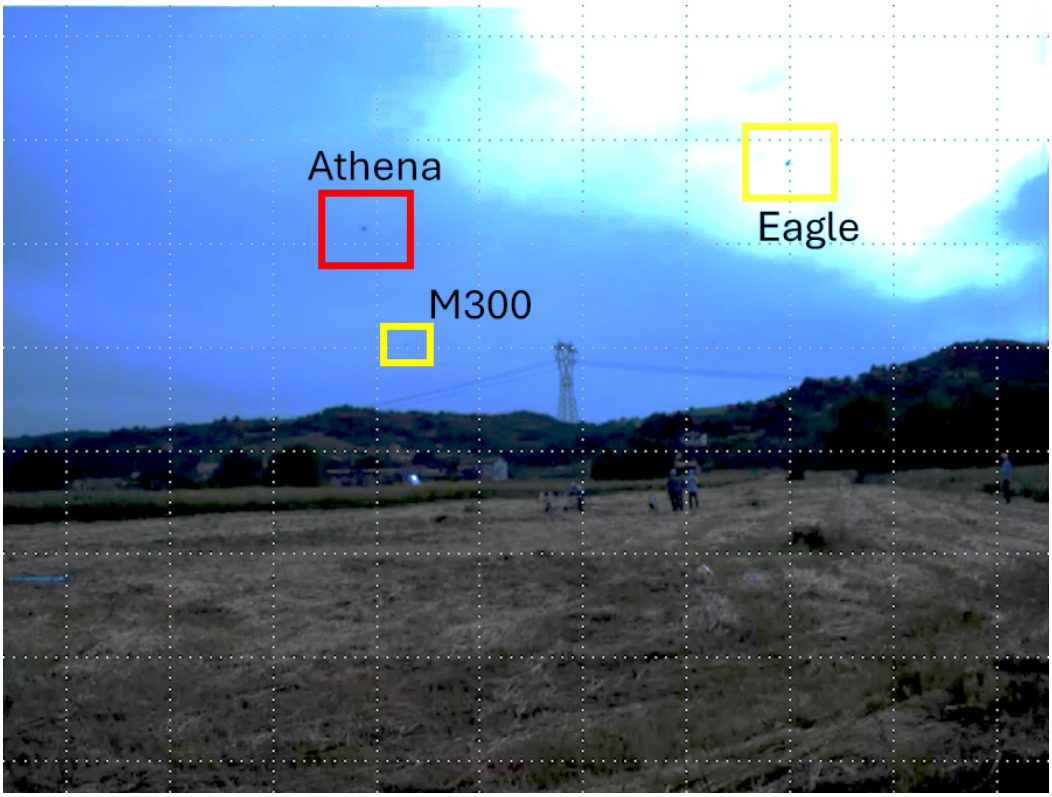


Figure 15: Frame collected by the UNINA camera during flight 1. SUAS are highlighted in the colored boxes.

VI. Conclusion

This research focused on collecting SUAS data during experimental test flights performed at NASA Langley Research Center, NASA Armstrong Flight Research Center, and Castel Campagnano Italy to assess distributed sensing methodologies for AAM aircraft in varying environments. These experiments aim to enable AAM regional passenger and cargo movement, delivery of consumer goods, urban passenger transport, and public good operations by evaluating the generalizability of aircraft detection algorithms against varying targets and backgrounds. The TTT project addresses the ARMD Technical Challenge for economically viable Advanced Air Mobility by increasing airspace autonomy, enabling higher-tempo operations, improving safety, and reducing transportation costs through advanced surveillance strategies to prevent conflicts. Preliminary findings demonstrate the feasibility of previous methodologies for detecting varying types of aircraft against different sensing backgrounds. Future work includes the analysis of these three datasets for developing a generalized airspace surveillance system in support of the AAM mission.

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