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בית הספר הריאלי העברי בחיפה

The Hebrew Reali School in Haifa
HRR – Haifa Reali Robotics

Technical Design Report
For
SUAS 2025 competition

HRR

Abstract

The team's competition strategy focuses on maximizing mission points using a cost-effective, off-the-shelf drone platform - specifically a mission-modified Tarot T960 hexacopter. Emphasizing flexibility and autonomy, the drone is equipped with advanced imaging and processing systems to perform mapping and payload delivery missions efficiently. The design integrates a Pixhawk controller, NVIDIA Jetson Orin Nano, and a YOLO-v11-based vision system to enable fully autonomous target detection and airdrop. Components were selected for affordability, global availability, and ease of field servicing, supporting humanitarian deployment scenarios. Testing followed a modular approach, validating each subsystem before full integration, ensuring reliability and mission readiness. The overall strategy prioritizes lightweight design, modularity, and real-world adaptability over high-cost performance.

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- https://dronix.co.il/
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- https://www.reali.org.il/
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Competition Strategy

In planning our competition strategy, we are trying to maximize the number of points obtained by accomplishing as much missions as possible, using the same vehicle and under the technical and budget constraints.
Since no budget for a vehicle to be defined by our needs, we had to settle for a vehicle based on a platform that was donated to us by a school alumni. We see the importance of the mission and the competition not by building the best platform, since enough money can build it to withstand

any mission. We rather see the challenge as using a cheap of-the-shelf platform which will be upgraded by the equipment to enable the autonomous mission, overall enabling more vehicles running more missions with better flexibility and availability.
In light of the above, the team is equipped with a standard Tarot T960 hexacopter, modified with energy, optics and image processing features. These will be described in the design strategy part. Due to the trade-offs of overall weight vs. airborne time, our aim is to first complete the mapping mission using the camera and the onboard image processing unit. The drone will scan the required area, taking photos which will be saved on the micro-SD card or on the SSD. Images will not be sent online to the operator station to save weight of transmitters and energy.
After the scan is complete, the drone will continue to airdropping of the payloads at the sites already identified by the camera at the mapping session. Our testing show we should be able to complete 3 drops, possibly 4 pending distances between drop zones.
Once the energy on the drone nears exhaustion, the drone will return to base. Since we know we do not have enough enery to spend the entire mission time at flight, we expect to have enough time after the last drop and return to base, such that the operator will retrieve the SD card from the camera and extract the map from it, to be submitted in due time.

Design strategy

Our modified Tarot T960 hexacopter is built to tackle every SUAS task, with special emphasis on autonomous object detection and a servo-based airdrop, the two highest-value scoring elements. We integrate a Pixhawk microcontroller running ArduPilot for flight control and waypoint navigation, while an NVIDIA Jetson Orin Nano serves as our onboard “brain,” fusing GPS with SLAM for precise positioning. A SIYI A8 Mini gimbal camera feeds real-time imagery to our custom-trained YOLO-v11 network, enabling us to identify and localize targets entirely on-board without ground intervention. When a target is confirmed, vehicle approaches the site and stabilizes above it, and the Jetson commands the servo mechanism to release the payload within the designated drop zone, closing the loop autonomously. Mission Planner, linked over an RFD900 telemetry link, provides robust ground oversight, health monitoring, and dynamic re-tasking if needed. We designed every subsystem—airframe, compute stack, vision pipeline, comms, and payload hardware – to be modular and field-serviceable, letting us iterate rapidly and keep risk low. Extensive simulation and live-flight testing have proven stable autonomy from take-off to landing, giving us the confidence that our system can execute the full mission profile while maximizing points where they matter most.
As a humanitarian aid mission, we emphasize budget, flexibility and agility. This enables multiple vehicles to be transported deployed and operated globally, operated by an average skilled team. We have chosen our components to be of-the-shelf, easily obtainable and serviceable, both by operator and by local distributors. The T960 platform is super-lightweight, easily disassembled and folded into a carry-on bag. Battery packs are light modular and

interchangeable, allowing choice between range and payload. All electronic components described above – camera, Jetson, Pixhawk etc. were selected for their price, but mostly for being globally available for in-field service while deployed. Our toughest challenge and therefore contribution to the system was integrating the individual components into a working autonomous system, applying data obtained from sensors and using it to search identify and locate sites in need, approaching them and dropping and aid kit within precise location. Overall lightweightness and low complexity of the vehicle was a guideline we followed, even when risking performance, to enable a solution that can easily be adapted by aid organizations globally.

Testing strategy

As a multidisciplinary system, testing will begin with each of the components separately. Beginning with platform components, testing different GPS units, battery configurations, telemetry options etc. This will be followed by stand-alone testing of the subsystems – optics, image processing, navigation, mechanical controlled dropping, and communications. These will includ mechanical and flight tests of the platform, laboratory and field testing of components and subsystems. When each subsystem presents mature-enough performance, they will be added one by one to the platform, allowing controllable understanding of the changes presented to the flight control, while testing new features added.
Eventually when the mission vehicle is ready, we will verify its compatibility to the mission, and be able to further tweak various performance and quality issues.