Test Project

Module 4 – Advanced Piloting and Vision Skills

3 hours

Unmanned Aerial Systems

Submitted by:

James Taylor – Studica, Independent Test Project Designer
Derek Murphy – Studica, Independent Test Project Designer

Mohammad Alshamsi – RobHitec, Independent Test Project Validator

WSC2026_TP64_en

Contents

Contents **2**
1.0 Introduction to Test Project **3**
2.0 Description of project and tasks **3**
2.1 Assessment Criteria 3
2.2 Module Task 4
3.0 Instructions to the Competitor **6**
3.1 Competition Requirements 6
4. Equipment, Machinery, Installations, and Materials Required. **7**
4.1 Equipment Provided by the Competition Organizer. 7

© WorldSkills International

1 Introduction to Test Project

Competitors will demonstrate the functionality of their UAS and complete tasks through autonomous flight control. In search and rescue life rafts, life vests, and marker buoys are often bright orange or red specifically *because* it's easy to segment against blue water from the air. Coast guard and SAR drones run essentially this pipeline — color/shape detection, tracking across frames, GPS-tagging the position once locked on.

Competitors must also add and setup components to the basic drone that they assembled and tested in Module A, then complete drone programming and tuning within 3 hours so the drone can perform autonomous flight, visual recognition, and precision hovering. The drone must locate, track, and execute an accurate stable flight and return autonomously to the takeoff and landing point throughout the entire flight—without any human control of flight direction.

Each competitor will be allowed time to conduct flight tests and tuning in the flight environment prior to evaluation.

2 Description of project and tasks

Module 4– Advanced Piloting and Vision Skills are expected to be completed within 3 hours.

2.1 Assessment Criteria

Module 4 will be scored by Experts during the Competition. Information about specific tasks and required tests will be provided to Competitors in the morning briefing.

- Each competitor submits a telemetry log (timestamped position estimates).
- Assessment will include scoring for acquisition time.

Competitors should complete all tasks independently within the time allocated to the Module.

First, prepare according to requirements.

Second, complete the tasks listed below

Workplace safety procedures and protocols must always be demonstrated.

If you are advised of a safety infraction during this module, there will be a percentage of marks deducted for each infraction. On the third infraction, the Competitor will be stopped, and the evaluation will be based on work already completed.

Experts will not intervene unless there is a safety concern.

© WorldSkills International

2.2 Module Task

Task # 1 – Equip the UAS with Autonomous Flight Equipment (1Hour)

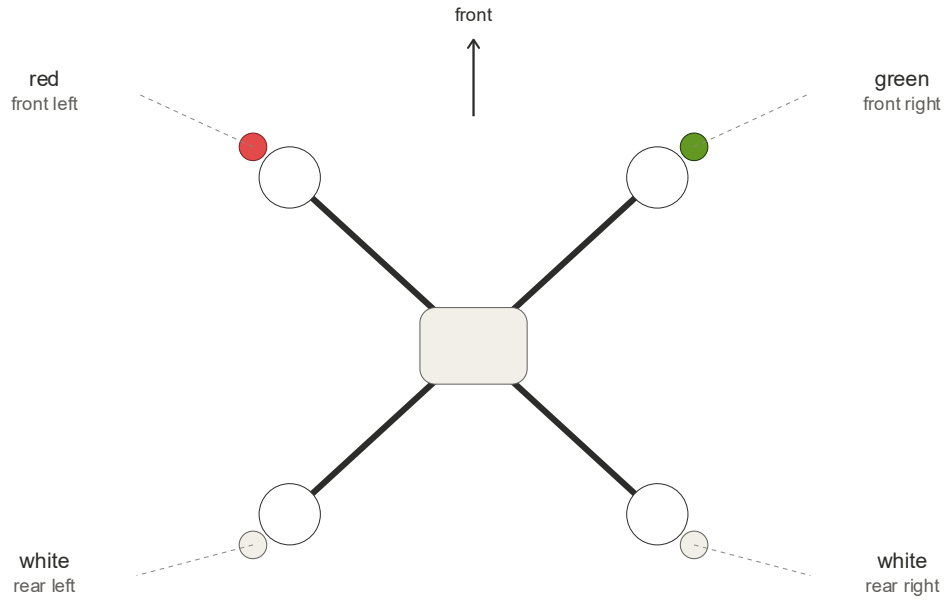
Using the supplied items from the Kit attach and install the Autonmous Flight equipment as follows:

- Complete the wiring and installation of the PDB for the RPI5
- Install the Drone CAP
- Install the Lidar
- Install the 3d Depth Camera

Task # 2 – Program the Drone Navigation Lights

Navigation lights on drones serve three main purposes: safety, orientation, and compliance. They help pilots and other airspace users identify the drone's position and direction, prevent mid-air collisions we will now set up or drone navigation lights.

Develop a LUA script for navigation lights, following a standardized color scheme: Red on the front left (port), Green on the front right (starboard), and White aft. These enable visual recognition of your drone's orientation and relative heading.



© WorldSkills International

Task # 3 Create am Autonomous program for the following navigation task.

Competitors must autonomously detect, track, and maintain a stable lock on a moving red ball placed in the arena, using only onboard sensing and computing. No ground-station processing or manual pilot correction of the tracking output is permitted during the assessed task.

PARAMETER	SPECIFICATION
Ball	Standard 15.2 cm diameter matte red ball, provided by organizers
Ball motion	Moved on a mobile stand; speed .5 m/s
Arena	Indoor, 10 m × 10 m x 10 m,
Onboard sensing	Installed camera, IMU permitted; no offboard/ground processing
Flight altitude	.5m to 1.5m AGL, team's choice within band
Distance to target	.5m to 1.5m (Safe Distance)
Run duration	3-minute Run (Drone must track for complete time)



Task #4 Test installation and tune flight.

Competitors can use schedule time to practice in the flight area – the general rules for booking the area apply.

Task # 5 – Autnomous Navigation Flight

1. Drone launches from a marked pad and climbs to the competitors chosen altitude band.
2. Drone recognizes object.
3. Ball on stand moves across the arena on guided vehicle.
4. The drone must track the ball back and forth across the court. It cannot stay in one spot and rotate (yaw). It must use Roll. Drone should respond to movement within 3 to 5 seconds.
5. The run ends at 3 minutes or when the ball exits the arena boundary, whichever comes first.

© WorldSkills International

Task # 6 – Submission Deliverables.

Telemetry logs (CSV): timestamp, reported ball position.

A USB stick with a country directory will be provided to the competitor once they return to their work area.

3 Instructions to the Competitor

3.1 Competition Requirements

Each competitor will use the following for this module:

1 X WS500 UAV Quadcopter Kit

Instructions

1. All detection, tracking, and prediction must run on the drone's onboard companion computer — no live video downlink to a ground computer for processing.
2. Competitors may use color-based detection, classical trackers (Kalman filter, optical flow, correlation filters), or learned detectors — method is the team's choice.
3. Manual pilot stick input is allowed for takeoff/landing and emergency stop only; it must not be used to correct or assist tracking during a scored window.
4. Each competitor submits a telemetry log.

Operation Safety Rules

1. Put on proper personal protective equipment according to operation requirements;
2. Take site safety protection measures and confirm them;
3. Before performing operations with power off, confirm that the power is off and batteries are disconnected;
4. Before performing operations with power on, turn on the power after confirming that no safety hazards exist;
5. Do not operate in a violent or an unsafe manner, including but not limited to forcibly pulling, dragging, smashing, throwing, and other violent behaviors, as well as behaviors that may cause personnel injuries or damage to equipment;
6. All the tools or materials used during operations should be placed in the tool trolley or on the rubber tool mat only.

Note: If a competitor fails to comply with the safety rules and is considered to have operated in a dangerous manner or has caused a safety hazard in the workplace, or equipment damage or personal injuries, marks will be reduced until his/her right to participate in the Competition is cancelled.

4 Equipment, Machinery, Installations, and Materials Required.

4.1 Equipment Provided by the Competition Organizer

One laptop installed with core programming tools not limited to but including:

- Mission Planner
- Rasperry PI Imager
- VS Code
- Drone OS Image

All equipment, tools, and materials listed in the Infrastructure List –see the WorldSkills Forum and Technical Description;

Personal Protective Equipment (PPE) and tools must be provided by Competitors.

Objects required for manipulation during the performance and testing.

Test arena for the performance evaluation tasks

© WorldSkills International