

**Autonomous Navigation Mission**

**(tests autonomous navigation capability)**

**Demonstrates autonomous navigation by following predefined waypoints,  
without human intervention.**

# USV

**The Objective** - The USV must autonomously navigate around a square course marked with buoys, without any human intervention during the mission.

**The Course** - 4 buoys are placed at the corners of a 15 m × 15 m square. The GPS coordinates of each buoy are provided to the team before the start. The USV departs from buoy 1, visits buoys 2, 3, and 4 in order, and returns to buoy 1, completing a full square.

**The Procedure** - The operator loads the coordinates into the system and initiates the mission. Once the mission starts, no human intervention is allowed. If the USV stops or becomes stuck, the team may request a single reset; the mission resumes from the last reached buoy.

**The Completion** - The USV autonomously completes the full square course and returns to the starting buoy. A buoy is considered reached when the USV comes within 2 m of it.

# UAV

**The Objective** - The UAV must autonomously navigate through a sequence of 5 predefined waypoints, without any human intervention during the mission.

**The Course** - 5 waypoints defined by GPS coordinates will be provided to the team before the start. The UAV must visit all waypoints in order, starting from waypoint 1.

**The Procedure** - The operator loads the coordinates into the system and initiates the mission. Once the mission starts, no human intervention is allowed. If the UAV stops or becomes stuck, the team may request a single reset; the mission resumes from from waypoint 1.

**The Completion** - The UAV autonomously reaches all 5 waypoints. A waypoint is considered reached when the UAV comes within 2 m of it.

# UGV

**The Objective** - The UGV must autonomously navigate through a sequence of 6 predefined waypoints, without any human intervention during the mission.

**The Course** - 6 waypoints defined by GPS coordinates will be provided to the team before the start. Waypoints are spaced approximately 10 m apart. Each waypoint is marked with a cone on the field. The UGV must visit all waypoints in order, starting from waypoint 1.

**The Procedure** - The operator loads the coordinates into the system and initiates the mission. Once the mission starts, no human intervention is allowed. If the UGV stops or becomes stuck, the team may request a single reset; the mission resumes from the last reached waypoint.

**The Completion** - The UGV autonomously reaches all 6 waypoints. A waypoint is considered reached when the UGV comes within 1.5 m of it.

**Obstacle Avoidance Mission**  
**(tests collision avoidance capability)**

**Demonstrates safe navigation toward a predefined goal while avoiding static obstacles, without human intervention.**

# USV

**The Objective** - The USV must autonomously navigate through a corridor from point A to point B, detecting and avoiding static obstacles, without any human intervention during the mission.

**The Course** - The course consists of a 30 m long, 10 m wide corridor. The starting point A and the destination point B are provided to the team before the start. Several buoys are placed as obstacles within the corridor. The positions of the obstacles are not known in advance.

**The Procedure** - The operator initiates the mission. Once the mission starts, no human intervention is allowed. If the USV collides with an obstacle, the mission is failed.

**The Completion** - The USV autonomously navigates from point A to point B without any physical contact with obstacles.

# UAV

**The Objective** - The UAV must autonomously navigate from a starting point A to a final point B, detecting and avoiding static obstacles, without any human intervention during the mission.

**The Course** - The starting point A and the destination point B are provided to the team before the start. Several slalom poles are placed as obstacles along the course. The positions of the obstacles are not known in advance.

**The Procedure** - The operator initiates the mission. Once the mission starts, no human intervention is allowed. If the UAV collides with an obstacle, the mission is failed.

**The Completion** - The UAV autonomously reaches the target location without any physical contact with obstacles.

# UGV

**The Objective** - The UGV must autonomously navigate from a starting point A to a final point B, detecting and avoiding static obstacles, without any human intervention during the mission.

**The Course** - The course consists of a 30 m long, 6 m wide corridor. The starting point A and the destination point B are provided to the team before the start. Several static objects are placed as obstacles within the corridor. The positions of the obstacles are not known in advance.

**The Procedure** - The operator initiates the mission. Once the mission starts, no human intervention is allowed. If the UGV collides with an obstacle, the mission is failed.

**The Completion** - The UGV autonomously reaches the target location without any physical contact with obstacles.

**Contact Engagement Mission, with target identification  
(tests perception-assisted contact engagement)**

**Identify the correct target among multiple objects and establish controlled  
physical contact.**

# USV

**The Objective** - The USV must autonomously search for and identify the correct target buoy among distractors, and perform a controlled physical contact with it, without any human intervention during the mission.

**The Course** - The mission takes place within a 20 m long and 15 m wide designated area. 3 colored buoys are placed within the area: 1 representing the correct target and 2 acting as a distractor. The color of the correct target is communicated to the team before the start, but the exact positions of the buoys are not known in advance.

**The Procedure** - The operator initiates the mission from the starting line. Once the mission starts, no human intervention is allowed. The USV must perceive the environment, distinguish the target from the distractors based on color, and approach it for contact. Physical contact with the wrong buoy or exiting the mission area results in mission failure.

**The Completion** - The mission is successful if the USV autonomously identifies the correctly colored buoy and establishes physical contact with it without any unsafe behavior or manual interference.

# UGV

**The Objective** - The UGV must autonomously search for and identify the correct target among multiple distractors based on visual features, and establish a gentle physical contact with it, without any human intervention during the mission.

**The Course** - The mission takes place within a 20 m long and 15 m wide designated area. 3 colored targets are placed within the area: 1 representing the correct target and 2 acting as distractors. The color of the correct target is communicated to the team before the start, but the exact positions of the objects are unknown.

**The Procedure** - The operator initiates the mission from the starting line. Once the mission starts, no human intervention is allowed. The UGV must perceive the environment, distinguish the target from the distractors based on color, and approach it. The contact must be a gentle touch—sufficient to be observed by the judges but without damaging the target. Physical contact with a distractor or exiting the mission area results in mission failure.

**The Completion** - The mission is successful if the UGV autonomously identifies the correct target and establishes a gentle physical contact with it.

# UAV

**The Objective** - The UAV must autonomously fly from point A to point B, identify the correct target marker using visual perception, and precisely deliver a payload onto it, without any human intervention during the mission.

**The Course** - The starting point A and the destination point B (target area) are provided to the team before the start. The target is marked by a 2-meter diameter colored circle at point B. No obstacles are placed along the flight path.

**The Procedure** - The operator initiates the mission. Once the mission starts, no human intervention is allowed. The UAV must navigate to the destination, use its camera to identify the center of the colored circle, and release a payload of 150 grams from a minimum altitude of 2 meters.

**The Completion** - The mission is successful if the UAV autonomously reaches the target location and the payload lands inside the designated 2-meter diameter circle.

**Cyber Resilience Mission (tests cyber-physical robustness)**  
**Demonstrates safe system behaviour under simulated cyber-induced disturbances affecting communication or control.**

# USV/UAV/UGV

**The Objective** - The mission demonstrates safe system behavior under simulated cyber-induced disturbances affecting communication. It specifically tests the system's ability to maintain safety when subjected to a simulated data link loss between the vehicle and the Ground Control Station (GCS).

**The Course** - The mission takes place during a standard autonomous navigation from Point A to Point B. No obstacles are placed along the path.

**The Procedure** - The operator initiates the autonomous mission. At a designated point, the jury will simulate a cyber disturbance by disconnecting the telemetry link or closing the GCS software. The vehicle must autonomously detect the link loss and transition to a safe state.

**The Completion** - The mission is successful if the system autonomously transitions to a predefined safe state:

- UAV - Hover or Return-to-Launch (RTL).
- USV / UGV - Controlled stop or Station Keeping (loitering).

The mission fails if the vehicle performs any uncontrolled or unsafe maneuvers.