Canadian Forces Base Suffield, Alberta, 12 September to 7 October 2022

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**Section 1 - CUAS 2022 Test Plan Instructions**

The IDEaS CUAS Sandbox offers participants a variety of test scenarios in order to demonstrate their CUAS systems. These test scenarios indicate what flight profiles and target UAS will be flown by the Red Team, and have been designed to be representative of UAS threats while also offering an increasing scale of difficulty. As not all profiles are applicable to all solutions, and some Innovators may wish to focus their test time towards certain profiles or repeat certain ones, each Innovator can propose a different test plan by selecting from the available scenarios to build their total plan. Test Plans will be finalized with each Participant prior to the Sandbox commencing.

**Points to note in building and submitting a test plan**:

* The plan is to be built and submitted via the provided template.
* The submitted plan will be evaluated as described in the evaluation criteria in Section 4 of the Application Form.
* DND/CAF will be the sole authority for final approval of the Participant’s test plans:
  + If portions of a proposed test plan are not acceptable to DND/CAF, the offer of acceptance to attend the Sandbox may impose changes to the test plan that the Participant must accept if they agree to attend the Sandbox.
  + After a Participant is selected, additional refinement and detailed scheduling of the proposed test plan may occur to optimize use of the Sandbox for each Participant. Such changes will remain within the overall intent of the original plan.
* Final approval of all test plans will be at the sole discretion of DND/CAF.

**Instructions**:

1. Review the template below. Blue areas must not to be changed.
2. Select the Red Team flight profiles (from Section 3) you would like to use to demonstrate your solution.
3. Insert them into the white rows in the template. The basic time planned for each flight must remain as shown in the Red Team flight profiles.
4. If desired, select the additional options of conducting a mobile demonstration, and/or including destruction of the target.
5. Enter the total time for the flight: Basic time + 30 mins if any option is included.
6. Plan and select additional flights within the residual time available each day.

**Evaluation of your Test Plan. As a Mandatory PASS/FAIL criteria, your test plan must:**

• 0800-0830 is reserved for the Daily Briefing and setup and is to be included each day.

• a minimum of a ½ day initial preparation period at the start of the Sandbox (morning of Day 1)

• a minimum of a ½ day pack-up period at the end of the Sandbox.

• A one hour lunch period is to be included each day.

• The basic time planned for each flight must remain as shown in the Red Team flight profiles.

• The last flight must be completed by 1530 each day to allow for daily site cleanup.

• Total duration of the plan must be no longer than 5 days, and can be shorter.

**Section 2 – CUAS Test Plan Template**

| **Plan for Day One** | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Day** | **Timing** | | **Activity** | **Participant**  **Flight Letter** | **Selected Red Team Flight Scenario (from Section 3 of this form)**  In the white space only, insert the flight profile you would like to demonstrate against. | | | | | **Activity Time** |
| **Red Team Profile #** | **Red Team**  **Profile Name** | **Basic Profile Time** | **Options**  **(+30 mins if one or both is selected)** | |
| **Begin** | **End** | **Mobile Demo?** | **Target destruction?** |
| 1 | 0800 | 0830 | Welcome Brief |  |  |  |  |  |  | 30 mins |
| 1 | 0830 | 1200 | Participant unpack and setup |  |  |  |  |  |  | 2.5 hours |
| 1 | 1200 | 1300 | Lunch |  |  |  |  |  |  | 1 hour |
| 1 | 1300 | 1330 | Safety & Operations Brief |  |  |  |  |  |  | 30 mins |
| 1 | 1330 | 1400 | First Flight preparation |  |  |  |  |  |  | 30 mins |
| 1 | 1400 | 1430 | Flight demonstration | A | 1.1 | Static Hover – mandatory profile | 30 mins | No |  | 30 mins |
| 1 | 1430 | 1500 | Flight demonstration | B | 1.2 | Straight Approach – mandatory profile | 30 mins | No |  | 30 mins |
| 1 |  |  |  | C |  |  |  |  |  |  |
| 1 | 1530 | 1600 | End of Day Cleanup |  |  |  | 30 mins |  |  | 30 mins |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Plan for Days Two to Five (duplicate for the number of days used)** | | | | | | | | | | |
| **Day** | **Timing** | | **Activity** | **Participant**  **Flight (A-Z)** | **Selected Red Team Flight Scenario (from Section 3 of this form)**  In the white space only, insert the flight profile you would like to demonstrate against. | | | | | **Activity Time** |
| **Red Team Profile #** | **Red Team**  **Profile Name** | **Basic Profile Time** | **Options**  **(+30 mins if one or both is selected)** | |
| **Begin** | **End** | **Mobile Demo?**  **(Yes/No)** | **Target destruction?**  **(Yes/No)** |
|  | 0800 | 0815 | Safety & Operations Brief |  |  |  |  |  |  | 30 mins |
|  | 0815 | 0900 | Daily preparation |  |  |  |  |  |  | 45 mins |
|  |  |  |  | D |  |  |  |  |  |  |
|  |  |  |  | E |  |  |  |  |  |  |
|  |  |  |  | F |  |  |  |  |  |  |
|  |  |  |  | G |  |  |  |  |  |  |
|  |  |  |  | H |  |  |  |  |  |  |
|  |  |  |  | I |  |  |  |  |  |  |
|  | 1200 | 1300 | Lunch |  |  |  |  |  |  | 1 hour |
|  |  |  |  | J |  |  |  |  |  |  |
|  |  |  |  | K |  |  |  |  |  |  |
|  |  |  |  | L |  |  |  |  |  |  |
|  |  |  |  | M |  |  |  |  |  |  |
|  |  |  |  | N |  |  |  |  |  |  |
|  |  |  |  | O |  |  |  |  |  |  |
|  | 1530 | 1600 | End of Day Cleanup |  |  |  | 30 mins |  |  | 30 mins |
|  |  |  |  |  |  |  |  |  |  |  |
| Your last day in the Sandbox must include the following, to be completed no later than 1600 hrs on your final day: | | | | | | | | | | |
|  | 1200 | 1600 | Final Day Packup, Administration, and Departure |  |  |  |  |  |  | ½ day |

**Annex A - Available Red Team Flight Scenarios**

**Explanation of columns in the Scenario Table**:

* **Planned Time Consumed**. This varies by scenario and includes the anticipated time for the setup, conduct, and completion of the scenario, even though the actual flight time of the target will be less. Back-to-back scenarios can thus be planned with no time between scenarios as that is already included. For planning purposes the range times are fixed for each scenario. During the actual conduct of the scenario, planned schedules will be adjusted to accommodate the reality of the day.
* **Mandatory or Optional**. Some scenarios are mandatory for all solutions and must be included in the plan.
* **Mobile Test**. Optional. If the specific scenario is being done as a vehicle mounted test an additional 30 minutes of planned time is added due to the additional setup/conduct/cleanup complexity.
* **Target Destruction**. While target destruction is the overall aim of Defeat solutions it need not be part of each test flight. For example, it may be sufficient to detect, track, and target the UAS multiple times, and then complete the destruction of it once, as opposed to destroying it each time. To control the consumption of targets:
  + Innovators are expected to include target destruction as part of the scenario only when relevant and necessary, and categorized as:
    - **Hard Kill** – Innovators will defeat the UAS using ammunition, nets, entanglers, missiles, or other means to physically disable the UAS.
    - **Soft Kill** –Innovators will use other means such as radiofrequency means to deter, disable, take over, or otherwise mitigate the UAS.
  + DND/CAF retains the terminal kill go/no go decision on each flight in order to control the consumption of targets.

| **Ser** | **Title** | **Description / Flight Pattern** | **Possible Target UAS Types**  **(subject to change)** | **Planned Time consumed** | **Mandatory or Optional?** | **Mobile Demonstration**  **(add 30 mins to planned time)** | **Target Destruction included?**  **(add 30 mins to planned time)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | **Basic Scenarios**. The basic scenarios are intended to provide the least challenging target to CUAS systems, and will be appropriate for the lowest through highest TRL technologies. It is expected that these flights will be used to gather basic information about the performance of the system, including range and accuracy. | | | |  |  |  |
| 1.1 | Static hover | The Red Team UAS will be presented at an appropriate range in a hover at 100m altitude. | * DJI Matrice * DJI Phantom * DJI Mavic | * 30 minutes | * **Mandatory** | * Optional | * No / Soft / Hard |
| 1.2 | Straight Approach | The UAS will approach the CUAS system directly at an altitude of 100m, at slow and moderate speeds (5 to 20m/s) using | * Skywalker X8 * XUAV Mini-Talon * DJI Matrice * DJI Phantom * DJI Mavic | * 30 minutes | * **Mandatory** | * Optional | * No / Soft / Hard |
| 1.3 | Diamond Pattern | The UAS will execute a diamond pattern at an appropriate range at an altitude of approximately 100m, at moderate speeds (8 to 20m/s). | * XUAV Mini-Talon * DJI Phantom | * 60 minutes | * Optional | * Optional | * No / Soft / Hard |
| 2 | **Intelligence, Surveillance and Reconnaissance Scenarios**. The ISR scenarios are intended to emulate flight patterns that enemy UAS might execute in an attempt to gather information about a friendly force. | | | |  |  |  |
| 2.1 | High Altitude Overwatch | The UAS will fly straight toward the target at as high a feasible altitude as possible (approx. 500m), at moderate speeds (10-20 m/s) | * Skywalker X8 * DJI Matrice | * 30 minutes | * Optional | * Optional | * No / Soft / Hard |
| 2.2 | Popup and Stare | The rotorcraft UAS will approach the CUAS system as discretely as possible, and then popup and hover at a low altitude, at a range appropriate for gathering ISR information about a target | * Mavic 2 Zoom | * 30 minutes | * Optional | * Optional | * No / Soft / Hard |
| 2.3 | Circular Observation | The fixed-wing UAS will execute a circular pattern around the CUAS system at an altitude of 250m at moderate speeds (10-15m/s), at a range appropriate for gathering ISR information about the target: | * XUAV Mini-Talon | * 60 minutes | * Optional | * Optional | * No / Soft / Hard |
| 3 | **Direct Attack Scenarios** The Direct Attack scenarios are intended to emulate flight patterns that enemy UAS might execute in an attempt to either drop munitions on a target, or perhaps execute a kamikaze attack. | | | |  |  |  |
| 3.1 | High and Fast Attack | A fixed wing UAS will fly straight toward the target at as high a feasible altitude as possible (several hundred meters), at the highest speeds possible (estimated at up to 55m/s), and then potentially execute a dive towards the target simulating a kamikaze attack. | * Class 1 Mini fixed wing UAS to be determined | * 30 minutes | * Optional | * Optional | * No / Soft / Hard |
| 3.2 | Low and Fast Attack | A fixed wing UAS will fly straight toward the target at as low a feasible altitude as possible (approx. 10-20m), at the highest speeds possible (estimated at up to 55m/s), simulating a kamikaze attack. | * Class 1 Mini fixed wing UAS to be determined | * 30 minutes | * Optional | * Optional | * No / Soft / Hard |
| 3.3 | Drop from Altitude | A rotorcraft UAS will fly straight toward the target at as high a feasible altitude as possible (several hundred meters), at the highest speeds possible (approx. 20m/s), and then hover over the target and drop a simulated munition (bean bag or other): | * DJI Phantom 4 | * 30 minutes | * Optional | * Optional | * No / Soft / Hard |
| 3.4 | Manoeuvering Approach | Rotorcraft UAS approach the target while manoeuvering and using obstacles to the greatest extent possible, simulating a kamikaze attack | * Class 1 Mini rotorcraft UAS to be determined | * 60 minutes | * Optional | * Optional | * No / Soft / Hard |
| 4 | **Diverse Communications Scenarios**. Some CUAS systems make use of the target UAS’s communication system as part of their CUAS solution. Consequently the test is not focused on flight patterns but rather how well the solution deals with different communication systems. This is done with a simple flight profile with different communication systems that may be in use on Class 1 Mini and Micro UAS. | | | |  |  |  |
| 4.1 | Communication Straight-In | All flights will be conducted using a straight-in approach to the target at a fixed altitude from an appropriate range. | * DJI Lightbridge (DJI Phantom 2.4GHz) * DJI Occusync (DJI Mavic 2.4/5.8GHz) * Parrot Wifi (2.4GHz) * Mavlink (FRSKY or other, 433MHz, 968MHz, 915MHz) * RMILEC (433MHz) * Dragonlink (433MHz) * Crossfire (868MHz, 915MHz) | * 30 minutes | * Optional | * Optional | * No / Soft / Hard |
| 5 | **Swarm UAS Scenarios**. The Swarm UAS scenarios will challenge the CUAS systems with multiple simultaneous targets. | | | |  |  |  |
| 5.1 | Straight Approach | (Horizontal or Vertical Spacing)– Rotorcraft UAS will approach the target at moderate speeds at an altitude of 100m, with distances of 10 to 50 meters of separation. | * Two UAS (DJI Phantom or Mavic) * Five UAS (DJI Phantom or Mavic) | * 90 minutes | * Optional | * Optional | * No / Soft / Hard |
| 5.2 | Undefined Approach | Rotorcraft UAS will approach the target with varying speeds, altitudes, and separations to challenge the CUAS system. | * Non-manoeuvering (5 UAS, DJI Phantom or Mavic) * Manoeuvering (5 UAS, DJI Phantom or Mavic) | * 90 minutes | * Optional | * Optional | * No / Soft / Hard |