

Counter Uncrewed Aerial Systems (CUAS) 2027 (Urban) Test Plan Template

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CUAS 2027 (Urban) Test Plan Instructions

The purpose of the test plan is to ensure optimal use of the test time and resources made available to each participating company, and to align and coordinate the expectations and tasks between the participating company, the provided Red Team, range control, safety, etc.

It is used as a mandatory PASS/FAIL criterion to ensure that an applicant selected to attend the Sandbox has demonstrated the competency to build and propose a viable test plan to achieve optimal use of their time at the Sandbox.

Test Range Description:

- Four different styles of detector test locations are offered to represent the different urban infrastructure challenges and opportunities a detection system may have to contend with:
 - Ground level
 - Mid-level balcony on a high-rise building
 - High-level balcony on a high-rise building
 - Rooftop on a high-rise building
- Each location will have:
 - The capacity for multiple companies to be concurrently testing at the same location
 - A Red Team flying assorted drones and flight paths at that location, enabling all companies at that location to concurrently test against the same red team target drones.
 - Red team flight selection during the test period will be flexibly adjusted and repeated as needed at each location. Flight profiles will be broadly categorized as follows:
 - Targets approaching from above rooftop height
 - Targets approaching from below rooftop height but within visual line of sight to the detector
 - Targets approaching from below rooftop height but manoeuvring around buildings and not always within visual line of sight to the detector
- Using this test plan template, companies request which test location(s), flight profiles, and targets they wish to use for how long, permitting them to test in all four locations if desired.

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Points to note in building and submitting a test plan:

- The test plan is to be built and submitted via the provided template. All sections must be completed as described.
- The submitted test plan will be evaluated as described below. If a viable plan is not evident a FAIL may be awarded and the applicant would not be selected.
- If portions of a proposed test plan are not acceptable to Canada, 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 an applicant is selected, there will be additional pre-Sandbox discussions to further refine the test plan and the Sandbox setup for each company.
- During the Sandbox, further adjustments to the test plan may also occur to account for such things as delays due to weather, target issues, equipment setup delays, changes based on previous test results, etc. The Sandbox is meant to be a learning and development opportunity. As the participants and trial staff learn throughout the event, the plan may be modified to explore interesting avenues or features of the CUAS system.
- Throughout, Canada is the sole authority for final approval of the Participant’s test plans. If such final approval cannot be achieved, continuation in the Sandbox may be at risk.
- The Sandbox team will make all reasonable efforts to accommodate the desired test plan to the extent possible.

Instructions: Review and complete the template tables in the sections that follow

Blue areas contain instructional details in each section and must not be changed.

White areas are where you enter the details of your plan.

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1. Physical description and footprint of the equipment being brought to the Sandbox

Instructions: The purpose of this section is to describe what you are bringing to the Sandbox so that we can determine if it is feasible to accommodate that type of equipment in the test range.

Your Application Form already includes how the technology works, and health and safety information so do not duplicate that information here. Focus on describing the quantity and size of the major equipment you are bringing. A detailed item by item list is not required at this time.

PASS: The described equipment can be reasonably accommodated within at least one of the offered test locations.

FAIL: The described equipment cannot be reasonably accommodated within any of the proposed test locations.

Example description.	- Two co-located model X radars mounted on a wheeled trailer. - One model X optical and infrared camera system mounted on a tripod stand. - User control station with monitors - Central processing computer - Ruggedized cabling and wiring to connect radar and camera sensors - Model X wireless routers connecting RF sensors to user control station - One vehicle-mounted remote weapons system, controlled from inside the vehicle, or optionally from the user control station. Canadian DND supplied 7.62mm machine gun and ammunition required. - One interceptor drone controlled from the user control station with optional manual pilot.
Describe your major equipment items here, including its weight (KG). You can insert a limited (<9) number of photos if desired.	

For each test location below, indicate:

- If you intend to demonstrate your solution in it;
- If you believe your technology and personnel will fit in it, inclusive all applicable safety distances for your technology while operating; and

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3. Any additional demonstration space adjustments you are requesting, (excluding hotel accommodations, meal areas, and storage as these are separate and easily accommodated).		
4. If you will be using a mesh network, please specify the primary operating location and secondary sensor locations, as well as any other relevant requirements of your setup.		
A	Rooftop Assume stairwell access only, with a single 91CM (36 inch) wide door.	
B	High level balcony (~10th floor or higher) Assume a balcony 4.5M (15 feet) x 1.5M (5 feet), and a room 4.5M (15 feet) x 6M (20 feet)	
C	Mid-level balcony (~5th floor) Assume a balcony 4.5M (15 feet) x 1.5M (5 feet), and a room 4.5M (15 feet) x 6M (20 feet)	
D	Ground level Assume an outdoor space 5M (16 feet) x 9.7M (32 feet) (four parking spaces)	
E	Mesh Network	

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2. Test Objectives
Instructions: Provide a numbered short list of high-level test objectives that you intend to demonstrate/test the capabilities of the CUAS technology you are bringing to the Sandbox. When you create your daily test schedule in the subsequent sections, each daily test item scheduled must refer to one or more of your numbered objectives here.
Example objectives (you need not use these): 1. Initialize and calibrate CUAS system. 2. Characterize range of sensor X against micro rotorcraft drone 3. Characterize tracking accuracy of sensor X 4. Establish vulnerability of system to rapidly manoeuvring drones 5. Identify operator workload and situational awareness during multiple-drone attack
PASS: The objectives make reasonable use of the Sandbox time and resources provided to the applicant and would demonstrate the capabilities of the system to Canada.
FAIL: The objectives do not make reasonable use of the Sandbox time and resources provided to the applicant, or do not demonstrate the capabilities of the system to Canada.

Table A: Test Objectives	
Obj #	Objective Description
1	
2	
3	
4	
5	
6	
7	
8	
9	

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3. Night Testing	
Instructions: Please read the details in the Applicant Guide in the section called “Can nighttime testing be done?” CUAS 2027 (Urban) will be conducted during daylight hours and that is the expectation with each company selected. There will be one evening (Tuesday, May 11, 2027 – TBC) of testing for those companies requesting the opportunity to participate in night trials. Once a company is selected we are open to considering portions of their Sandbox time at night within the post-selection process and considerations in the Applicant Guide. For the evaluating your test plan this is not a Pass/Fail item; however, to enable forward planning please indicate your level of requirement for nighttime testing below.	
3.1 Is your company requesting any night testing?	Yes or No?
3.2 If yes, please substantiate why night testing is essential, as opposed to daytime testing only. Why can’t the results of daytime testing be inferred to how your system would perform at night?	
3.3 If your request for night testing cannot be accommodated, will you still accept an invitation to the Sandbox and do your testing in the daytime only?	Yes or No?

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4. Daily Test Schedule and Pass/Fail Evaluation For describing your proposed test plan on the provided template : • Group your test points by test day and location: ○ We expect you to do all your testing at one location before moving to another, to minimize the effort of moving between sites. ○ We expect you to remain at one location for an entire day. Moving locations and resetting within one test day will generally consume too much down time and will only be permitted by exception at Canada’s sole discretion. ○ Each test point should be scheduled to last for 60 minutes before the next one commences, to permit time for coordination of all personnel and equipment between test points. ○ Within one test point of 60 minutes, it may be possible to repeat the same test scenario multiple times with minor alterations incorporated, such as resetting the position, or a variation on the route flown. Such multiple iterations within the same scenario and 60-minute block need not be shown at this point. • For each test day/location: ○ Select the desired combinations from the four “<i>Test Point Descriptive Tables</i>” (see next page) that best represent each test point you wish to demonstrate. ○ Enter each test point into your Test Plan template, referencing your choices from these four tables in the corresponding columns of your plan. • Test Plans will be finalized with each Participant prior to the Sandbox commencing but can evolve and be adapted during the sandbox as well, rather than being rigidly adhered to. • If you intend to request night tests, indicate on which days you plan to conduct them in the Activity Name (e.g., Night Detection). PASS: A realistic test plan that clearly includes the following considerations: • It aligns with and viably achieves the stated Test Plan objectives listed in section 2. • It utilizes the template and time blocks as shown on the template following all instructions throughout this template without substantive modification. • It utilizes the four “<i>Test Point Descriptive Tables</i>” (see next page) in combination to produce the proposed test points. • Total duration of the plan must be no longer than 5 days and can be shorter. FAIL: The test plan is not considered viable to achieve as it fails one or more of the above PASS requirements and rectification with the applicant is not considered sufficiently viable.

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Test Point Descriptive Tables.

- Select the desired combinations from the four “Test Point Descriptive Tables” that best represent each test point you wish to demonstrate.
- Enter each test point into your Test Plan template, referencing your choices from these four tables in the corresponding columns of your plan.

You are NOT expected to use all possible combinations from these tables.

Note that in Table 1, these four types of test locations are anticipated but may be adjusted depending on the technologies selected to attend, as described in the section on safety and privacy in the Applicant Guide:

1. Test Location of the detector?	
A	Rooftop
B	High level balcony (~10 th floor or higher)
C	Mid-level balcony (~5 th floor)
D	Ground level

2. Flight Profile: Target approaches from? Visual Line Of Sight (VLOS)	
A	Above rooftop, within VLOS
B	Above the rooftop, not within VLOS
C	Below rooftop, within VLOS
D	Below the rooftop, not within VLOS, manoeuvring around buildings and often hidden from VLOS

3. Target Maneuverability?	
A	Static hover (assumes a rotorcraft target type)
B	Loitering in a small area in a fixed location
C	Flying towards the detector.

4. Target Type? (precise targets provided may change)		
A	Mini Rotorcraft	• DJI Mavic 3 • Autel EVO II
B	Micro Rotorcraft	• DJI Mini 4 Pro
C	Mini VTOL Fixed-Wing	• Heewing Cruza T2 VTO
D	Long-Endurance Mini Fixed-Wing	• Chaos Choppers Hornet VTOL
E	FPV	• SpeedyBee Master 5
F	Swarm of assorted drones	

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Complete the following for each day of your proposed Daily Schedule, on an assumption that you are given the number of test days you requested (a maximum of 5 days).

Test Day 1

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)	Target Maneuverability (Table 3)	Target Type (Table 4)	Test Objective # (from Table A above)	Additional comments
Sunrise is at 0720. Lunch and breaks/snacks provided on site to permit continuity of testing.									
1	A	0800	0900	Insert your test location for the day here.	Location in-briefs, health and safety, unpack, setup, prepare for testing				
1	B	0900	1000						
1	C	1000	1100						
1	D	1100	1200						
1	E	1200	1300						
1	F	1300	1400						
1	G	1400	1500						
1	H	1500	1600						
1	I	1600	1700		End of day debriefs, data storage, equipment pack up, and site daily closedown.				
Sunset is at 1620									

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Test Day 2

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)	Target Maneuverability (Table 3)	Target Type (Table 4)	Test Objective # (from Table A above)	Additional comments
Sunrise is at 0720. Lunch and breaks/snacks provided on site to permit continuity of testing.									
2	A	0800	0900	Insert your test location for the day here.	Location in-briefs, health and safety, unpack, setup, prepare for testing				
2	B	0900	1000						
2	C	1000	1100						
2	D	1100	1200						
2	E	1200	1300						
2	F	1300	1400						
2	G	1400	1500						
2	H	1500	1600						
2	I	1600	1700		End of day debriefs, data storage, equipment pack up, and site daily closedown.				
Sunset is at 1620									

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Test Day 3

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)	Target Maneuverability (Table 3)	Target Type (Table 4)	Test Objective # (from Table A above)	Additional comments
Sunrise is at 0720. Lunch and breaks/snacks provided on site to permit continuity of testing.									
3	A	0800	0900	Insert your test location for the day here.	Location in-briefs, health and safety, unpack, setup, prepare for testing				
3	B	0900	1000						
3	C	1000	1100						
3	D	1100	1200						
3	E	1200	1300						
3	F	1300	1400						
3	G	1400	1500						
3	H	1500	1600						
3	I	1600	1700		End of day debriefs, data storage, equipment pack up, and site daily closedown.				
Sunset is at 1620									

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Test Day 4

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)	Target Maneuverability (Table 3)	Target Type (Table 4)	Test Objective # (from Table A above)	Additional comments
Sunrise is at 0720. Lunch and breaks/snacks provided on site to permit continuity of testing.									
4	A	0800	0900	Insert your test location for the day here.	Location in-briefs, health and safety, unpack, setup, prepare for testing				
4	B	0900	1000						
4	C	1000	1100						
4	D	1100	1200						
4	E	1200	1300						
4	F	1300	1400						
4	G	1400	1500						
4	H	1500	1600						
4	I	1600	1700		End of day debriefs, data storage, equipment pack up, and site daily closedown.				
Sunset is at 1620									

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Test Day 5

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)	Target Maneuverability (Table 3)	Target Type (Table 4)	Test Objective # (from Table A above)	Additional comments
Sunrise is at 0720. Lunch and breaks/snacks provided on site to permit continuity of testing.									
5	A	0800	0900	Insert your test location for the day here.	Location in-briefs, health and safety, unpack, setup, prepare for testing				
5	B	0900	1000						
5	C	1000	1100						
5	D	1100	1200						
5	E	1200	1300						
5	F	1300	1400						
5	G	1400	1500						
5	H	1500	1600						
5	I	1600	1700		End of day debriefs, data storage, equipment pack up, and site daily closedown.				
Sunset is at 1620									

Counter Unmanned Aerial Systems (CUAS) 2024 Test Plan Template

Annex A – Example Day 1 Schedule

Table A: Test Objectives	
Obj #	Objective Description
1	Initialize and calibrate CUAS system.
2	Characterize range of sensor X against micro rotorcraft drone
3	Characterize tracking accuracy of sensor X
4	Establish vulnerability of system to rapidly manoeuvring drones
5	Identify operator workload and situational awareness during multiple-drone attack

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)		Target Maneuverability (Table 3)		Target Type (Table 4)		Test Objective # (from Table A above)	Additional comments
Sunrise is at 0720. Lunch and breaks/snacks provided on site to permit continuity of testing.												
1	A	0800	0900	A. Rooftop	Location in-briefs, health and safety, unpack, setup, prepare for testing							
1	B	0900	1000		A	Above rooftop, within VLOS	A	Static hover (assumes a rotorcraft target type)	A	Mini Rotorcraft	1, 2, 5	
1	C	1000	1100		B	Above the rooftop, not within VLOS	A	Static hover (assumes a rotorcraft target type)	B	Micro Rotorcraft	1, 2, 5	
1	D	1100	1200		B	Above the rooftop, not within VLOS	A	Static hover (assumes a rotorcraft target type)	C	Mini VTOL Fixed-Wing	1, 2, 5	
1	E	1200	1300		C	Below rooftop, within VLOS	B	Loitering in a small area in a fixed location	D	Long-Endurance Mini Fixed-Wing	1, 2, 3, 5	

Counter Unmanned Aerial Systems (CUAS) 2024 Test Plan Template

Test Day	Test Serial Letter	Start	End	Detector Location (Table 1)	Flight Profile (Table 2)		Target Maneuverability (Table 3)		Target Type (Table 4)		Test Objective # (from Table A above)	Additional comments
1	F	1300	1400		C	Below rooftop, within VLOS	B	Loitering in a small area in a fixed location	E	FPV	1, 2, 3, 5	
1	G	1400	1500		D	Below the rooftop, not within VLOS, manoeuvring around buildings and often hidden from VLOS	C	Flying towards the detector.	F	Swarm of assorted drones	1, 2, 3, 4, 5	
1	H	1500	1600		D	Below the rooftop, not within VLOS, manoeuvring around buildings and often hidden from VLOS	C	Flying towards the detector.	F	Swarm of assorted drones	1, 2, 3, 4, 5	
1	I	1600	1700		End of day debriefs, data storage, equipment pack up, and site daily closedown.							
Sunset is at 1620												