Track B: Autonomous Wildfire Response

Round 2: Semifinals

Rules and Regulations

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Introduction

This Rules and Regulations is issued for the XPRIZE Wildfire Track B: Autonomous Wildfire Response (“Track B”) Semifinals. This document is to supplement the Competition Guidelines (originally published April 21, 2023, currently Version 2.2 as of August 6, 2024). While the Guidelines remain in full effect as the primary document governing the competition, at each round of the competition, this document is published to provide necessary operational details specific to that round of the competition.

Rules and Regulations detail the concept, requirements, constraints, boundaries and directives of the Semifinals. All teams must adhere to these Rules and Regulations at all times during Semifinals. Failure to adhere to these Rules and Regulations may result in consequences as detailed in the Competitor Agreement.

XPRIZE reserves the right to adjust the Competition Guidelines and Rules and Regulations based on emerging operational, scientific, and legal information to ensure personal and environmental safety. XPRIZE will make all final determinations on safe and acceptable operating conditions for competition operations. XPRIZE reserves the right to disqualify teams who are found to be operating in an unsafe or unethical manner, whether at official testing sites or at their own facilities.

All competing teams will be notified of revisions in a timely manner. Official updates will be communicated to team leaders by email. Send any questions or communications to wildfire@xprize.org.

For the most updated version of the Rules and Regulations, check xprize.org/wildfire and always remember to replace your files with the most recent versions of official documents.

1. Test Plan

1.1. Introduction

The XPRIZE Wildfire Track B: Autonomous Wildfire Response Semifinals represent a significant stage in the competition where teams will demonstrate their solutions for autonomously detecting, navigating, and suppressing an incipient stage destructive wildfire in an outdoor environment with variable natural weather conditions. This test is intended to be a natural lead-up to Finals.

For Track B, the Grand Prize will be awarded to the team that can demonstrate their solution's ability to autonomously detect and suppress a high-risk fire in a 1,000 km^2, environmentally challenging area, leaving any decoy fires untouched within 10 minutes.

1.2. Objective

The testing objectives are linked to overall system capabilities, which are distinct critical elements necessary to achieve the specific winning team statement indicated in section 1.1.

In October 2025, the teams will have to demonstrate the functionality of their solution's integrated subsystems, such as sensors, drones, robots, and fire suppression, and how they work together to achieve the desired outcome.

1.3. Test Methodology

Track B Semifinals will entail deployment of working technology and/or prototypes in a closed outdoor test environment designed to simulate real-world conditions and scenarios. Functional testing methodology will be used to evaluate each solution against the winning team statement to ensure each part of the solution performs as expected. Teams will be provided additional opportunities to demonstrate the effectiveness of each solution component if unable to complete the test as an integrated system. Team’s integrated solutions and/or components will be evaluated on the criteria below.

Fully Autonomous Integrated
Objective: Test the ability of the integrated solution to operate autonomously from detection to response and suppression.
Requirement: These autonomous systems must feature a safety requirement known as “Human-on-the-Loop” autonomy. This means the solutions must be capable of operating successfully without human input during the test (participants may provide input when training their systems), although humans will be supervising the testing and can abort or override if problems arise.

Smart Detection
Objective: Test the ability of the solutions to recognize incipient stage destructive fire and not respond to decoy fires.
Requirement: Solutions should not respond to false positives such as water vapor, clouds, or low-intensity fires non-destructive fire. Detection systems should be capable of monitoring up to a 1000km^2 area during day and night conditions.

Safety
Objective: Teams' solutions must not introduce harm in their operation or delivery (i.e., by striking anyone with a drone or a dangerous suppression material delivery mechanism).
Requirement: The teams' solutions must include safety overrides (see Rule 1 below), and must be non-toxic—particularly if they innovate with a new chemical suppressant—based on current globally-recognized NFPA standards (NFPA 1143 and NFPA 1145) and EPA standards. Concerning Lithium Ion Batteries, teams may refer to NFPA 855.

Functionality in Extreme Weather Conditions
Objective: Assess the performance of the solutions under severe weather conditions.
Requirement: Testing should be conducted in adverse weather scenarios, including heavy rain, high winds (solutions must perform efficiently at wind speeds of 30 km/h and be tested up to 100 km/h), or snow. Additionally, the solutions may face degraded conditions like low visibility and extreme temperature variations. Solutions must demonstrate robustness and durability to withstand the difficulties of an extreme outdoor environment.

Functionality in Complex Terrain
Objective: Assess the solutions' performance in challenging terrain.
Requirement: The solutions must operate efficiently on slopes with at least a 50-degree average incline over a 100-foot distance. They should also be capable of navigating through water, mud, dense vegetation, and thick forest canopies. The test site is intended to mimic real-world conditions for fire detection and response, presenting various obstacles such as utility infrastructure, fences, gates, buildings, and vehicles that the teams must overcome.

Connectivity
Objective: Ensure the solutions maintain connectivity during operations.
Requirement: Solutions should have multiple types of connectivity for backup. Additionally, the teams will have to overcome the potential interference from other teams or external sources that may disrupt their communication or sensor signals.

1.4. Test Logistics

Date & Time

Semifinals are currently scheduled for October 2025. The exact testing location, dates and assigned testing times will be announced to teams by September 1, 2025. Teams can expect both night and day operational windows.

Location

The test site for the fire detection challenge is a 1,000 km^2 area of wildland terrain that offers a variety of extreme environmental and weather conditions.

Forward Deployment

Teams will be permitted to forward deploy their solutions in the testing area in advance of the allotted time for testing. The logistics and regulations guiding this forward deployment, including the exact test site location and access details, will be shared with teams closer to the semi final event. Teams will be given a pre-scheduled date and time for all of these activities. Within reason and as defined by XPRIZE testing partners and any regulatory requirements limitations, XPRIZE intends to provide the time, information and logistical support needed for testing.

1.5. Testing Assumptions and Artificialities

In any testing, assumptions and artificialities may be necessary to complete testing in the time allotted and/or account for logistical limitations. Testing participants should accept that assumptions and artificialities are inherent in any testing, and should not allow these considerations to negatively impact their participation.

Assumptions

Assumptions constitute the implied factual foundation for the Testing and, as such, are assumed to be present before the Testing starts. The following assumptions apply to the Track B Semifinals Testing:

- Teams should assume they are acting in a scenario whereas they have been contracted to protect a 1000 km^2 area from destructive wildfire. That area offers a variety of values at risk, along with extreme environmental and weather conditions.
- Throughout testing, XPRIZE will record and validate the performance of Team's solutions. XPRIZE staff, judges, and fire managers will observe any and all aspects of testing. Teams should plan accordingly.

Artificialities

The Semifinal test period will include some artificialities, for example if high winds, heavy rain, fog or smoke can not be obtained naturally then teams will be expected during some portions of testing to handle artificially created conditions, these conditions may or may not be immediately apparent to the teams.

2. Selection for Progression to Finals

XPRIZE will use Semifinal judged results, in concert with Developmental Check-ins, to make determination as to which teams progress to Finals. Only those teams with a chance of success at Finals will be allowed to progress.

2.1. Test Assessment Criteria

Teams will be scored based on the accuracy, precision, and timeliness of their suppression and detection methodology. Scoring metrics will be released to teams at minimum 90 days in advance of Semifinals Testing.

As a guide, teams are reminded of the following metrics, summarized from the Competition Guidelines and information provided during QTS:

Detection	Detection of Fire	**Scoring Criteria:** Time to detect
	Accuracy of Detection	**Scoring Criteria:** Positional accuracy of detected fire, accuracy of valid fire (i.e. Not a false positive)
	Fire Behaviour	**Scoring Criteria:** Additional information available from detection methodology
Suppression	Arrival at the fire	**Scoring Criteria:** Total time from detection to application of first suppression
	Suppression Methodology	**Scoring Criteria:** Efficacy of suppression
	Fire Out	**Scoring Criteria:** Total time from ignition to suppression / detection to suppression
Scalability	External Factors	**Scoring Criteria:** Overall assessment of the solutions ability to handle the detection and suppression of an incipient stage wildfire in a 1000km^2 area with a focus on the ability of the solution to scale to an international scale. Looking at factors such as price, deployability, ground infrastructure requirements, ect.

3. Rules and Regulations

3.1. Testing Range Rules

Rule 01	Safety Overrides
Description	Teams will be expected to have emergency full control over their autonomous systems. This can include but is not limited to the ability to cease both air and ground operations and abort suppression efforts if the situation is deemed unsafe by XPRIZE staff and Testing Officials (including judges, site personnel, or other testing administrators). Teams' autonomous systems must feature a safety requirement known as "Human-on-the-Loop" autonomy. This means the solutions must be capable of operating successfully without human input during the test (participants may provide input when training their systems), although humans will be supervising the testing and can abort or override if problems arise.
Rationale	Ground and Airborne operations safety.

Rule 02	Ground Operational Considerations
Description	Teams must follow XPRIZE staff rules of engagement when interacting with the testing site locations to ensure the safety of all participants, as well as safe testing operations. To that end, teams will comply with both local laws and additional safety measures put in place by the testing partner. Teams will only have access to predetermined areas as specified by XPRIZE. As well, teams may be forbidden from accessing certain shared areas and/or operating their systems continuously to ensure a fair testing environment for all contestants.
Rationale	Fair and Safe Testing environment.

3.2. Timing and Reporting Rules

Rule 03	Each test window is a maximum of 90 minutes.
Description	Each team shall have a test window of 90 minutes (real-time).
Rationale	This allows for appropriate time for activation of detection systems to begin monitoring, and for suppression to occur.

Rule 04	Reporting
Description	Teams are to provide the below information of all fires identified and characterized as incipient and potentially destructive. This must include the following information:

	• Time (UTC) of identification/detection • Time (local) of identification/detection • Time of arrival • Area of Fire • Latitude of fire • Longitude of fire • Time of fire being declared fully out • Time solution returns to home
Rationale	Consistent geospatial reporting requirements to ensure multinational integration.

3.3. Administrative Rules

Rule 05	**Safety**
Description	Teams must comply with all local health and safety regulations and laws during testing. Teams must comply with site-specific safety guidelines and procedures during testing, as provided by XPRIZE and testing officials.
Rationale	Overall Safety testing participants and administrators. Teams should refer to Section 2 of the Competition Guidelines for overall health and safety expectations throughout the competition.

Rule 06	**Cooperation with XPRIZE Wildfire**
Description	Teams must cooperate with XPRIZE Wildfire and representatives to facilitate the conduct and verification of Semifinals.
Rationale	By entering into Semifinals teams acknowledge that communications and cooperation are fundamental to the conduct of a successful test. XPRIZE may request information from teams directly, including cooperation with scheduling and logistic planning and provision of requested technical details and performance or analytic data. XPRIZE will make every effort to cooperate with teams, communicate proactively and accommodate each team's specific circumstances within reason. XPRIZE reserves the right to disqualify teams for lack of cooperation during this process as per Section 3.5 of the Competitor Agreement.

Rule 07	Developmental Check-ins
Description	Teams must complete all Developmental Check-ins in the lead-up to Semifinal conduct.
Rationale	XPRIZE Wildfire inherently involves TRL uplift from QTS through to Round 3 Finals. In order to provide assurance that teams maintain a competitive trajectory between QTS and Semifinals, XPRIZE uses Developmental Check-ins. A Developmental Check-in is a scheduled event where teams are required to submit updates on their progress in designing their technological systems. These updates will be delivered via XPRIZE's Prize Operations Portal (POP) where teams will be asked specific questions regarding the development of their systems. Examples of information teams may be asked to submit during check-ins include technical specifications, pictures, drawings, diagrams, videos, narrative reports, proof of regulatory licensing and/or other applicable materials. Teams will be allowed three business weeks to prepare submission materials.

Rule 08	Data Policies
Description	In order to validate team data, and validate results from each team's autonomous systems, teams will need to be ready to have their system operations recorded; this will be accomplished through three primary methods: ● Screen recording through a HDMI/Display port video capture card to see and evaluate user input and overall UI. ● External camera, to observe human input and coordination with test site staff. ● Teams will provide any graphical information, sensor input and camera feeds through a shared hard drive. Test site staff will work with individual teams to ensure data co-operability.
Rationale	To ensure teams' results incorporate the required level of autonomy and provide judges with in-depth material to reference.

Rule 09	**Piloting Certification and Airworthiness (For airborne solutions)**
Description	*Piloting Certification* For operating small unmanned aircraft systems under 55lbs, teams are expected to provide certificated pilots with equivalent licensing to 14 CFR Part 107. For operating unmanned aircraft systems over 55lbs, teams are expected to provide certificated pilots with licensing equivalent to those outlined 14 CFR Part 61. For aircraft types with additional type certification that have been modified to be optionally piloted, certification of that type, or manufacturer specific training, is required. *Airworthiness* Airworthiness for airborne systems will depend on which country Semi-Final and Finals will be taking place in. Teams will be expected to provide the airworthiness documentation they have acquired from their country of origin. Airworthiness will be examined continuously throughout the competition and Developmental Check-in processes.
Rationale	To ensure safe operation and establish a safe track record of participating teams.