# Rules and Regulations
# Version 4.2

August 26, 2022

These RULES AND REGULATIONS ("Rules") govern the ANA AVATAR XPRIZE. This Rules and Regulations Version 4.2 supersedes all previous versions. This Version also serves as an addition to and, where applicable, overrides information contained in the published Competition Guidelines originally published September 10, 2018, and updated August 30, 2019. Certain details relating to the Semifinals have been removed for brevity.

All participating Teams must adhere to these Rules in order to be eligible to progress through the Competition milestones and be qualified for selection as a winner of the Competition. Failure to adhere to these Rules may result in consequences as detailed in the Competitor Agreement.

XPRIZE may update these Rules as necessary during the course of the Competition to provide additional information or to improve the quality of the Competition. There may also be unanticipated issues that will require modifications to these Rules. XPRIZE reserves the right to revise these Rules as it, in its sole discretion, deems necessary. Dates and locations are subject to change pursuant to the Competitor Agreement. Competing Teams will be notified directly of any such revisions.

**Note**: All terms that are in bold throughout the document have a corresponding definition in the Glossary section.

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# 1. Introduction and Scope

The ANA Avatar XPRIZE was launched in March 2018, and is sponsored by All Nippon Airways (ANA). The competition challenges Teams to integrate a range of diverse, cutting-edge technologies to create a physical robotic **Avatar System** that will transport a person's senses, actions and presence to a remote location in real time.

Robotic technologies have advanced greatly in the last decade and are now employed in a wide range of applications and services. The ANA Avatar XPRIZE seeks to accelerate the development of robots as an integral part of human communications and increase the functionality and application of robots in society.

The winner of this XPRIZE will demonstrate a functional Avatar System, which consists of a human **Operator** controlling a robotic Avatar (**Operator/Avatar**) at a real and/or **Simulated Distance** that allows the Operator to interact with another human (**Recipient**), or the remote environment, receiving all sensory information through the robotic Avatar. The ultimate goal is for a person to feel as if they are truly where the Avatar is, experiencing a sense of **Presence** through the Avatar.

# 2. Rules and Regulations Revisions

XPRIZE may update these Rules as necessary during the course of the Competition to provide additional information or to improve the quality of the Competition. There may also be unanticipated issues that will require modifications to these Rules. XPRIZE reserves the right to revise these Rules as it, in its sole discretion, deems necessary. Dates and locations are subject to change pursuant to the **Competitor Agreemen**t. Competing Teams will be notified directly of any such revisions.

This version of the Rules and Regulations addresses specifics pertaining to the Finals Testing. To this end, Sections of the previous Rules and Regulations Version 3.2 that pertained to the 2021 Semifinals (primarily Sections 7 and 8.1) have been removed for brevity. (Please refer to the Rules and Regulations Version 3.2 if you need to consult these previous sections.)

In Rules and Regulations Version 4.0, Sections 7 and 8 now refer to the Finals Testing which will be significantly different from how testing in Semifinals was accomplished. Tasks and the Testing Course required for Finals are defined in more detail in Version 4.2.

# 3. Teams

## 3.1 Eligibility

XPRIZE believes that solutions can come from anyone, anywhere. Scientists, engineers, academics, entrepreneurs, and other innovators with new ideas from all over the world are invited to form a Team and register to compete. To participate, a Team is required to first create an account in the **Prize Operations Platform (POP)** system. POP is an online platform through which all Teams will register for the Competition, pay the required registration fee, and submit their qualifying documents throughout the life of the Prize. Teams are expected to maintain their POP profiles throughout the Competition, ensuring their profile is always up to date with the most recent Team and Team members information.

A Team may recruit additional experts and can add new members to their Team profile page in POP at any time throughout the Competition. Teams may also merge with other Teams during the Competition. Teams must notify XPRIZE of a merger before it takes place. Please refer to the **Competitor Agreement** for all eligibility terms, and contact XPRIZE with related questions.

## 3.2 Team Definitions

Teams are categorized per the following:

- **Interested Team:** A Team or individual that is interested in participating in the Competition and has created a profile in the XPRIZE internal POP system.

- **Registered Team:** A Team that has paid the required registration fee and is eligible to submit a **Qualifying Submission** for Judge review.

- **Qualified Team (up to 150 Teams):** A Team that has been selected by the Judging Panel from the pool of Registered Teams based on the strength of their Qualifying Submission.

- **Semifinalist Team (up to 75 Teams):** A Team that has successfully completed the **Semifinalist Selection** and is selected by the Judges to proceed in the Competition and attend **Semifinals** testing.

- **Finalist Team (up to 20 Teams):** A Team that has successfully completed Semifinals testing and is chosen by the Judging Panel to attend **Finals** Testing.

*Team Progression Chart*

| Semifinalist Verification | Semifinals Team Video Deadline | Semifinals Testing | 20 Finalist Teams Announced | Finals Testing Event | Winners Announced |
|---|---|---|---|---|---|
| **June 1, 2021** | **July 1, 2021** | **Sept 2021** | **May 25, 2022** | **Nov 2-5, 2022** | **Nov 5, 2022** |

Dates are tentative and subject to change

## 3.3 Team Roles and Responsibilities

Teams are responsible for the items listed below. This is not a comprehensive list. Please contact XPRIZE at avatar@xprize.org if you have any questions.

1. Completing all required activities for each stage of the Competition in the POP system.
2. Remaining in compliance with the Competitor Agreement.
3. Fulfilling insurance and eligibility requirements as detailed in the Competitor Agreement.
4. Design and development of the **Avatar Solution**.
5. Transporting the Avatar Solution to and from physical testing sites.
6. Deployment and setup of the Avatar Solution before any test and removal of the Avatar Solution after the end of testing, in keeping with the allotted schedule set by XPRIZE.
7. Costs associated with lodging and travel for Team members to any Competition event.
8. Costs associated with transporting the Avatar Solution, insurance, customs fees, and other fees that may be incurred from bringing the Team's Avatar Solution to a testing location.
9. Training Judges and XPRIZE operations staff (as needed) to operate their Avatar Solution.
10. Cooperating with the Judging Panel in any verification activities both onsite, as well as any follow up verification (post-testing) as necessary.

11. Following all safety protocols as required during testing to ensure the safety of all participants during testing events.

As defined in the Competitor Agreement, all Teams and Team Members must adhere to all applicable laws, including, but not limited to, local, regional, national, and international laws, orders, directives, ordinances, treaties, rules, and regulations for all aspects of the Competition. Teams are solely responsible for acquiring any appropriate licenses, waivers, or permits from the applicable regulatory bodies or other applicable third parties.

## 3.4 Finalist Verification

Finalist Teams will be required to submit eligibility materials to verify they are prepared to proceed to Finals. The **Finalist Verification** submission deadline is scheduled for August 1, 2022.

Due by August 1, 2022:
1. Proof of Team Insurance and Eligibility (refer to the Insurance Compliance Checklist)

Teams are encouraged to work on these requirements early in the process to ensure they are able to meet the deadline. Details on upload requirements for the Finalist Verification will be provided to Teams closer to the deadline. It is the Team's responsibility to ensure all components are received on time and in the correct, uncorrupted format.

**IMPORTANT NOTE:** Only Teams whose Insurance and Eligibility Requirements have been fulfilled and confirmed by XPRIZE (as per the Competitor Agreement) will be permitted to attend Finals.

# 4. Judging Panel

## 4.1 Selection and Contributions

The Judging Panel has been selected from a wide range of experts in the technology domains that are expected to be integrated into an Avatar Solution. The Judging Panel is composed of volunteers whose responsibilities include:

- Assist in the creation and/or validation of the Rules and Regulations and judging criteria that govern this competition.
- Review and judge Teams' initial Qualifying Submissions and select Semifinalist Teams to proceed forward in the Competition.
- Evaluate the viability of each Team's solution ahead of Semifinals and Finals.
- Select the Teams to advance to Semifinals and Finals.
- Score Team entries for both the in-person Semifinals and in-person Finals rounds of Testing.

## 4.2 Judging Panel Roles During Testing

During Finals, Judges will participate in all testing. Judges will serve as the Operators of the Avatars during testing and as the Recipients on the **Test Course**. Judges will evaluate and score the tasks throughout the Test Course. The Operator Judge will have an Assistant in their room during the testing session.

Judges will be assigned their roles at XPRIZE's discretion. Teams may not request a particular Judge and will not know ahead of time which Judge is acting in what role at testing.

## 4.3 Judges' Decisions

Judging decisions are final. Judges are prohibited from providing feedback to Teams. Teams may not contact Judges outside of XPRIZE-managed circumstances. XPRIZE does not interfere with the Judges' deliberations or decisions in any way. Judges are required to recuse themselves for any reason that might compromise the impartiality of their deliberations or decisions.

In some instances, the Judging Panel may require additional information from Teams and XPRIZE will facilitate these discussions as necessary.

The Judging Panel retains ultimate discretion to declare the winners of the Competition and otherwise award all Prizes (subject to the Competitor Agreement). All judging decisions and opinions made by the Judging Panel are binding on both Teams and XPRIZE, and are not subject to review or contest. No judging decision may be challenged by a Team, and all Teams agree to abide by and refrain from any such challenge.

# 5. Competition Timeline and Milestones
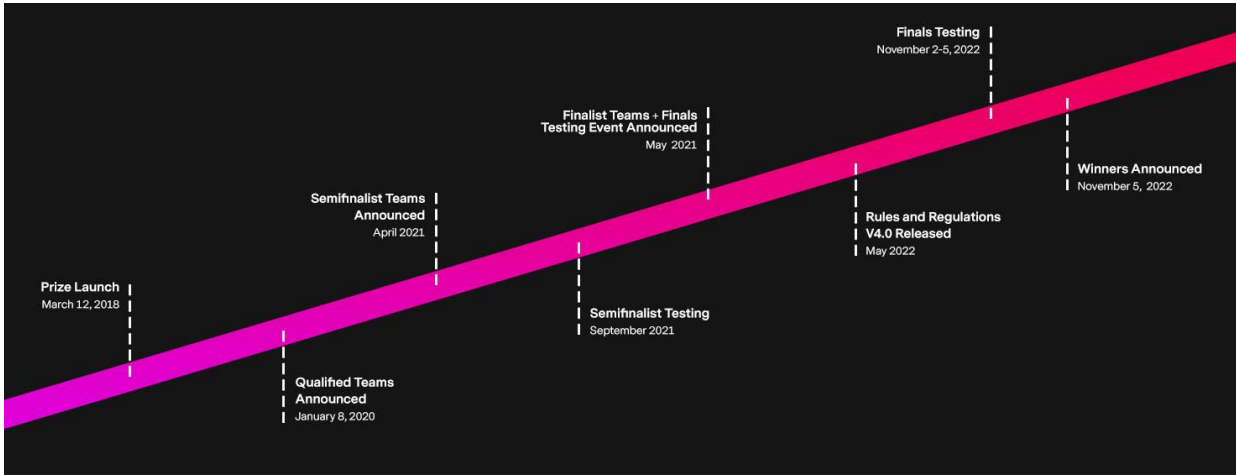


Teams must accomplish the following milestones in order to progress in the Competition.

*Competition Milestone Reference Table*

| Competition Milestone | Date | Requirements | # Teams |
|---|---|---|---|
| *Qualifying Submission and Competitor Agreement Deadline* | October 31, 2019 | Complete written submission on POP (See Section 5.1) and sign the Competitor Agreement | Up to 150 will be selected |
| *Semifinalist Selection Submission* | February 2, 2021 | Submit written and video portions (See Section 5.2) | Up to 75 will be selected as Semifinalists |
| *Semifinalist Verification* | June 1, 2021 | Complete Semifinals Insurance & Eligibility Requirement, Technical Enrollment (See Section 5.3) | Up to 75 will advance to Semifinals testing |

| | | | |
|---|---|---|---|
| *Semifinals Team Video* | July 1, 2021 | Submit Semifinals Team Video (See Section 5.4.1) & Team Video Documentation (See Section 5.4.2) | This video will be scored by Judges (as in Section 8.1.7) and counts for 10 points of your Semifinals Score |
| *Semifinals Testing* | September 2021<br><br>*Testing time frames and location to be released to Teams by July 2021.* | Transport Avatar Systems to testing facility; demonstrate Avatar capabilities to Judging Panel (See Section 8.1) | Up to 75 will test at Semifinals; Up to 20 will advance to the Finals and split $2 Million prize purse; individual Team testing schedules will be released by July 2021 |
| *Finals Verification* | August 1, 2022 | Complete Finals Insurance & Eligibility Requirement | Only Finalist teams who are verified will be able to attend Finals Testing |
| *Team Member Registration* | September 30, 2022 | Complete Finals Testing Team Member Registration Form (online) | See Operations Guide for details and link to registration website |
| *Finals Testing* | November 1-5, 2022 | For details see Section 8.2 | Up to 20 will test at Finals |
| *Announce Competition Winners* | November 5, 2022 | See Section 9 | First, Second, and Third place prizes available to the top ranking teams at Finals |

# 6. System Requirements

## 6.1 Avatar Robot

Teams are encouraged to design and build or purchase existing Avatar Systems that will allow them to be successful in the Competition. However, due to safety considerations and planned indoor testing, the **Avatar Robot** must meet the following conditions:

- Total weight, including its power source, must not exceed 160 kg.

- Width and length dimensions must be no more than 100 cm x 120 cm maximum.
- Total height must be less than 210 cm.
- The Avatar must be able to safely operate indoors, and must not release any direct emissions.
- Teams may **not** use a network and/or power tether for their system for Finals Testing. All Avatar Robots must be wireless for power and communications.
- The shore power in the test location will be 120 VAC nominal for battery charging and operator equipment. Note: Avatars can not be plugged into shore power during Testing.
- The Test Course will require mobility of the Avatar. The mobility solution can vary, but must be safe for humans to be around.

**If a team needs to utilize an Avatar Robot different than was previously tested at Semifinals, they should contact XPRIZE no later than September 15, 2022.**

## 6.2 Use of Drone Technology

Because the overall purpose of the Avatar XPRIZE is to facilitate human-to-human interaction, Avatar forms that do not support this key aspect, including drones, robots that operate underwater or within other environments not conducive to our indoor testing protocols, or forms that do not provide some correspondence to the Operator's physical performance through the Avatar, will not be permitted.

## 6.3 Operator Interface

Teams are permitted to use the Operator Interface they deem to be the most effective in allowing the Operator to feel the senses and actions transported to and from the robotic Avatar. These may be existing commercial systems or custom-made solutions. They should be intuitive and easy for the Operator Judge to learn and use effectively.

To ensure safety and testing considerations, the Operator Interface should adhere to the following provisions:

- The overall specifications of such a system must be reasonable and not impair the user's normal activities in any significant way, such as excessive size or weight.
- The interface system worn by the Operator may be tethered or untethered, as long as adequate connection is maintained between the elements of the system.

- It is permissible for the interface system to include a Heads-Up Display that includes overlaid information in addition to visual or sensory input from the robot.
- Any use of **Brain Computer Interfaces (BCI)** as part of the Operator Interface must not be of an invasive nature. Only externally-worn devices are allowed.
- Teams are required to share their **Operator View** via a real-time feed to XPRIZE during Finals Testing.

## 6.4 Avatar Communications

During Finals, Teams should plan to have a data communications network approach where all network traffic between Operator and Avatar will go through the Competition Network. Finals Event details will be updated in the **ANA Avatar XPRIZE Network Guide by August 2022.** The ANA Avatar XPRIZE Network Guide will be made available in the Competing Teams Access Folder on Google Drive.

# 7. Test Course

## 7.1 Introduction

At **Finals** Testing, a dedicated Test Course will be used to evaluate team performance, as detailed in Section 8.2.10 below. The Test Course is designed to evaluate the ability of the Avatar to allow the Operator of the system to experience a sense of presence in the remote location. The Avatar System must facilitate the transfer of sensory information from the remote location back to the Operator who is controlling the Avatar. The **Avatar Ability** will be judged based on the Avatar being able to complete each task. (See Section 8.2.11).

## 7.2 Test Course Domains, Tasks and Capabilities

### 7.2.1 Test Course Domains

The Test Course **Domains** have been developed through extensive consultation with industry experts, the ANA Avatar XPRIZE Advisory Board and Judging Panel. They are representative of the anticipated areas in which Avatars will provide benefit to humans in the coming years. The Test Course comprises the following three specific use case Domains:

1. **Connection:** Avatars will provide the opportunity of human to human connection, even when you are at a distance.
2. **Exploration:** Avatars will allow humans to explore places otherwise too difficult, dangerous, or impossible to experience.
3. **Skills Transfer:** Avatars will transport critical skills and expertise in real time to remote locations where and when they are needed.

## 7.2.2 Test Course

The Test Course is composed of a set of 10 discrete tasks over the three Domains.

## 7.2.3 Test Course Capabilities

**Capabilities** that will be evaluated as part of the Test Course tasks may include the following:
(**Note**: these capabilities are **not** listed by level of importance)

- High quality visual and auditory perception
- Localization of people, objects, and sounds
- Gaze control
- Gestures
- Aspects of touch (haptics capabilities including weight detection, pressure, force feedback and texture determination)
- Manipulation
- Grasping
- Mobility
- Navigation

In addition, communication qualities such as the following are built into the Test Course tasks:

- Body language
- Emotional expression
- Conversational turn-taking
- Shared experience

Usability considerations such as intuitive controls, ease of deployment and safety will also factor into the evaluation process.

## 7.3 Test Course for Finals

Details of the Test Course will be released in the **Finals Operations Guide** approximately three months (August 2022) ahead of Finals Testing. Teams can expect the Finals Test Course to be significantly more difficult than the Semifinals Scenarios, and will include advanced mobility, haptic/manipulation and interaction tasks.

The exact details of distances, platform or workspace heights, object locations will not be disclosed prior to November 2nd, 2022.

# 8. Competition Testing

The following sections cover the details of testing for the Finals event.

## 8.1. Finals Testing

### 8.1.1 Finals Location and Facilities

The ANA Avatar XPRIZE Finals will be held at the [Long Beach Convention & Entertainment Center](#) (LBCC), in Los Angeles County, CA, USA.

At least one member of the Team is required to be present onsite during that Team's allotted **Test Slot** times. Teams will be limited to 20 overall Team Members that will be issued credentials that permit access to official testing spaces and access to the event center on non-public days. This number is based on space, configuration, and safety considerations at the event center and is subject to change.

Prior to Finals, Teams should not visit or contact the LBCC directly with any questions. All Finals questions should be sent directly to XPRIZE via Colin Peartree ([colin.peartree@xprize.org](mailto:colin.peartree@xprize.org)).

XPRIZE will publish the Finals Operations Guide approximately three months (August 2022) before Finals Testing. The Operations Guide will detail the policies and procedures for testing including test tasks, event operations, logistics, shipping, safety and other details to effectively participate in Finals Testing.

## 8.1.2 Finals Dates

Finals Testing is scheduled for November 1-5, 2022. Teams should plan to arrive at the venue on Tuesday, November 1st and stay through the completion of Finals Testing on Saturday, November 5th. The exact details on arrival times, shipping and move-in process will be provided in the Finals Operations Guide.

| Day | Activities | Public/Private | Detail |
|---|---|---|---|
| Nov 1, 2022 | Teams arrive, setup | Private | Teams provided access to Team Garages for load in and setup |
| Nov 2, 2022 | Finals Integration Checkout (See Section 8.1.4) | Private | Teams that pass the Integration Checkout advance to Finals Qualification |
| Nov 3, 2022 | Finals Qualification | Private | Teams that pass the Finals Qualification advance to Test Course Runs, Day 1 |
| Nov 4, 2022 | Finals Testing, Day 1 | Public | Successful Teams advance to Test Course Runs, Day 2 |
| Nov 5, 2022 | Finals Testing, Day 2 | Public | |
| Nov 5, 2022 | Award Ceremony | Public | Competition Award Ceremony will be conducted on-site at the conclusion of Day 2 testing |

### 8.1.3 Public Finals Event

The intent of the XPRIZE Finals Event is to showcase the potential of Avatar technology to the world. Therefore, the last two days of the Finals Event, November 4th and 5th, will be open to the public as a free event. On the publicly attended days, teams can expect to see spectators viewing the Test Course as well as the general **Team Garage** area which is located within the **Avatar Technology Fair** area.

**Operator Control Room**s will be closed to public access, but monitored remotely via video and broadcast live. Teams are encouraged to invite friends and family to participate as audience members on the public days of the event. At present, it is also anticipated that the event will be livestreamed. More details about the public event, and possible livestream option, will be shared with teams at a later date.

### 8.1.4 Finals Integration Checkout

On Wednesday, November 2, Teams will need to pass a **Finals Integration Checkout** before they are cleared to proceed to **Finals Qualification** on Thursday, November 3. XPRIZE staff will conduct the Checkout to ensure all Avatar Systems are prepared for Finals Testing. This will include an overall safety and e-stop check, a wireless communication test and a video compatibility test to ensure teams are able to share Operator's view in real-time with XPRIZE. More details to be provided in the Finals Operations Guide.

### 8.1.5 Finals Qualification

On Thursday, November 3, all Teams that pass Finals Integration Checkout will be provided a Test Slot on the Test Course for their Finals Qualification**.** During this Test Slot the Team's system will be operated by a Judge and the scoring methodology as detailed in Section 8.1.11 will be used. While scores from Finals Qualification will not be counted in Finals Testing scores, they will be used to identify the Teams advancing to Finals Testing as well as their testing order for the following day (Day 1). It is anticipated that the top 16 teams (and ties based on points) that receive a minimum score of 4 points during Finals Qualification will advance to Finals Testing Day 1.

### 8.1.6 Finals Testing Day 1

On Friday, November 4, the Teams advancing to Finals Testing Day 1 will be provided a Test Slot on the Test Course in reverse order of how they performed during the Finals

Qualification. The team with the lowest score from Finals Qualification will run first and the Team with the highest score will run last. The Team's system will be operated by a Judge during their Slot and the scoring methodology as detailed in Section 8.1.11 will be used. The top 12 teams (and ties based on points) will advance to Day 2.

## 8.1.7 Finals Testing Day 2

On Saturday, November 5, the Teams advancing to Finals Testing Day 2 will be provided a Test Slot on the Test Course in reverse order of how they performed during Day 1 Testing. The Team with the lowest score from Day 1 of the remaining 12 teams (and ties based on points) will test first and the Team with the highest score will test last. The Team's system will be operated by a Judge during the Slot and the same scoring methodology as Day 1 will be used.

| Day | Activities | # of Teams Advancing |
|---|---|---|
| Nov 2, 2022 | Finals Integration Checkout | Up to 20 Teams |
| Nov 3, 2022 | Finals Qualifications | 16 Teams (and ties) |
| Nov 4, 2022 | Finals Testing, Day 1 | 12 Teams (and ties) |
| Nov 5, 2022 | Finals Testing, Day 2 | Available Awards:<br>1st Place - $5M<br>2nd Place - $2M<br>3rd Place - $1M |

## 8.1.8 Finals Testing Procedures

Teams advancing to each day of Finals Testing will be provided a Test Slot on the Test Course. Each Slot will be two hours in duration with no more than 75 minutes for Operator Room setup and Operator training and then an exact 25 minutes for the **Scored Trial.** Starting times will be kept exact to the published testing schedule and the time for testing on the Test Course will not be extended for Team delays. Teams are strongly encouraged to rehearse their Operator gear setup and Operator Training in advance of attending Finals to ensure they are adequately prepared.

*Finals Testing Breakdown*

| Time | Day #1 - Slot #1 | Day #2 - Slot #2 |
|---|---|---|
| 75 mins | Operator Room setup & Judge Training | Operator Room setup & Judge Training |
| 25 mins | Test Course | Test Course |
| 20 Mins | Move-out | Move-out |

## 8.1.9 Finals Scored Trial

Judges will participate in all Finals Scored Trials. Judges will serve as the Operators of the Avatars during testing and as the Recipients on the Test Course. Judges will score the evaluation criteria in Section 8.1.11. The Operator Judge will have an Assistant in their room during the testing session.

During the first 75 minutes of each Test Slot, Teams will set up and train the Operator on the operation of the system. Teams should plan for a different Operator Judge during each Test Slot (including the Finals Qualification).

**Note**: The testing setup will be such that the Operator and the Recipient interacting with the Avatar will be in discrete spaces: the **Operator Control Room** and the **Test Course**. There will be no communication between the Operator and the Recipient other than through the Avatar System. The Operator Control Room will be a specialized room that a Team only has access to during their Test Slot. Teams will have to move into their Operator Control Room as part of their 75 minute setup and Judge Training.

An Operator Judge may call for a **Reattempt** of a Trial if they deem it necessary. In the unlikely event this is required, the reattempt will be scheduled at the end of that testing day, and the best score of the two Trials run by that Judge will be retained.

Team requested Reattempts will **not** be allowed at Finals. Teams are strongly encouraged to ensure their Avatar Systems are robust and that their Operator Setup and Training is clear and concise.

## 8.1.10 Finals Test Course

The Finals tasks will be of much greater complexity and more challenging than those at Semifinals. Finals tasks and scoring criteria are listed in Section 8.1.11. The Finals Test Course will contain three different Domains: Connectivity, Exploration and Skills Transfer. The three Domains are sequential and dependent on each other and cannot be completed individually. The Avatar System will have to advance through the tasks of each Domain in order to move to the next Domain. It is anticipated that each Domain's tasks will increase in complexity as the Avatar Robot advances through the Test Course. There will be an exact 25 minute time limit to complete the entire Test Course.

**Each task will have to be completed before advancing to the next task. If an Operator using an Avatar System can not complete the task, then that will be the end of the scored trial for that system.**

### Test Course



Domain 1 — Connection    Domain 2 — Skills Transfer    Domain 3 — Exploration
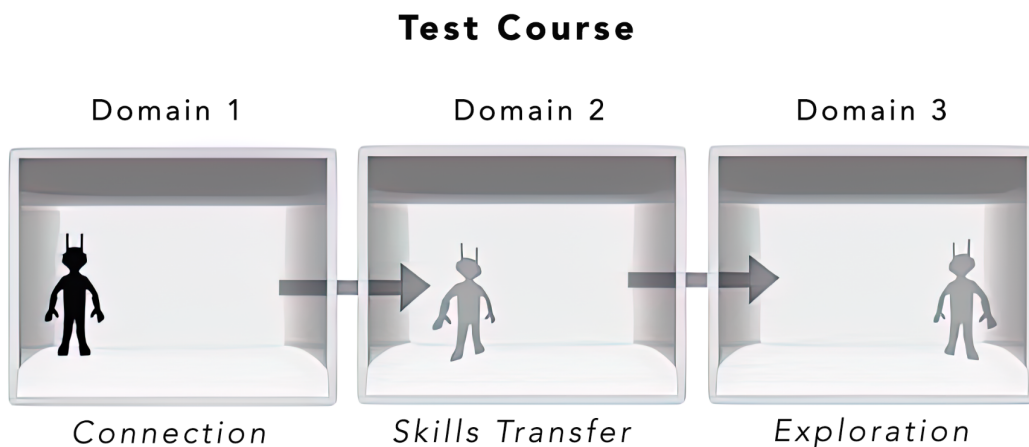
In preparation for Finals, Teams should plan for the following capabilities within each Domain:

Connectivity
- Interacting with the Recipient Judge to include high quality vision and audio.
- Mobility - moving distances >3 meters over flat open surface, untethered
- Grasping - gestures, lifting, pulling or pushing objects

Exploration
- Mobility - moving distances >20 meters over flat surface, untethered
- Manipulation - lifting, turning, placing objects (up to 3kg)
- Haptics - identifying weights of objects

<u>Skills Transfer</u>
- Manipulation - use of tools, knobs, levers, etc. (up to 3kg)
- Haptics - determination of textures, pressures
- Navigation - understanding the environment to maneuver including narrow passageways >5 meters over flat surface

The following is an example of what tasks Teams might encounter during the three Domains of the Test Course. Specific tasks may change, as might the order in which tasks must be completed.

*Test Course Example:*
The Avatar will begin the Test Course in the first Domain, where they will move to interact with a Recipient. Through discussion with the Recipient the Operator Judge will learn their mission and the tasks that need to be completed in each Domain in order to complete the Test Course. The Avatar will then have to engage a mechanism to open a door and maneuver out of the room into the next Domain.

Once in the next Domain, the Avatar will have to maneuver over a long distance and around obstacles to arrive at the desired location. The Avatar will then have to grasp and arrange certain objects including identifying them by weight.

Once the objects are set in place, the Avatar will maneuver to the last Domain. Upon arriving at the last Domain, the Avatar will have to use a tool that requires manipulation. Additionally, the Avatar will need to employ a sense of touch in order to identify an object.

Note: Details about the planned Finals testing objects can be found in the Finals Testing Operations Guide.

## 8.1.11 Finals Scoring

Each Scored Trial will consist of one run on the Test Course which contains 10 tasks across all three Domains. There will be one overall score for each Scored Trial. The maximum score for the Trial will be 15 points. Teams advancing to Day 2 testing will be provided another Test Slot to attempt to complete the course. The Judges will take the best score of the two Test Slots. If teams are tied after Day 2, the faster time to complete the Test Course will be used as the tie breaker.

**In order to win the First Place prize, a Team needs to complete all 10 Tasks. Each task will have to be completed before advancing to the next task. If an Operator**

**using an Avatar System can not complete the task, then that will be the end of the scored trial for that system.**

Teams' scores and the overall rankings for Finals are planned to be made public during and after testing.

> **Avatar Ability:** This category is evaluated based on the following criteria, and is worth up to 10 points on the Test Course. Each task will be scored Pass/Fail, with 1 point for each Pass and 0 points for each Fail.
> > Pass: Able to complete the task
> > Fail: Not able to complete the task
>
> Connectivity Tasks:
> - Task 1: Was the Avatar able to move to the designated area?
> - Task 2: Did the Avatar introduce themself to the mission commander?
> - Task 3: Was the Avatar able to confirm (repeat back) the mission goals?
> - Task 4: Was the Avatar able to activate the switch?
>
> Exploration Tasks:
> - Task 5: Was the Avatar able to move to the next designated area?
> - Task 6: Was the Avatar able to identify the heavy canister?
> - Task 7: Was the Avatar able to lift up and place the heavy canister into the designated slot?
>
> Skills Transfer Tasks:
> - Task 8: Was the Avatar able to navigate through a narrow pathway to get to the designated area?
> - Task 9: Was the Avatar able to utilize a drill within the domain area?
> - Task 10: Was the Avatar able to feel the texture of the object without seeing it, and retrieve the requested one?
>
> **Operator Experience:** This category is evaluated based on the following criteria, and is worth up to 3 points. Each question is worth up to 1 point each and will be scored as follows:
> > Never / Poor (0 points)
> > Sometimes / Fair (0.5 points)
> > Always / Good (1 point)

- The Avatar System enabled the Operator Judge to feel present in the remote space and conveyed appropriate sensory information.
- The Avatar System enabled the Operator Judge to clearly understand (both see and hear) the Recipient.
- The Avatar System was easy and comfortable to use.

**Recipient Experience:** This category is evaluated based on the following criteria, and is worth up to 2 points. Each question is worth up to 1 point each and will be scored as follows:

Never /Poor (0 points)
Sometimes / Fair (0.5 points)
Always / Good (1 point)

- The Avatar Robot enabled the Recipient Judge to feel as though the remote Operator was present in the space.
- The Avatar Robot enabled the Recipient Judge to clearly understand (both see and hear) the Operator.

|  | Connectivity Tasks | Exploration Tasks | Skills Transfer Tasks | Operator Experience | Recipient Experience | **Total** |
|---|---|---|---|---|---|---|
| *Test Slot* | *4 points* | *3 points* | *3 points* | *3 points* | *2 points* | ***15 points*** |

## 8.1.12 Finals Tetherless/Wireless Operations

Avatar Robots will need to operate on the Test Course without any physical connections to power, Ethernet communications or mobility restraint. XPRIZE will provide the wireless infrastructure to communicate with the Avatar Robot while on the course. Details of this will be provided in future updates to the Networking Guide. In addition, Teams should consider their on-board power requirements to complete the Test Course when developing their Avatar Robot. Teams should also plan for on-board power that is sufficient for their 25 minutes on the Test Course.

## 8.1.13 Operator View Sharing

A main objective of the Avatar Finals is to share these emerging technologies with the public. In order to support this goal, each Team is required to share their Operator View

with a real-time feed to XPRIZE. Teams will be provided a connection in the Operator Control Room that allows for a direct feed of their Operator Display. This will be tested as part of Finals Integration Checkout and is a mandatory requirement to participate in Finals Testing.

**Note**: The Avatar Operator View will be made public to both the event audience and the livestream feed.

# 9. Awards

There will be $10,000,000 (Ten Million USD) in total **Prize Purses** available:

- **Semifinals Prize Purse**
  In September 2021, 15 advancing Finalist teams were selected to equally share a milestone prize purse of $2,000,000 (Two Million USD).

- **Finals Prize Purse**
  There will be a Finals Prize Purse in the amount of $8,000,000 (Eight Million USD). The Finals Prize Purse is available to the top ranking teams to be awarded as First, Second, and Third Place Awards.

    - First Place: $5,000,000 (Five Million USD)
    - Second Place: $2,000,000 (Two Million USD)
    - Third Place: $1,000,000 (One Million USD)

# 10. Operational Health and Safety

Operational health and safety are fundamental concerns in this Competition. Teams must design their systems with operational health and safety for Operators, Recipients, and bystanders in mind. Teams are responsible for operating safely and in compliance with local, regional, or national occupational health and safety regulations relevant to their technology during both Semifinals and Finals onsite testing.

Safety checks will be conducted before formal testing begins and additional safety details will be provided well in advance of all testing. XPRIZE staff, Judges, and/or third-party measurement and verification teams may refuse to test Teams whose submissions are deemed unsafe. XPRIZE will make all final determinations on safe and acceptable operating conditions for Competition operations.

# GLOSSARY

**Avatar Ability:** This refers to the actual performance and capabilities of the robotic Avatar during testing.

**Avataring In:** This refers to the act of the Operator controlling the remote Avatar.

**ANA Avatar XPRIZE Network Guide:** This document details the XPRIZE-supplied setup and data communications network that message traffic will use during testing events.

**Avatar Robot:** This is the actual physical robot part of a Team's Avatar Solution. It is also referred to as the robotic Avatar.

**Avatar Solution:** This refers to a Team's specific Avatar System (including the Operator Interface, the robotic Avatar and all sensors, software and mechanical parts) that will be used in the Competition.

**Avatar System:** This refers to the complete and total system consisting of the Operator and Operator Interface, the robotic Avatar and all sensors, software and mechanical parts, and includes the environment or Recipient with which the Operator interacts.

**Avatar Technology Fair:** A public part of the Finals Event where attendees can get hands-on experience with a variety of Avatar technologies.

**Brain Computer Interface (BCI):** This is any mechanism by which the robotic Avatar uses signals measured directly from an Operator's brain as part of the overall system. Also known as BMI, or Brain Machine Interface.

**Capabilities:** These are the aspects of the robotic Avatar System which are necessary to accomplish the required tasks. These can include perceptual, manipulation and movement as well as aspects needed to support communication between the **Operator** and the **Recipient** (See more details in Section 7.2.3).

**Competitor Agreement:** A legal and binding document that details the responsibilities of competitors for the prize.

**Course:** See **Test Course.**

**Domains**: These are the three potential applications  for Avatar technology that will be part of the Final Testing Course: Connectivity, Exploration, and Skills Transfer.

**Finals:** The last set of testing events for the ANA Avatar XPRIZE that will determine the overall winners.

**Finals Integration Checkout:** Teams are required to perform this checkout to ensure all Avatar Systems are prepared for Finals Testing. This will include an overall safety and e-stop check, a wireless communication test and a video compatibility test to ensure teams are able to share Operator's view in real-time with XPRIZE.

**Finals Operations Guide: See Operations Guide.**

**Finals Qualification:** During this Test Slot the Team's system will be operated by a Judge and the scoring methodology as detailed in Section 8.1.11 will be used. While scores from Finals Qualification will not be counted in Finals Testing scores, they will be used to identify the Teams advancing to Finals Testing as well as their testing order for the following day (Day 1).

**Finals Verification:** This is a mandatory administrative update to ensure Teams are prepared to proceed to the Finals round of the Competition. It includes insurance and eligibility considerations.

**Insurance Compliance Checklist:** An insurance requirement list that outlines a Team's mandatory coverage during Testing rounds. This document can be found in the POP Resources Section.

**Operations Guide:** The Operations Guide for Finals will detail the policies and procedures for testing including the Test Course, event operations, logistics, shipping, safety and other details to effectively participate in testing events.

**Operator:** The person in the Avatar System who is controlling the actions of the robotic Avatar through some form of Operator Interface.

**Operator/Avatar:** The Operator when controlling the robotic Avatar. Designated by the abbreviation **O/A.**

**Operator Control Room:** The discrete physical area of the testing setup where the Operator of the system will reside. This area is connected to the Test Course only through the provided communication network.

**Operator Experience:** This is both the objective and subjective involvement of the Operator controlling the robotic Avatar, by which they feel a sense of actual Presence in the remote location.

**Operator Interface:** The means (equipment, software, control devices) by which an Operator interfaces with the robotic Avatar at a distance.

**Operator View:** This refers to a direct, real-time feed of what the Operator sees while using the Avatar.

**Overall System:** This refers to the measure of the reliability of the system hardware and software.

**Prize Operations Platform (POP):** The standard internal XPRIZE portal for Teams to input data for use in this Competition.

**Presence:** This is the sense that one's actions and senses feel as if they are truly experiencing a location other than the one where the user's physical body currently resides.

**Prize Purse:** This refers to money offered, won, or received as a prize. It also refers to the overall amount of funds allocated to all prizes in this Competition.

**Qualifying Submission:** This is a form in POP that must be completed by Teams no later than October 31$^{st}$, 2019. It consists of a series of questions to be answered that outline the expertise, capabilities and plans for the functional Avatar Solution that each Team will be creating. It will also require an Executive Summary of up to two pages of text and any supporting images, diagrams, or charts.

**Reattempt**: An Operator Judge may call for a Reattempt of a Trial if they deem it necessary. In the unlikely event this is required, the best score of the two Trials run by that Judge will be retained. Team requested Reattempts will not be allowed at Finals.

**Recipient:** The human receiving the actions of the Operator via the robotic Avatar. Designated by the abbreviation **R**.

**Recipient Experience:** This refers to the experience of the person receiving the actions of the Operator via the robotic Avatar.

**Scored Trial:** The testing activity by which a Team's Avatar Solution will be scored on the Test Course during Finals.

**Semifinals:** The set of testing events for the prize that will help determine which Teams progress to Finals Testing.

**Simulated Distance:** The goal of the Avatar System is to teleport one's senses and actions to a remote location. This distance, or separation, including any resulting technical circumstances such as networking delays, may be simulated rather than being an actual physical distance.

**Test Course:** A Test Course comprises three domains: Connectivity, Exploration, and Skills Transfer and Exploration, as the three areas in which we expect Avatars to be useful, Within these domains there will be specific tasks that must be completed for the competition.

**Test Slot:** The two-hour timeframe allocated to Teams during testing events.

**Technical Enrollment:** This enrollment will include certain steps and questions to be answered by the Teams, such as attending Team member lists, and other details required in advance of Semifinals and Finals Testing.

**Trial:** See **Scored Trial**.