

THE 6TH KIBO-ROBOT PROGRAMMING CHALLENGE GUIDANCE SESSION#2

April 23, 2025

Kibo-RPC Secretariat

AGENDA



- 1. Overview of the Kibo Robot Programming Challenge (Kibo- RPC)**
- 2. Outline of the 6th Kibo-RPC**
- 3. Preliminary Round**
- 4. Final Round**
- 5. Q&A**

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OVERVIEW OF THE KIBO-RPC

- The Kibo Robot Programming Challenge is a robot programming competition in which robots are controlled by student programs on the International Space Station (ISS).
- The program is open for undergraduate students^{*1} from all over the world (mainly in the Asia-Pacific region)^{*2} to participate in.

^{*1}Some exceptions are available, so please check with the person in charge.

^{*2}Please refer to the guidebook for details.

- The program allows students to:
 - Gain scientific, technical and mathematical skills and expertise.
 - Learn about position and attitude estimation for space robots, the need for corrective actions, and how to achieve them.
 - Image recognition

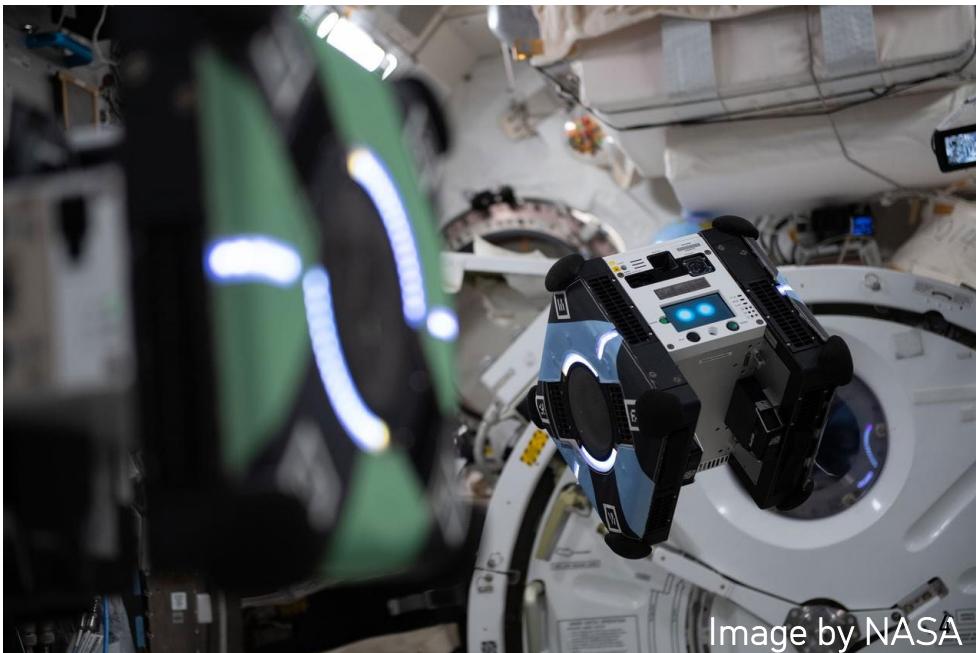


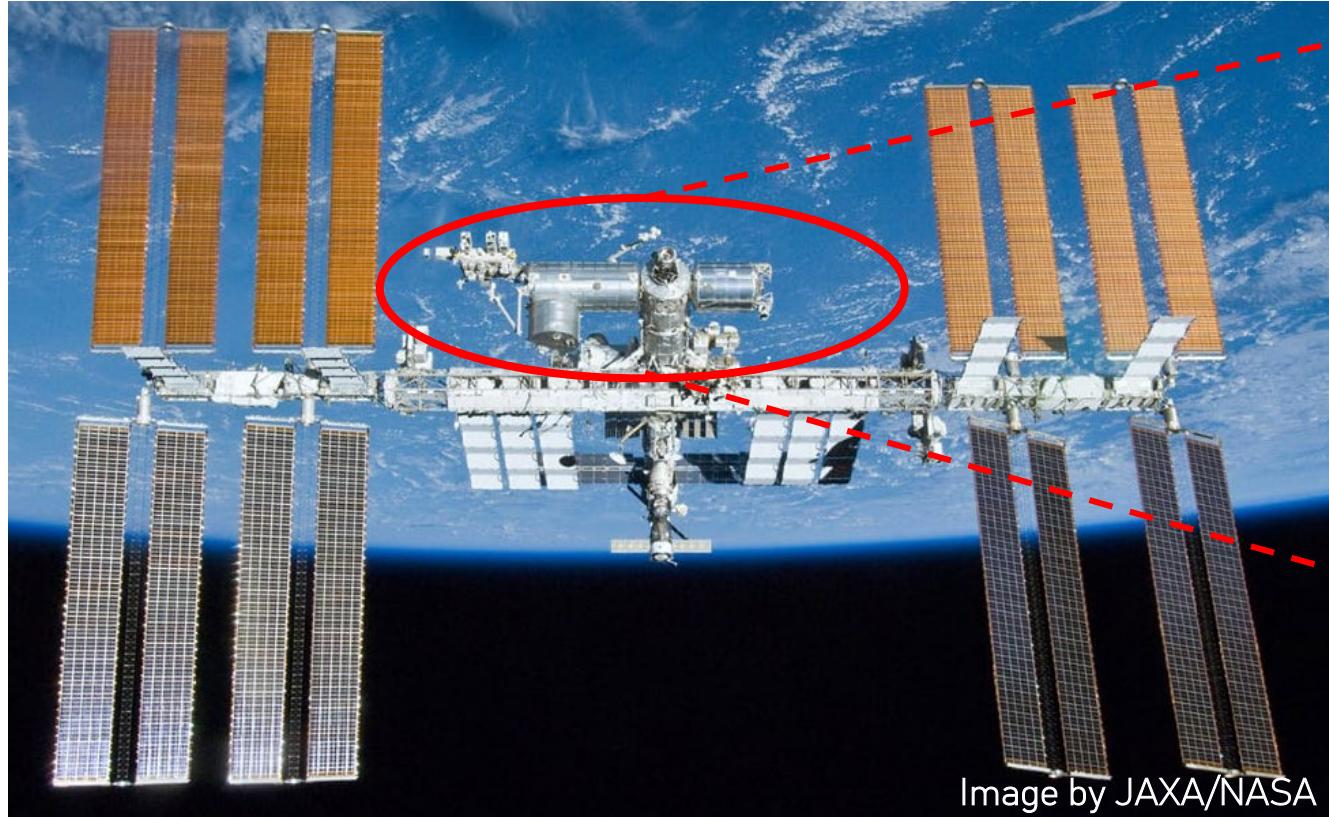
Image by NASA



OVERVIEW OF THE KIBO-RPC

- The International Space Station (ISS) is a huge crewed experimental facility built about 400 km above the ground.

Overall view of the ISS



Kibo Japanese Experiment Module



Kibo-RPC will be conducted in the Japanese Experiment Module Kibo.



OVERVIEW OF THE KIBO-RPC

- Introduction of free-flying robots on board the ISS

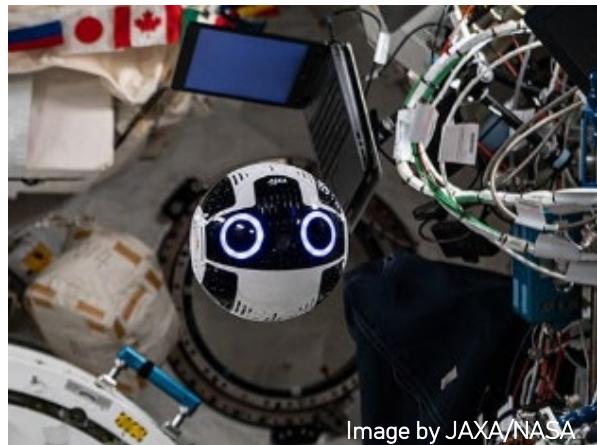
Astrobee



Astrobee is NASA's new free-flying robotic system that will help astronauts reduce the time they spend on routine duties, leaving them to focus more on the things that only humans can do.

Working autonomously or via remote control by astronauts, flight controllers, or researchers on the ground, the robots can perform tasks such as taking inventory, documenting experiments, or moving small items or cargo throughout the station.

Int-Ball



Int-Ball is a free-flying camera drone designed to ultimately eliminate the need for crew members to capture routine video footage aboard the ISS/Kibo.

Similar to current consumer-grade cameras, Int-Ball is used by on board crew to provide flexible views for ground operators.

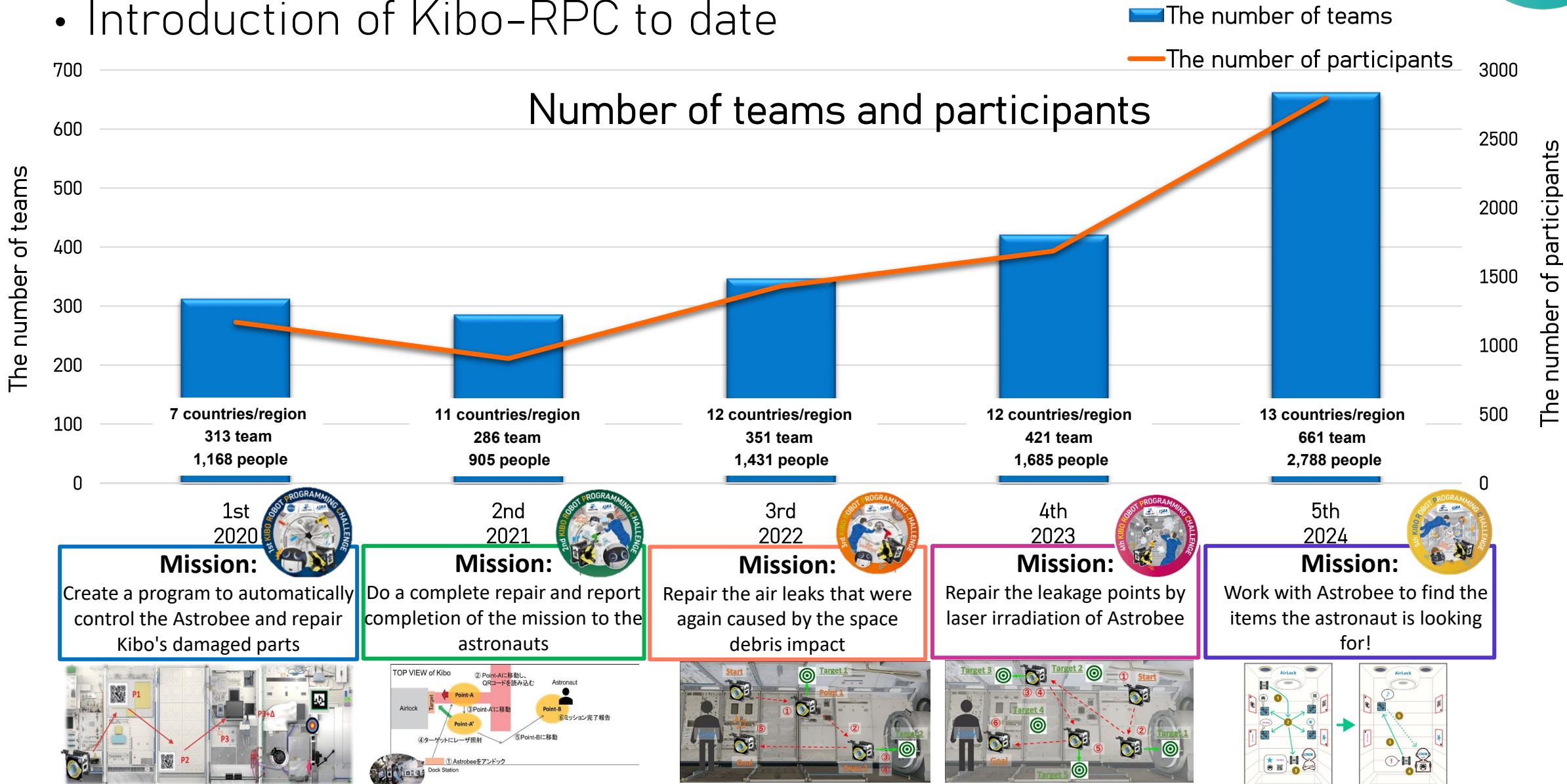
Int-Ball is perhaps the first human-friendly camera robot in space.

Testing is underway for full-scale operations in the future.



OVERVIEW OF THE KIBO-RPC

- Introduction of Kibo-RPC to date



AGENDA



- 1. Overview of the Kibo Robot Programming Challenge (Kibo- RPC)**
- 2. Outline of the 6th Kibo-RPC**
- 3. About the Preliminary Round**
- 4. About the Final Round**
- 5. Q&A**



OUTLINE OF THE 6TH KIBO-RPC



Game Story



The space pirate IB-1 (**Int-Ball the First**) has hidden the space treasures he collected during his short life somewhere **on the International Space Station "Kibo"**.

The astronaut knows clues to find the real treasure hidden by IB-1, but the exact location is unknown. However, previous research has identified several possible sites where the treasure may be hidden, and landmarks have been found nearby.

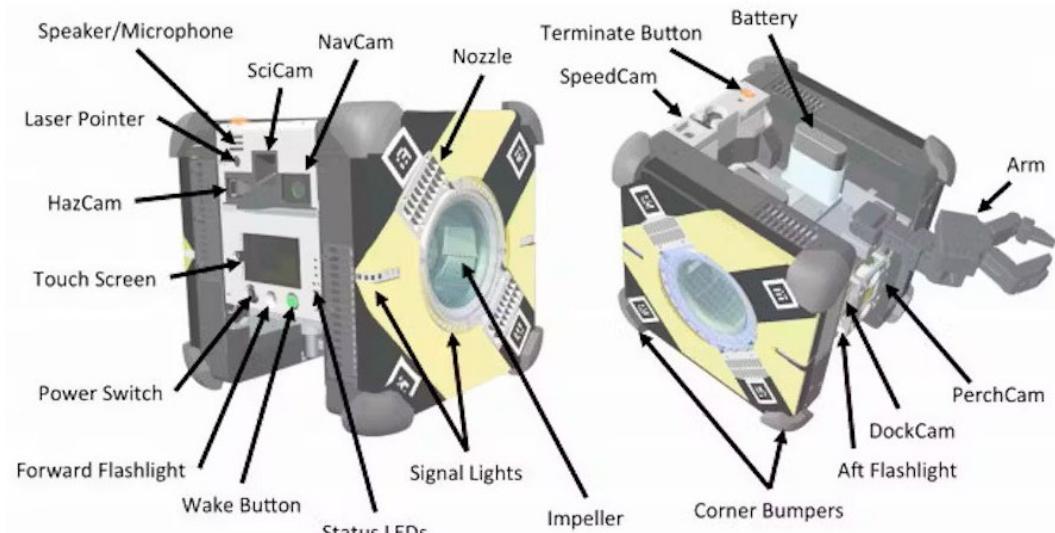
Now, you will take control of the **Astrobee** and together we will search for IB-1's hidden treasure.

First, to find the treasure, the participants must command the Astrobee around **the potential sites by following the landmarks**. Be careful that **fake treasures may be scattered** among them. After visiting all the candidate sites, use the clues that the astronaut has to find the real treasure, return to the correct location and get the treasure! The path you take to the treasure is up to you.

Grab the treasure hidden by the Space Pirate IB-1 before your rivals find it!

Work with Astrobee to find the treasure left on the ISS by the space pirate!

Astrobee (NASA)



- SciCam: Streaming camera
- HazCam: Obstacle detection camera
- NavCam: Image processing camera
- Laser Pointer: Laser irradiation of targets
- Arm: Robot hand for grasping objects
- Signal Lights: Lights to report mission completion

*This story is fictional.

OUTLINE OF THE 6TH KIBO-RPC



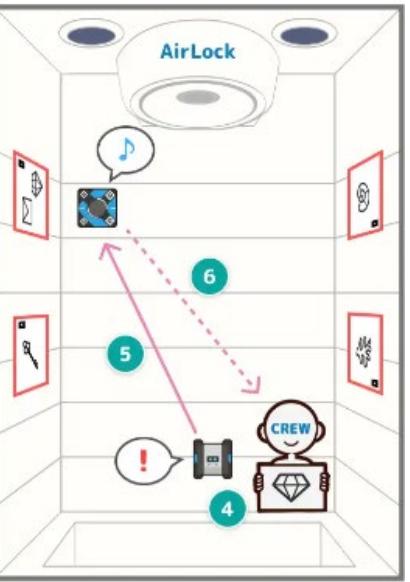
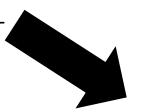
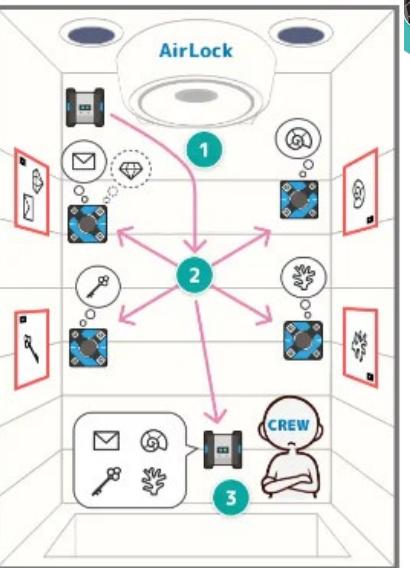
Mission and Rules

OUTLINE OF THE 6TH KIBO-RPC



Overview of the Game (Mission)

- ① **Move** the Astrobee to start the game
- ② **Patrol** the Astrobee inside the Kibo module **and accurately read** the images on the **Items** at the designated areas.
(refer to the scoring factor 1)
- ③ After patrol, **fly to an astronaut and report** what you have read about the Items. **(refer to the scoring factor 2)**
- ④ **Read the treasure as it calls a Target Item** image from what the astronaut holds.
- ⑤ **Match the Target Item** from images of what you have read during patrol. Then, **go to the area** where you found the target and **take a snapshot of the target**. **(refer to the scoring factor 3)**
- ⑥ **Light up** the Astrobee's signal lights to notify the astronaut about the location of the target (treasure).
- ⑦ The **faster** you finish your mission, the **more** you get bonus points.
(refer to the scoring factor 4)
- ⑧ When the Astrobee **path through Oasis Zones**, it earns more bonus **points** according to the **time it spent** and farther the **location** from the Lost Item within the same Oasis Zone. **(refer to the scoring factor 5)**

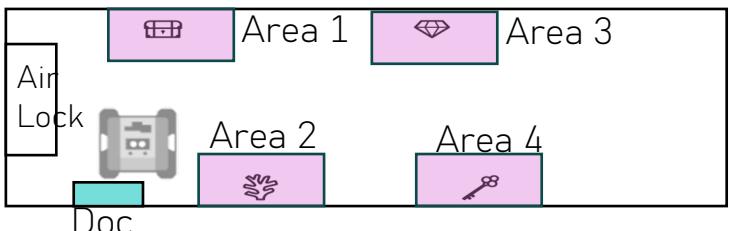




OUTLINE OF THE 6TH KIBO-RPC

Glossary: Items

- 1) **Lost Item**: A general term that includes **Landmark Items** and **Treasure Item**.
- 2) **Target Item**: Items displayed by an astronaut. It is printed with real treasures (Treasure Items) and Landmark Items.
- 3) **Landmark Item**: A kind of the Lost Items. You need to report to the astronaut after patrolling each Area.
- 4) **Treasure Item**: A kind of the Lost Items that an astronaut searches for. Your mission is to look for a real treasure, Target Item, to take pictures of.
- 5) **AR tag**: A tag that allows Astrobee to recognize the location
- 6) **Area**: There are four locations inside the Kibo called “Area”, and Lost Items will be displayed in these areas.



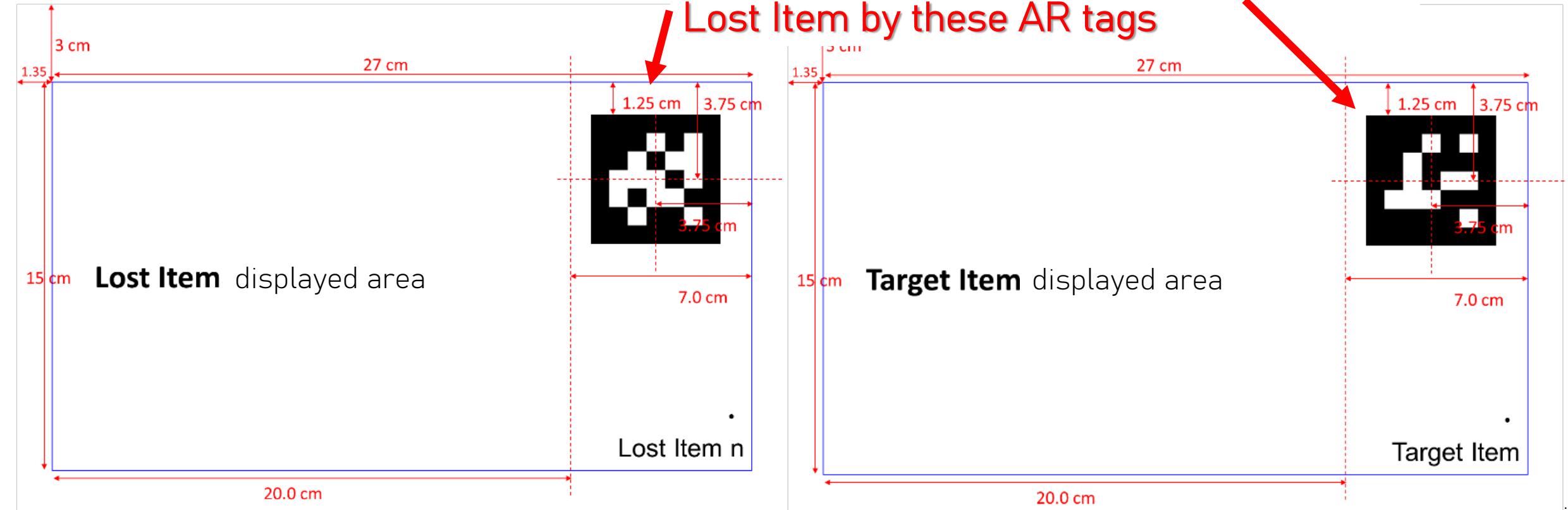


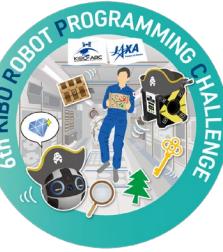
OUTLINE OF THE 6TH KIBO-RPC

AR Tag information

- The size of the "displayed area" and "AR tag" of Lost Item and Target Item are the same.

Astrobee identifies either Target Item or Lost Item by these AR tags





OUTLINE OF THE 6TH KIBO-RPC

Lost Items

- Treasure Items : 3 kinds

crystal	diamond	emerald

- Landmark Items : 8 kinds

coin	compass	coral	fossil	key	letter	shell	Treasure_box



OUTLINE OF THE 6TH KIBO-RPC

Samples of the Lost Items (case of the Landmark Items only)

- The number and size of Lost Items placed in each area will vary depending on the difficulty level.

The higher the level, the more difficult it becomes, but the higher the score.



Easy/
Low score
Score / Difficulty
Difficult/
High score

Lv	Sample Landmark Items		
1	Lost Item 1	Lost Item 1	Lost Item 1
2	Lost Item 2	Lost Item 2	Lost Item 2
3	Lost Item 3	Lost Item 3	Lost Item 3
4	Lost Item 4	Lost Item 4	Lost Item 4



OUTLINE OF THE 6TH KIBO-RPC

Samples of the Lost Items (mixture of the Landmarks and a Treasure)

- The number and size of Lost Items placed in each area will vary depending on the difficulty level.

The higher the level, the more difficult it becomes, but the higher the score.



Easy/
Low score

Score / Difficulty
↓
Difficult/
High score

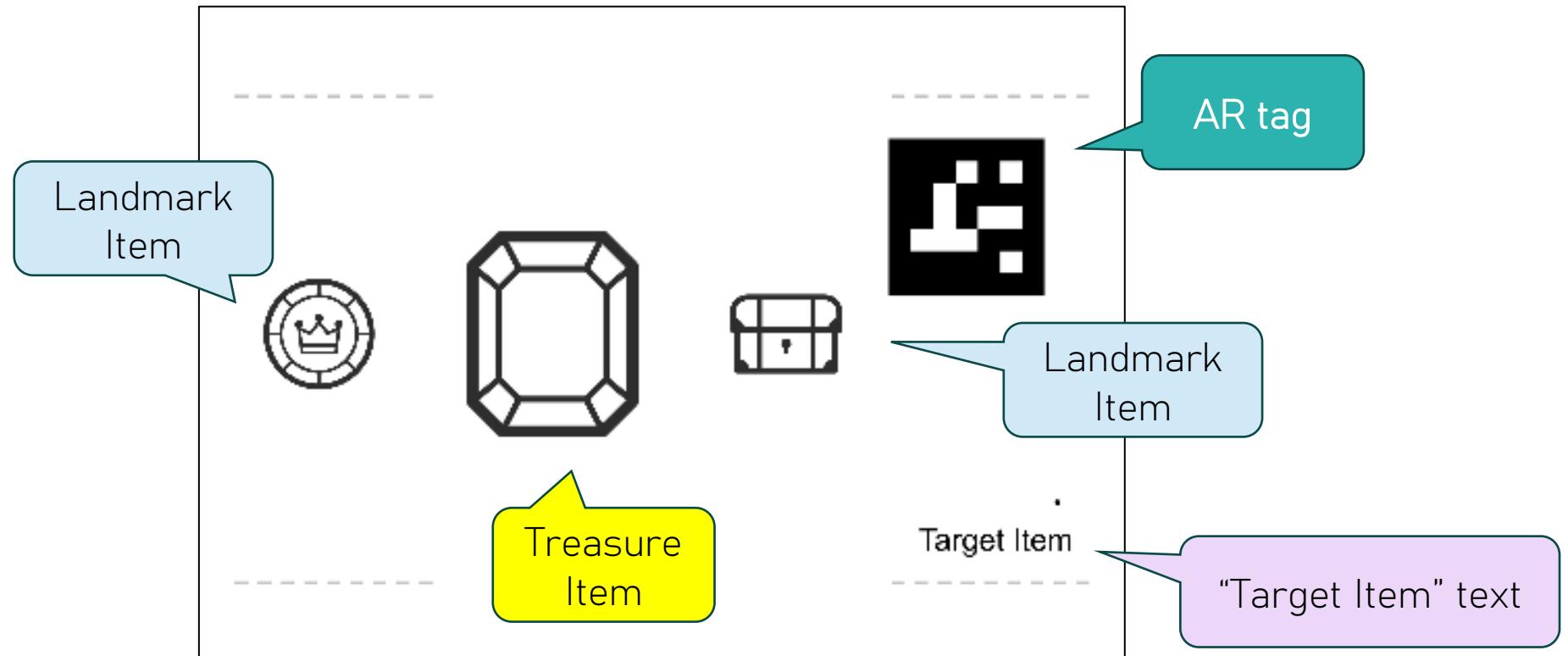
Lv	Sample Target Items Landmark + Treasure Items		
1	Not Applicable (No Lv. 1)		
2			
3			
4			



OUTLINE OF THE 6TH KIBO-RPC

Sample Target Item

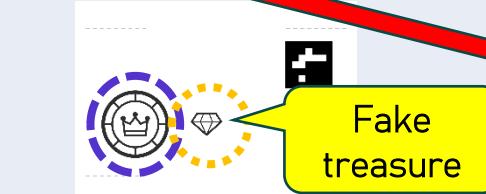
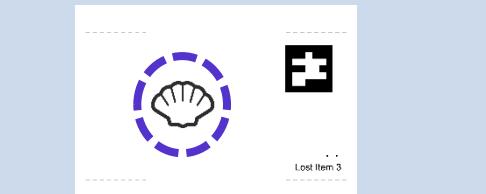
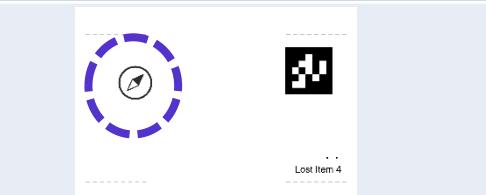
- Mixture of the Landmark Items and Treasure Items





OUTLINE OF THE 6TH KIBO-RPC

Sample Target Item in each Area

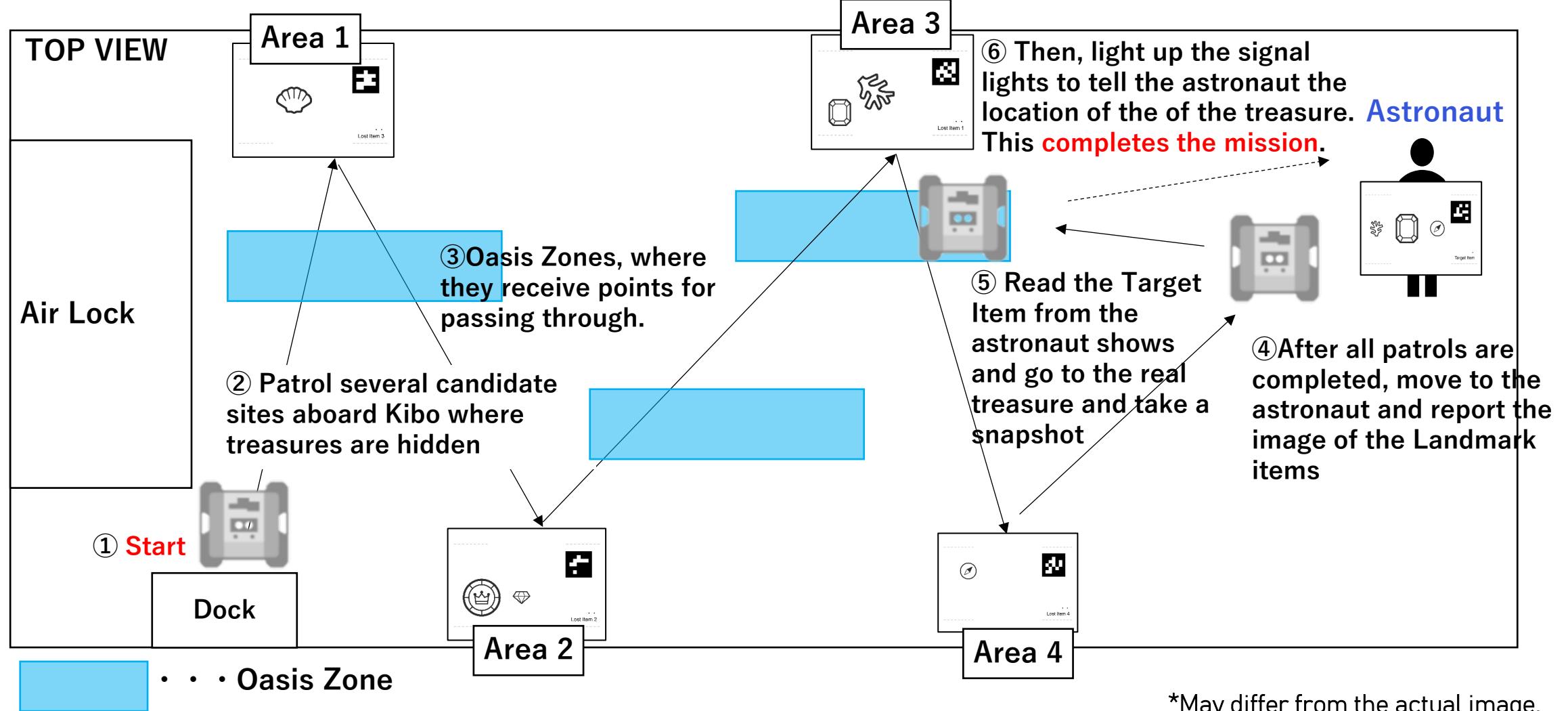
Area	Target Item
1	 <div>Target Item shown by the astronaut</div>
2	 <div>Fake treasure</div>
3	 <div>Placed together in Area 1</div>
4	

- Items report after patrol (Landmark Item)
- The real treasure that the astronaut is looking for (Treasure Item)
- Fake treasure (Treasure Item)
- Landmark items displayed on the Target Item
One of the two landmark items are placed together with the real treasure item in the Area (Landmark Item)



OUTLINE OF THE 6TH KIBO-RPC

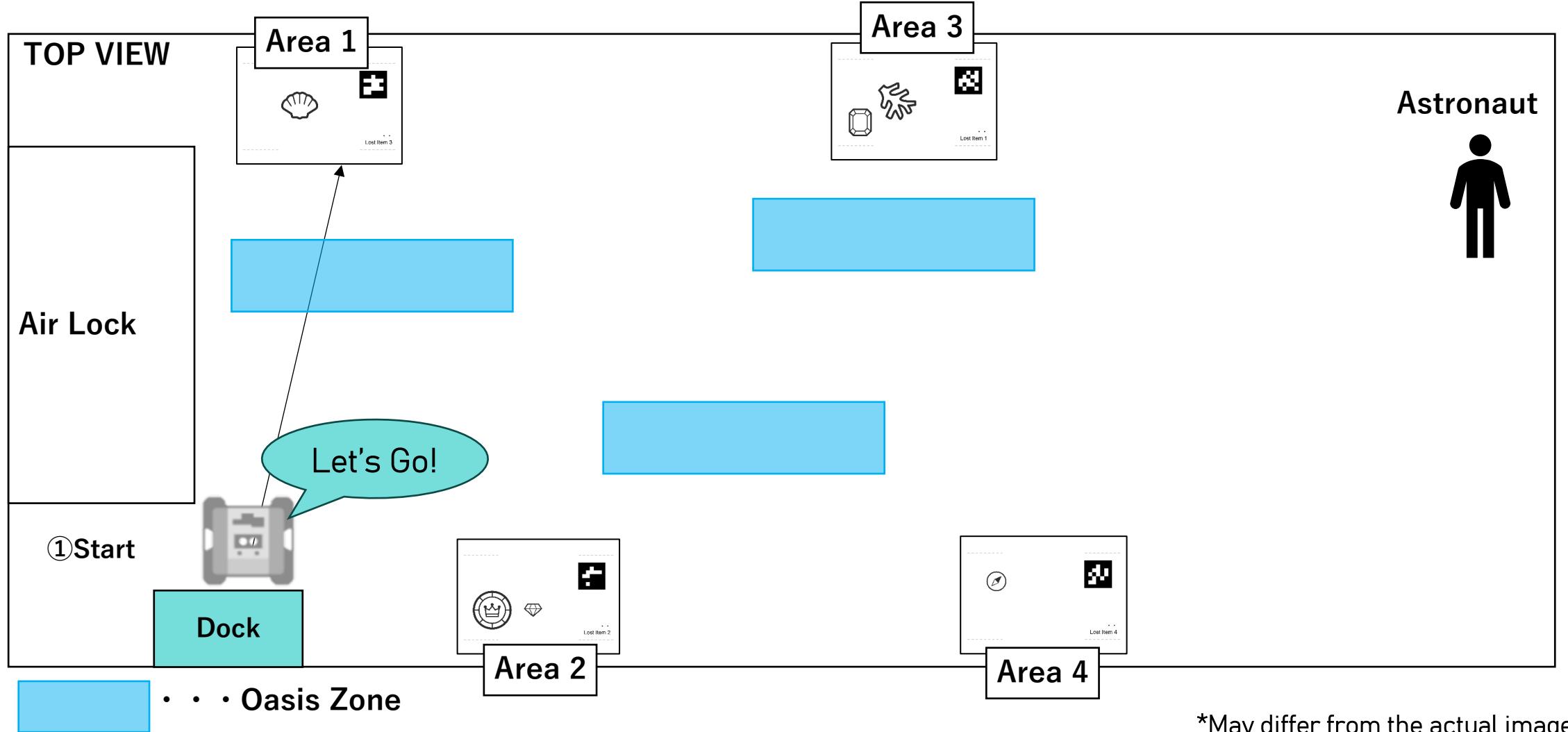
Mission Details





OUTLINE OF THE 6TH KIBO-RPC

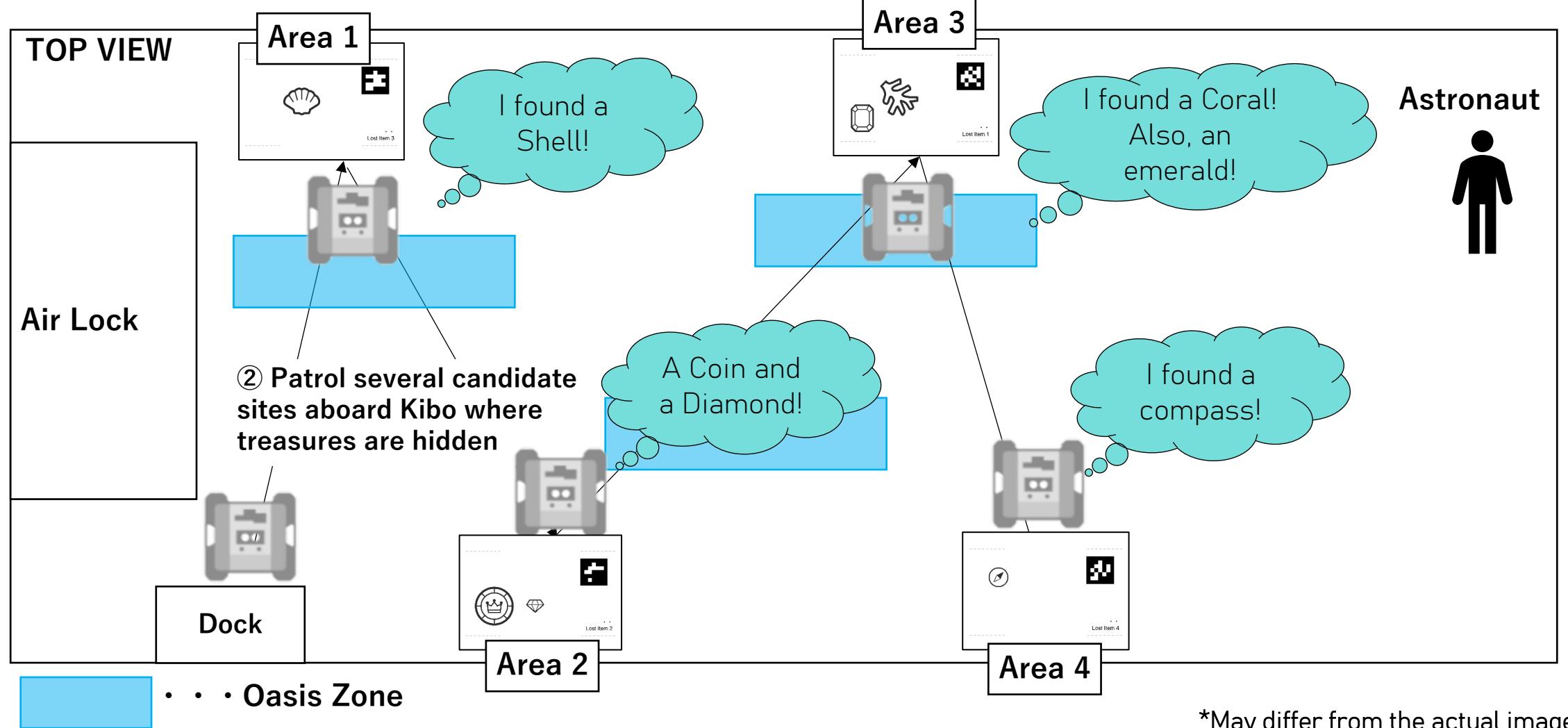
Mission Details





OUTLINE OF THE 6TH KIBO-RPC

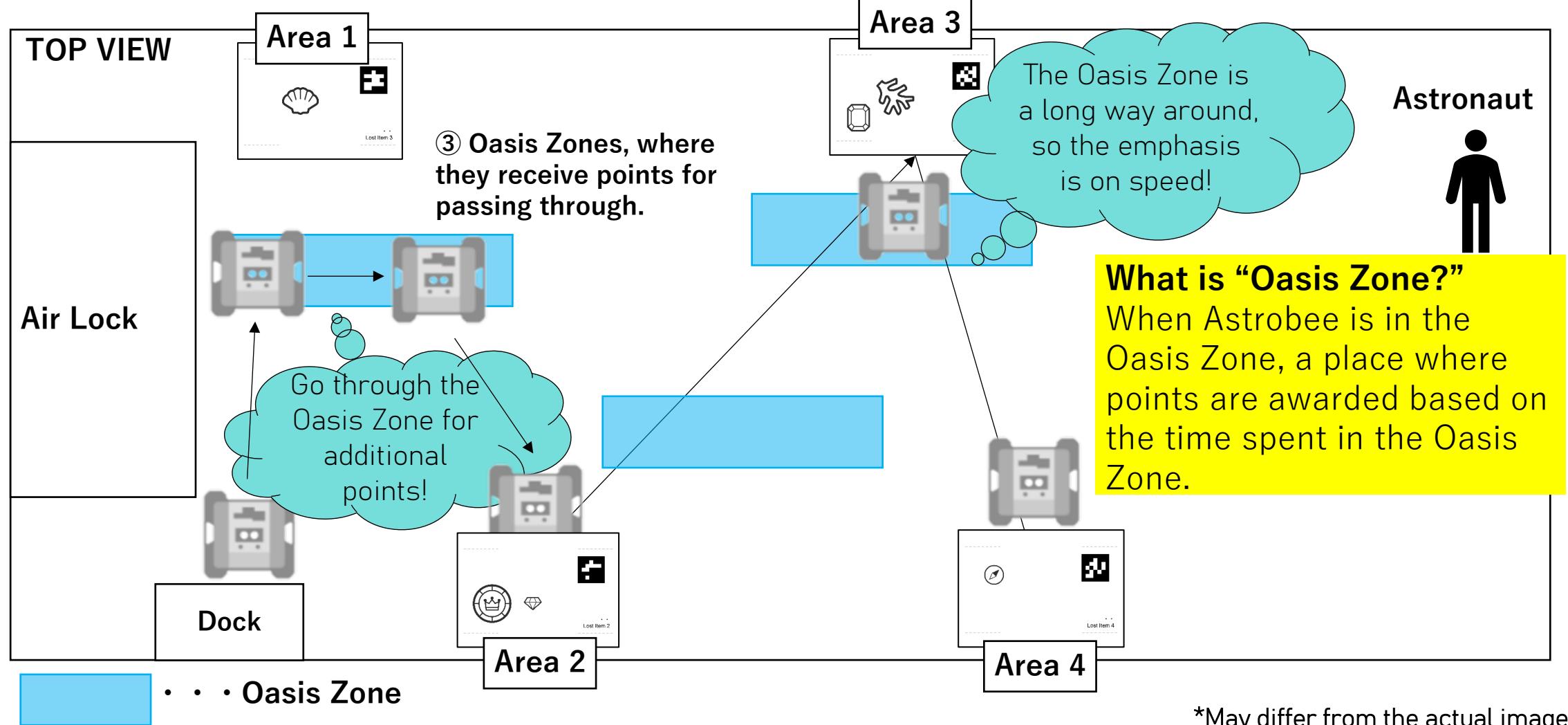
Mission Details





OUTLINE OF THE 6TH KIBO-RPC

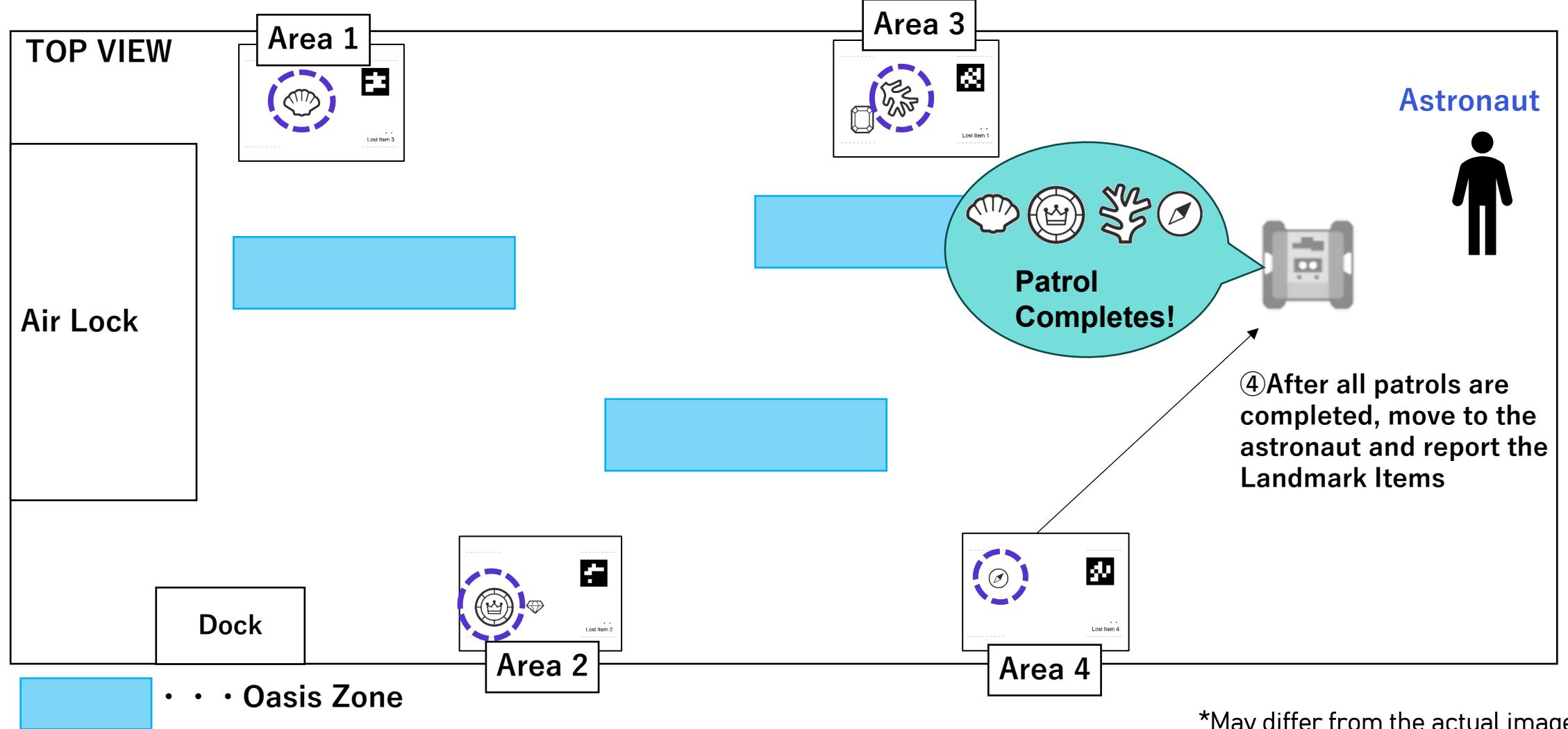
Mission Details





OUTLINE OF THE 6TH KIBO-RPC

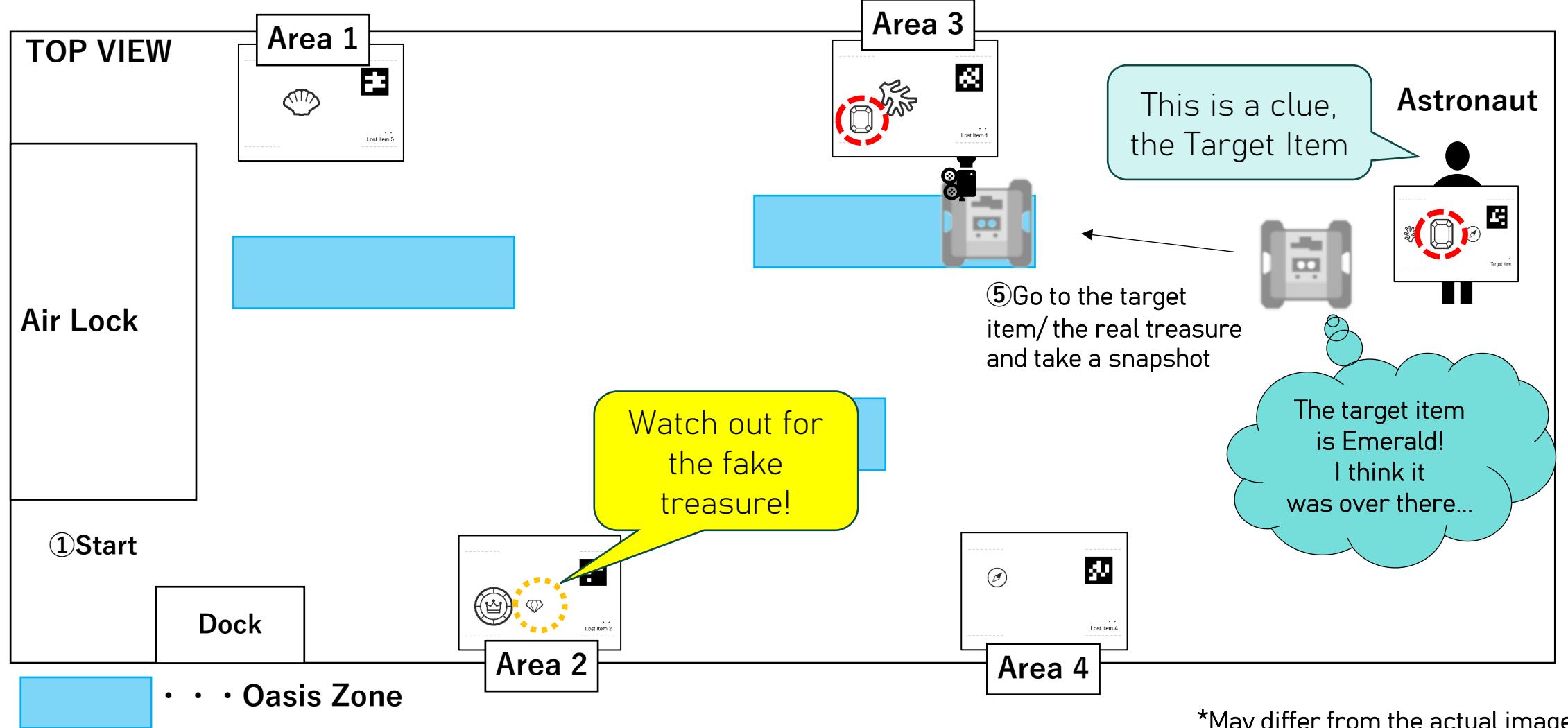
Mission Details





OUTLINE OF THE 6TH KIBO-RPC

Mission Details

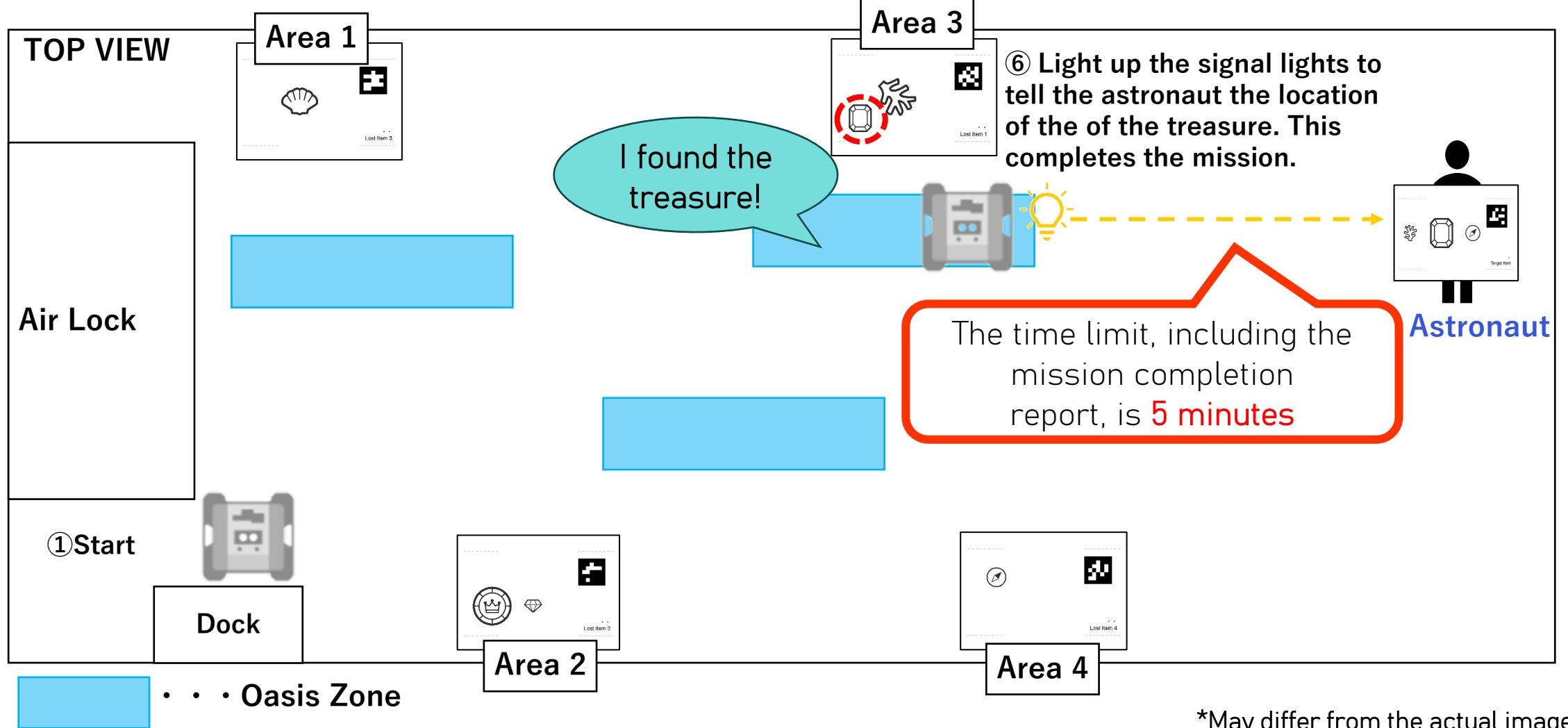


*May differ from the actual image.



OUTLINE OF THE 6TH KIBO-RPC

Mission Details





OUTLINE OF THE 6TH KIBO-RPC

Scoring Factors

1) Match the area and items

Accurately process images and recognize the items and numbers of **Landmark Items** placed in each area

Successful	Unsuccessful
<p>Area 1</p> <p>There is a treasure box on the <u>area 1</u>.</p>	<p>Area 1</p> <p>There is an emerald on the <u>area 1</u>.</p>

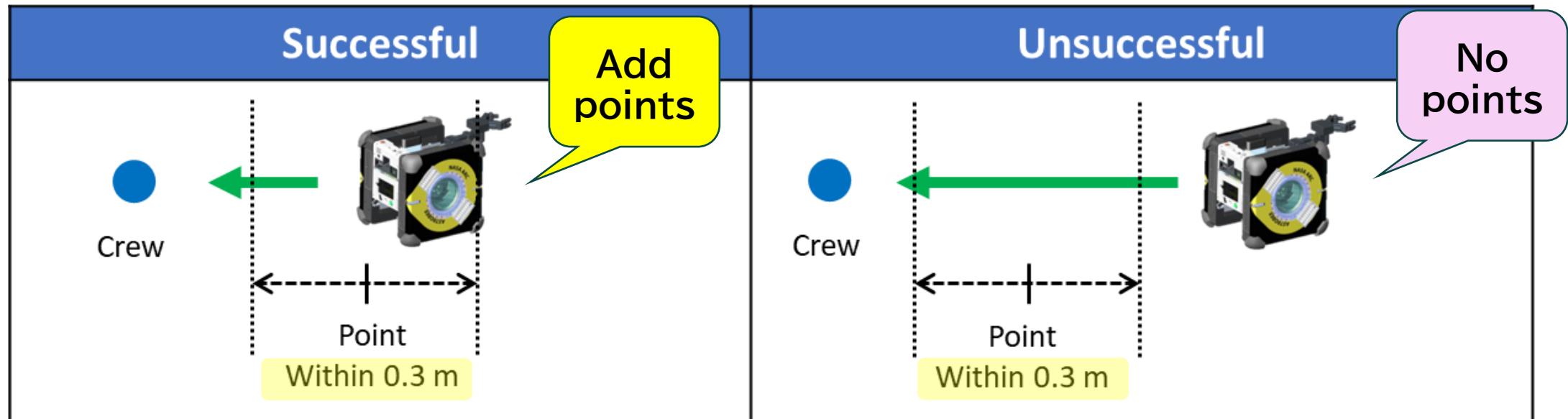


OUTLINE OF THE 6TH KIBO-RPC

Scoring Factors

2) Reporting coordinate of the patrol's completion

Scoring is based on the arrival coordinate when the patrol's completion report is submitted.

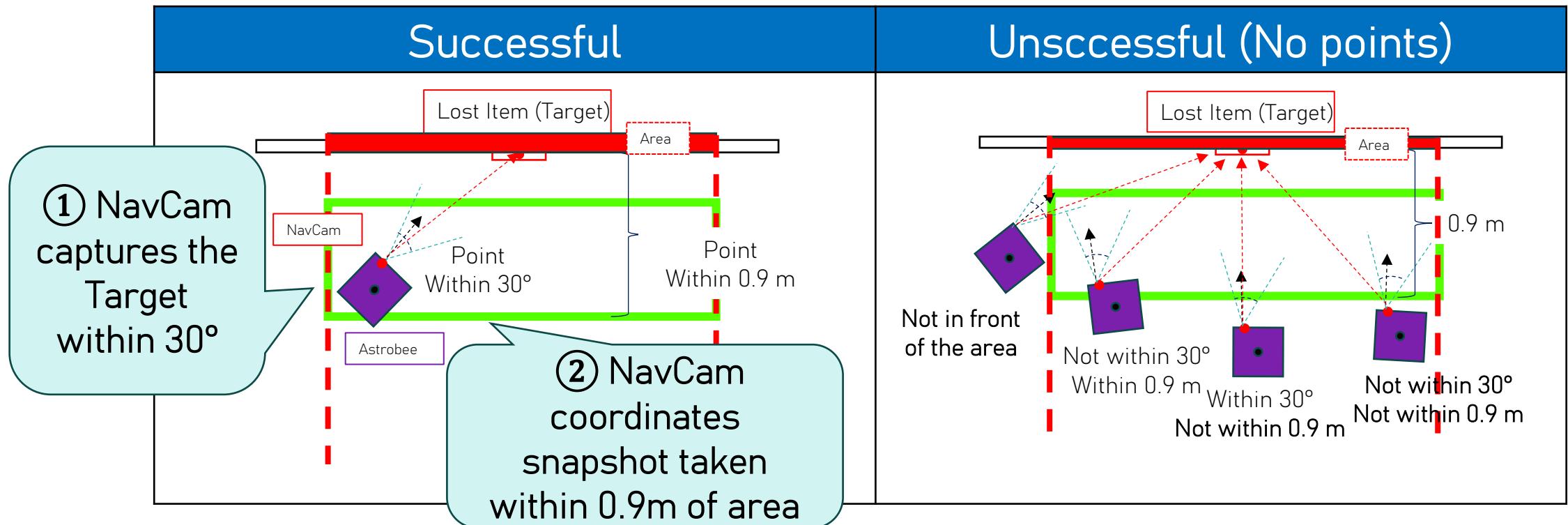


OUTLINE OF THE 6TH KIBO-RPC

Scoring Factors

3) Snapshot Angle and Position of Target Item

Scoring based on the angle of view of the camera and the coordinates



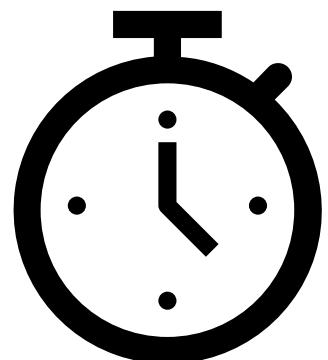


OUTLINE OF THE 6TH KIBO-RPC

Scoring Factors

4) Mission Time Remaining

The time limit remaining at the time of reporting the Target Item is converted into points and additional points are awarded.



**More remaining time
= more points**



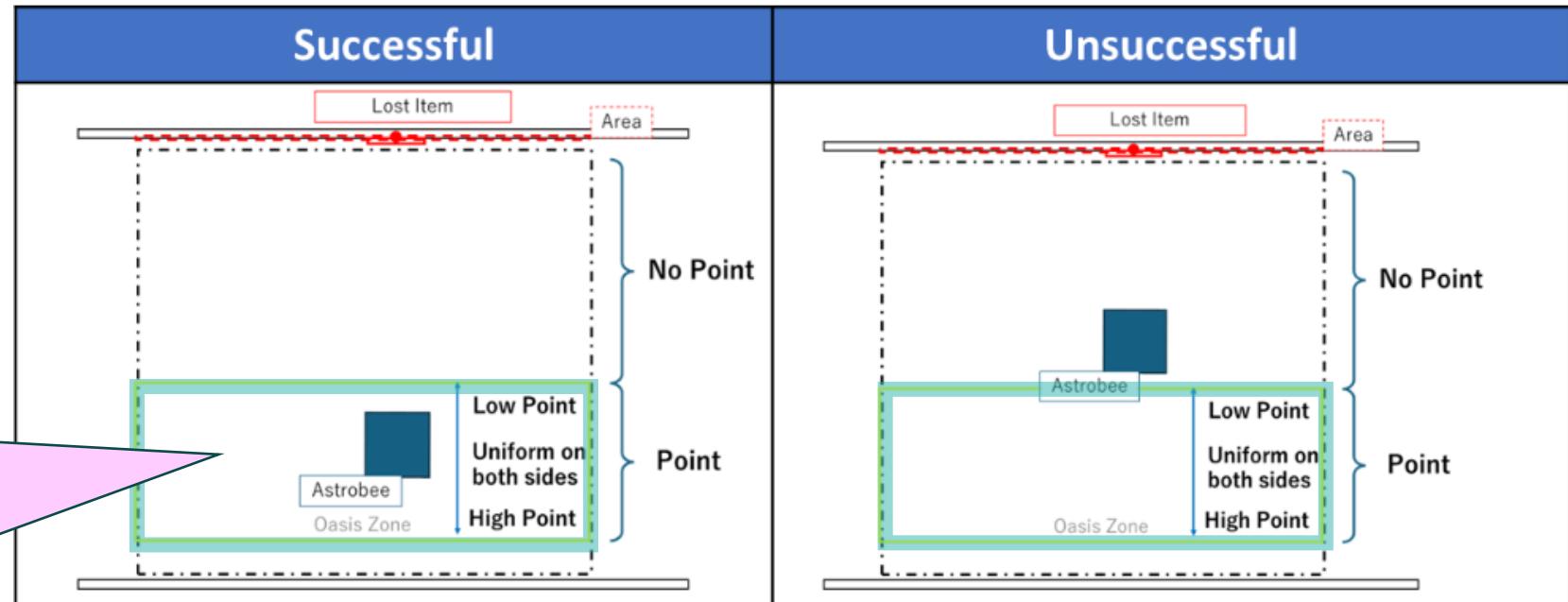
OUTLINE OF THE 6TH KIBO-RPC

Scoring Factors

5) Astrobee's Flight Path

If the Astrobee's flight path was within the Oasis Zone, it will score points based on the time it spent and the location within the same oasis zone

Earn more points by straying further from the Lost Item within the Oasis zone





OUTLINE OF THE 6TH KIBO-RPC

Tips

- In this mission, it is important to be able **to accurately scan the images of the displayed objects!**
 - ✓ The key is to have Astrobee accurately recognize what and how many pieces are placed in which area.
 - ✓ This time, it is important **to identify the exact image** because the treasure you are looking for may be located with a landmark!
- Consideration of the **strategical patrol route** may lead to an increase in scores!
 - ✓ Whether you choose a route through **the Oasis Zone, which gives points for passing through**, or a route that **emphasizes speed**, strategically design your route and aim for a high score!
- **Think about various recovery methods and keep them in mind** in case things do not go as expected! (for example: it goes on a loop, images aren't being loaded, the mapping is insufficient etc.)
 - ✓ It is essential to know how many errors to anticipate and how well prepared you are to deal with them.
- Ultimately, **a team that takes the time to run and build many simulators will be the stronger team!**

SCHEDULE



Open Simulator environment

- Issue Simulator login account
- Issue rulebook, Programming Manual, and Sample APK

**Submit APK
Deadline**

6/19 23:59 (JST)

Guidance Session 2

Application Deadline

Milestone

• 4/1 • 4/16

• 5/12

Students

**Send application
by May 12 @ 23 : 59 (JST)**

Write Codes

till June 19, 2025 @ 23:59 (JST)

Registered team can start writing codes using simulator to prepare for the APK

Participants can continue writing code until the APK submission deadline!

Preliminary Round: Nationals



**Release Simulator
for the Finals**

By end of Aug

Modify APK

The finalists modify APK for the in-orbit operation

**Participate in the
Preliminary Round**

**Modified APK
deadline**



**In-orbit
Operation**



@JAXA
Tsukuba
Space
Center

**In-orbit
Operation**

The finalists chance to watch own turn of in-orbit operation via online

**Participate in
the Finals**

The finalists @ JAXA TKSC/ online





HOW TO PARTICIPATE

1. Please read through the application guidelines on the Kibo-RPC Web page for application procedures.

Conditions for participation

1. Students (Restrictions may apply in certain countries/regions)
2. Participation in teams of **at least 3 and no more than 8 members** (The maximum number of teams may vary depending on the country/region)
3. Each team needs team leader to manage the team (a team member can also be the person in charge)
4. Agree to the terms and conditions in the application guidelines

Some countries/regions participating in Kibo-RPC may differ in terms of requirements such as nationality, number of persons in a team limit, and age limit for participation, etc. Please check with the space agency in the relevant country/region for details.

2. Click on "**Application Form**" at the Kibo-RPC office in each country/region POC and submit your team information. ↓

If you need to make modifications, please send an e-mail to the secretariat with the team name and the modification's content.

Deadline for applications is May 12, 2025, at 23:59 (JST)

Japan



Japan Aerospace Exploration Agency
(JAXA)

3. After submitting your application, a registration completion e-mail will be sent.

Please keep carefully the ID in the e-mail.

Please share the ID only within the team and do not divulge it to anyone outside the team.

[Learn more](#)

Kibo-RPC Secretariat
Z-KRPC@ml.jaxa.jp

[Application Form](#)



HOW TO PARTICIPATE

Team category in the 6th Kibo-RPC

Table 3.1 Team Categories

Case	Nationality of participants	Location of their School	Means of Participation ^{*1}
1	Kibo-RPC Participating Countries/Region	Kibo-RPC Participating Countries/Region	Apply from the preliminary round of the country/region the team members are from or where the school is located.
2	Kibo-RPC Participating Countries/Region	Kibo-RPC non-participating countries/region	Apply from the preliminary round of the country/region the team members are from.
3	Kibo-RPC non-participating countries/region	Kibo-RPC Participating Countries/Region	Apply from the preliminary round of the country/region where the school is located.
4	Kibo-RPC non-participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Kibo-RPC non-participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Apply from the preliminary round through the UNOOSA international slot.
5	Kibo-RPC non-participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Kibo-RPC non-participating countries/region <u>from developed economies</u> ^{*2}	Apply from the preliminary round through the UNOOSA international slot.
6	Kibo-RPC non-participating countries/region <u>from developed economies</u> ^{*2}	Kibo-RPC non-participating countries/region <u>from developing economies and economies in transition</u> ^{*2}	Apply from the preliminary round through the UNOOSA international slot.

*1 Multiple entries in various preliminary rounds in different countries/region are not allowed.

*2 For country/region classifications, see the [World Economic and Situation Prospects 2025](#) published by United Nations Department of Economic and Social Affairs and other related organizations.



PROCESS AS FROM APPLICATION

Independent study period (February to April)

- An independent study period is arranged until the simulator opens to the public in April.
- During this period, you can learn about Astrobee programming through NASA's public Github (also described in the guidebook).
 - GitHub-1 (<https://github.com/nasa/astrobee>)
 - GitHub-2 (https://github.com/nasa/astrobee_android)
 - Astrobee's website (<https://www.nasa.gov/astrobee>)
- The programming language will be **Java**. Learning it in advance would help the qualifiers in developing programs.
- We also suggest to study in advanced machine learning and artificial intelligence (ex: object detection), and pattern matching, which are used in the rules of this game.

Watch the guide video to develop your program!

- Kibo-RPC's website has tutorial videos on how to log in to the site and how to create a program.
- If you are new to programming, please watch the video first.

A must-watch for programming beginners!

開発手順ガイド動画

チュートリアルビデオ：01 マイページへログイン

チュートリアルビデオ：02 Kibo-RPC チュートリアルビデオ

チュートリアルビデオ：03 Kibo-RPC の使い方

チュートリアルビデオ：04 Kibo-RPC の使い方

チュートリアルビデオ：05 Kibo-RPC の使い方

YouTube 見る

第3回Kibo-RPCの動画のため、動画中の記述は第4回Kibo-RPCと一致しない部分があります。

PROCESS AS FROM APRIL 1ST

Environment: Android Studio
Language: Java



Preparations

**Details will be included in the PG manual to be released on 4/1*

1. Check the specifications of the PC to be used

- 64-bit processor
- 4 GB RAM (8 GB RAM recommended)
- Ubuntu 20.04 or Windows 10 (64-bit version)

General PC specs are OK

2. Install AndroidStudio

Install AndroidStudio from Android developer site

Ubuntu only: [openJDK8] [ADB (Android Debug Bridge)] [Gradle] installation required

3. Download additional components for AndroidStudio

Download additional components to build the program.

4. Download the Template APK from the competition webpage

This is a pre-established scope for programs that participants are not allowed to exceed.

*APK (Android Application Package) is an Android app. Programs for Astrobee are expected in this format.



PROCESS AS FROM APRIL 1ST

When preparations are complete

1. PC Set-up

- Install Android studio/download **Template APK**
- If necessary: Build local environment

Simulator will not run
without the Template APK

2. Program creation, simulation trials, debugging/improvement

Start studying during the independent study period
to prepare for the release of the simulator!



PROGRAM CREATION PROCESS

1. Program Creation



Let's create a program on your own PC!
(Java language)



PROGRAM CREATION PROCESS

Screenshot of an Android Studio project interface showing the code for `YourService.java`.

The Project structure on the left shows the following directory tree:

```
DefaultApk
  app
    src
      main
        java
          jp
            jaxa
              iss
                kibo
                  rpc
                    defaultapk
                      MainActivity.java
                      YourService.java
```

A red arrow points from the Project structure towards the `YourService.java` file in the editor.

The `YourService.java` code is as follows:

```
package jp.jaxa.iss.kibo.rpc.defaultapk;

import jp.Jaxa.iss.kibo.rpc.api.KiboRpcService;

/**
 * Class meant to handle commands from the Ground Data System and execute them in Astrobee
 */

public class YourService extends KiboRpcService {
    @Override
    protected void runPlan1(){
        // write here your plan 1
    }

    @Override
    protected void runPlan2(){
        // write here your plan 2
    }

    @Override
    protected void runPlan3(){
        // write here your plan 3
    }
}
```

A red box highlights the `runPlan1()` method. A callout bubble with an orange border provides the following instruction:

Refer to the Astrobee command list in the Programming Manual if you want to implement a function that is not in the command list, implement it yourself or import the library and write it.



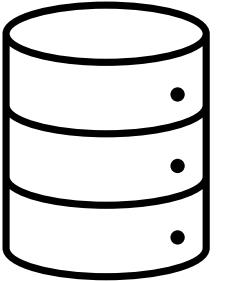
PROGRAM CREATION PROCESS

1. Program Creation



Create a program on your own PC
(Java language)

2. Upload APK to JAXA server



PROGRAM CREATION PROCESS

You can access to the simulator after April 1st.



A screenshot of the Kibo-RPC website. At the top, there is a navigation bar with links for "HOME", "FAQ", "DOWNLOAD", and language options "EN" (highlighted with a red dashed circle) and "JA". Below the navigation bar, the main title "Kibo Robot Programming Challenge" is displayed. The page features several images: a close-up of a robotic arm; a large central image of a robotic arm in a space station module; and a smaller image of a white spherical robot. At the bottom, a banner with a starry background encourages participation with the text "Space×Robot×Programming" and "Join us!! Kibo-RPC 6th mission".



PROGRAM CREATION PROCESS

Homepage

Kibo-RPC
Kibo Robot Programming Challenge

HOME SIMULATION EVENT BULLETIN BOARD CHANGE PASSWORD LOGOUT

Simulator Issues

There are no issues.

Preliminary Round Info

Coming soon...

Simulator Releases

Date	Version	Note
April 03, 2023	1.0	1st release of Web Simulator for Preliminary Trial



PROGRAM CREATION PROCESS

Simulation page

Kibo-RPC
Kibo Robot Programming Challenge

HOME **SIMULATION** EVENT BULLETIN BOARD CHANGE PASSWORD LOGOUT

SIMULATION RESULTS RANKING

Preliminary Trial

Slot #1 Available

Program Drag & drop your APK file or click here to browse it

Simulator Version 1.0

Memo

Target Pattern Random Customized

START SIMULATION TERMINATE SIMULATION VIEW RESULT

Slot #2 Available



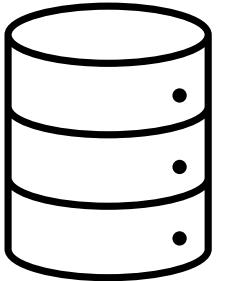
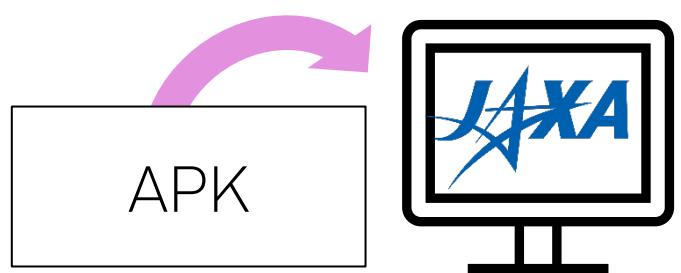
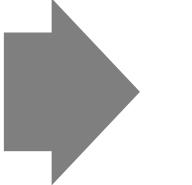
PROGRAM CREATION PROCESS

1. Program Creation

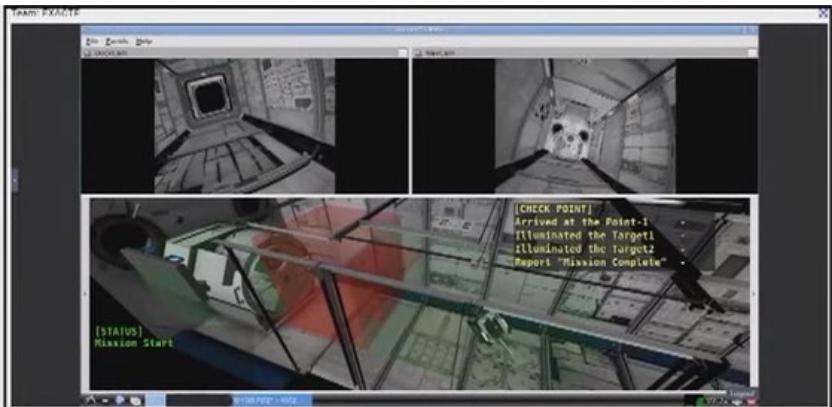


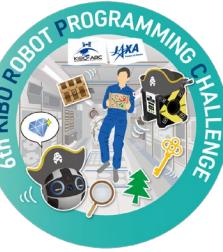
Create a program on your own PC
(Java language)

2. Upload APK to JAXA server



3. Program Execution





PROGRAM CREATION PROCESS

Simulation page

A screenshot of the Kibo-RPC simulation interface. At the top, there's a navigation bar with links for HOME, SIMULATION (which is highlighted in green), BULLETIN BOARD, CHANGE PASSWORD, and LOGOUT. Below the navigation bar, there are two buttons: "SIMULATION" (highlighted with a blue border) and "RESULTS".

The main area shows a slot labeled "Slot #1 Available". It contains a "Program" section with a dashed box around it, showing a file named "6th_demo.apk" with a size of "0.1 GB". To the right of the program section are three icons: a cloud, a double arrow, and a rocket. Below the program section is a "Memo" input field.

On the right side of the slot, there are dropdown menus for "Simulator Version" (set to "1.0") and "Simulator Level" (set to "Normal"). A large red arrow points to the "START SIMULATION" button, which is purple with white text. Next to it is a "TERMINATE SIMULATION" button.

A teal arrow points upwards from the "Normal" simulator level dropdown towards the "Normal" text, indicating that the difficulty level can be changed.

You may set the difficulty level

- Beginner
- Easy
- Normal
- Hard
- Very Hard



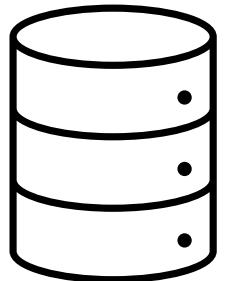
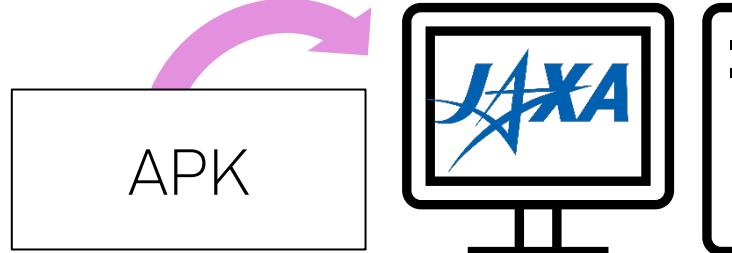
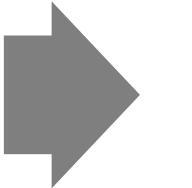
PROGRAM CREATION PROCESS

1. Program Creation



Create a program on your own PC
(Java language)

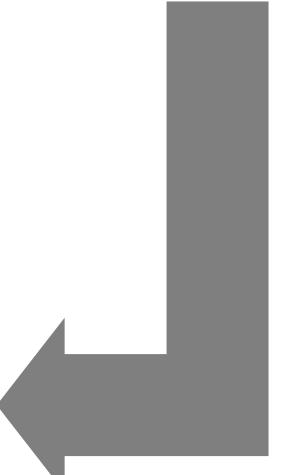
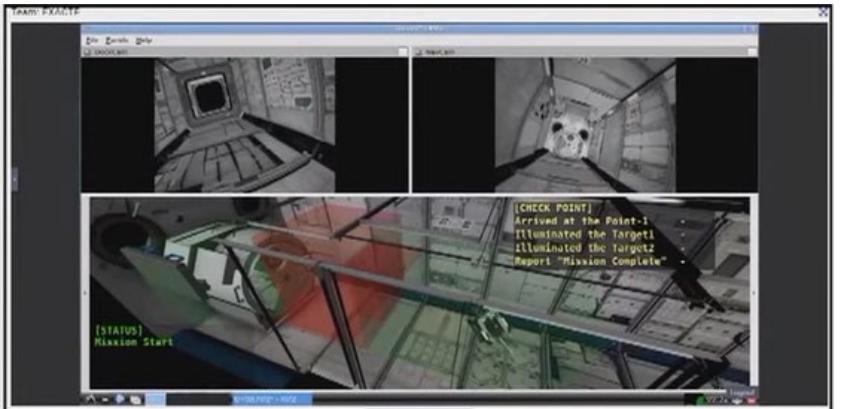
2. Upload APK to JAXA server



4. Check the results

Phase	Phase Time	Hit the Circle	Score	Total
1	01:14.8	1 / 1	200.0 pt	200.0 pt
2	02:25.9	1 / 1	40.0 pt	40.0 pt
3	03:55.6	0 / 2	0.0 pt	0.0 pt
4	04:22.0	0 / 1	0.0 pt	0.0 pt

3. Program Execution





PROGRAM CREATION PROCESS

Kibo-RPC
Kibo Robot Programming Challenge

db_akao_JP_B (Japan)

HOME

SIMULATION

BULLETIN
BOARD

CHANGE
PASSWORD

LOGOUT

SIMULATION >

RESULTS

Phase Preliminary

Country/Region Japan

Team db_akao_JP_B

Executed

2025-03-21 04:18:23

Status

FINISHED

Score

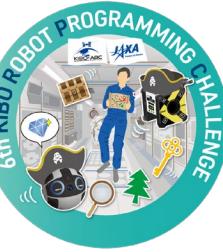
148.4 pt

Memo

VIEW

REMOVE

You can save up to 20 different data



PROGRAM CREATION PROCESS

Kibo-RPC
Kibo Robot Programming Challenge

db_akao_JP_B (Japan)

HOME

SIMULATION

BULLETIN
BOARD

CHANGE
PASSWORD

LOGOUT

SIMULATION >

RESULTS

Phase Preliminary

Country/Region Japan

Team db_akao_JP_B

Executed

Status

Score

Memo

2025-03-21 04:18:23

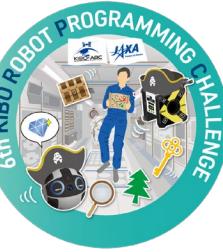
FINISHED

148.4 pt

VIEW

REMOVE

You can save up to 20 different data



PROGRAM CREATION PROCESS

[BACK](#)

Simulation Result

Status	Finished	Executed	2025-03-21 04:18:23
Team	[REDACTED]	Country/Region	[REDACTED]
APK	6th_demo.apk	DOWNLOAD APK	
Simulator Version	1.0	Simulator Level	Beginner
Memo	Detailed Result		
Result			
Total Score	148.4 pt	Game Time	03:35.5
Rounding Competition Report		Found Item Report	
Correct matching of area and item	2 / 4	Found the correct item	
Report time	02:27.6	Angle of NavCam and the item	28.4°
Score	70 pt	Score	60 pt
Oasis Bonus	1.45 pt	Target Item	



PROGRAM CREATION PROCESS

Matching of Area and Item Detail				Lost Items and Image Recognition Results	
Area 1	 Lost Item 1		Level	1	
			Item reported	treasure_box	
			Quantity of item reported	1	
			Recognition		
Area 2	 Lost Item 2		Level	1	
			Item reported	No Report	
			Quantity of item reported	No Report	
			Recognition		
Area 3	 Lost Item 3		Level	2	
			Item reported	emerald	
			Quantity of item reported	1	
			Recognition		
Area 4	 Lost Item 4		Level	2	
			Item reported	letter	
			Quantity of item reported	1	
			Recognition		

[SIMULATOR VIEWER](#)

[DOWNLOAD LOG FILES](#)

[DOWNLOAD ROSBAG FILE](#)

[DOWNLOAD IMAGE FILES](#)

Click here to check the simulator view!



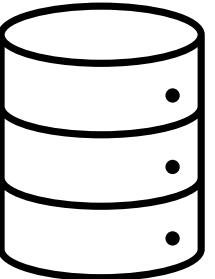
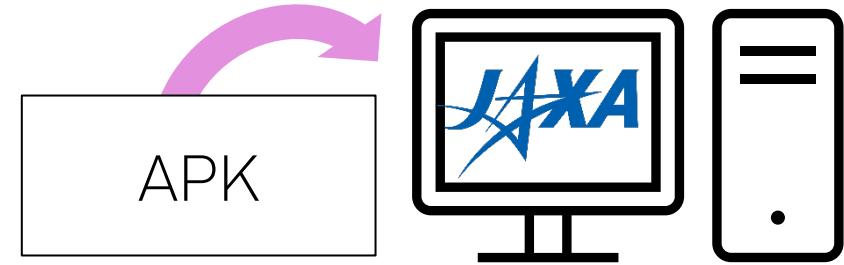
PROGRAM CREATION PROCESS

1. Program Creation



Create a program on your own PC
(Java language)

2. Upload APK to JAXA server



4. Results Verification

You can improve your program
from the simulation results to
make a better program!

Kibo-RPC
Mission Planning System

Simulation

Status: Finished
Team: jaxa-magpie_secretariat
APK: alFlightMission.apk
Phase: Preliminary Trial
Simulator Version: 1.0
Memo: add logs

Target Result

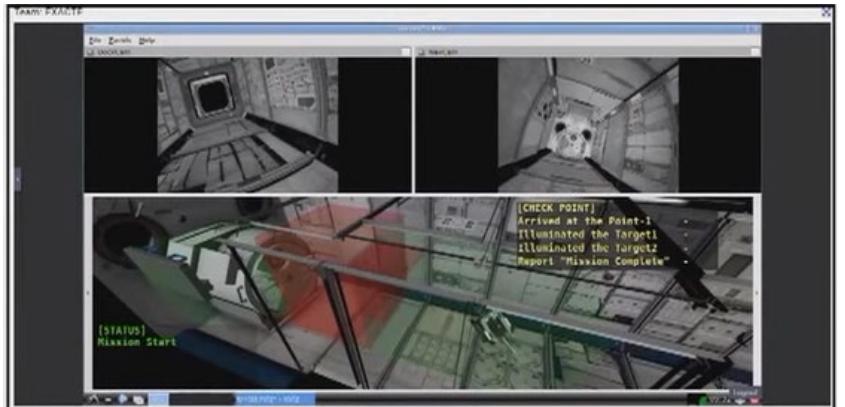
Phase	Phase Time	Hit the Circle	Score	Detail
1	01:44.8	1 / 1	40/40 pt	Total Result
2	02:25.9	1 / 1	40/40 pt	Score
3	03:55.8	0 / 2	0/40 pt	Game Time
4	04:22.0	0 / 1	0/40 pt	04:22.0

Report Result

Finish within the time limit: ✓
Reading QR Code: ✓
Score: 118.4 pt

SIMULATOR VIEWER DOWNLOAD LOG FILE DOWNLOAD ROBOTSFILE DOWNLOAD HARDFILED

3. Program Execution



AGENDA



- 1. Overview of the Kibo Robot Programming Challenge (Kibo- RPC)**
- 2. Outline of the 6th Kibo-RPC**
- 3. About the Preliminary Round**
- 4. About the Final Round**
- 5. Q&A**

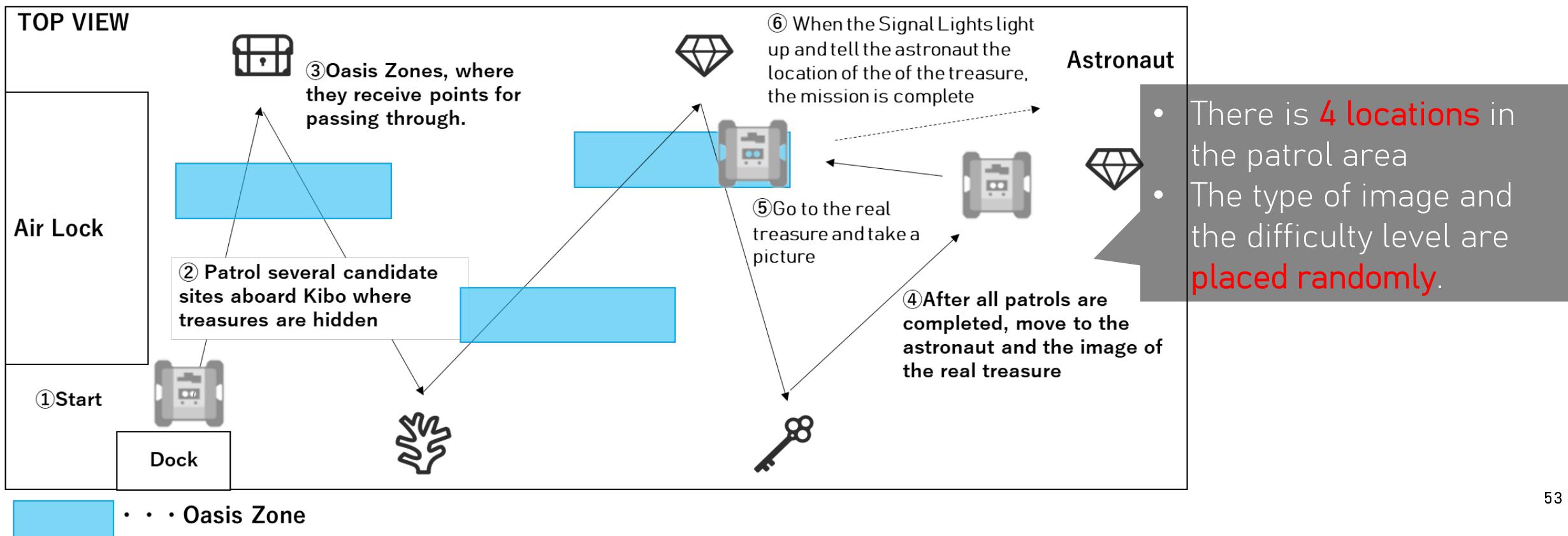


ABOUT THE PRELIMINARY ROUND

Mission Details

- In the Preliminary Round, each country's space agencies will run APKs submitted by the deadline using the Simulator, and teams with the highest average score will access to the Final Round.

*Factors other than the sole simulation score may be included in the evaluation depending on the country/region.





ABOUT THE PRELIMINARY ROUND

Preliminary Round Rules

1. Eligibility for Participation

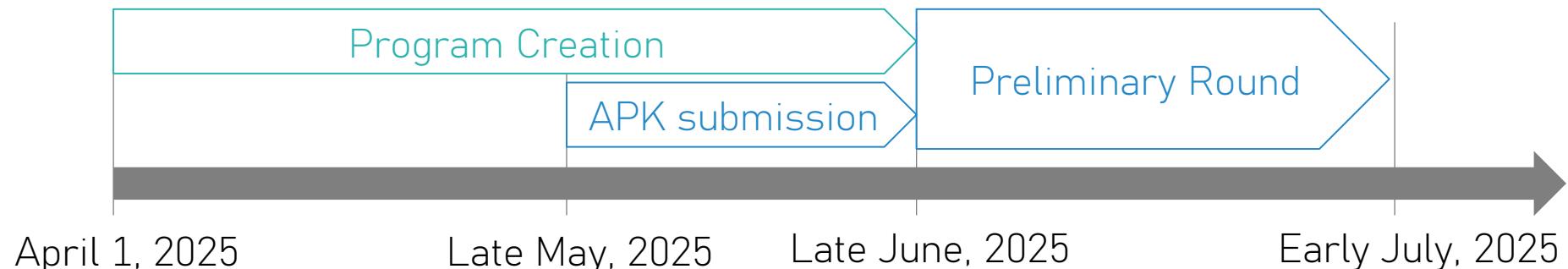
- Teams that have submitted application form by 23:59 on May 12, 2025
- Teams that have submitted APKs for Qualification by the submission deadline

The final schedule will be included in the rulebook!

APK submission period: **Late May to Mid June, 2025 at 23:59 (JST)**

2. Preliminary round period

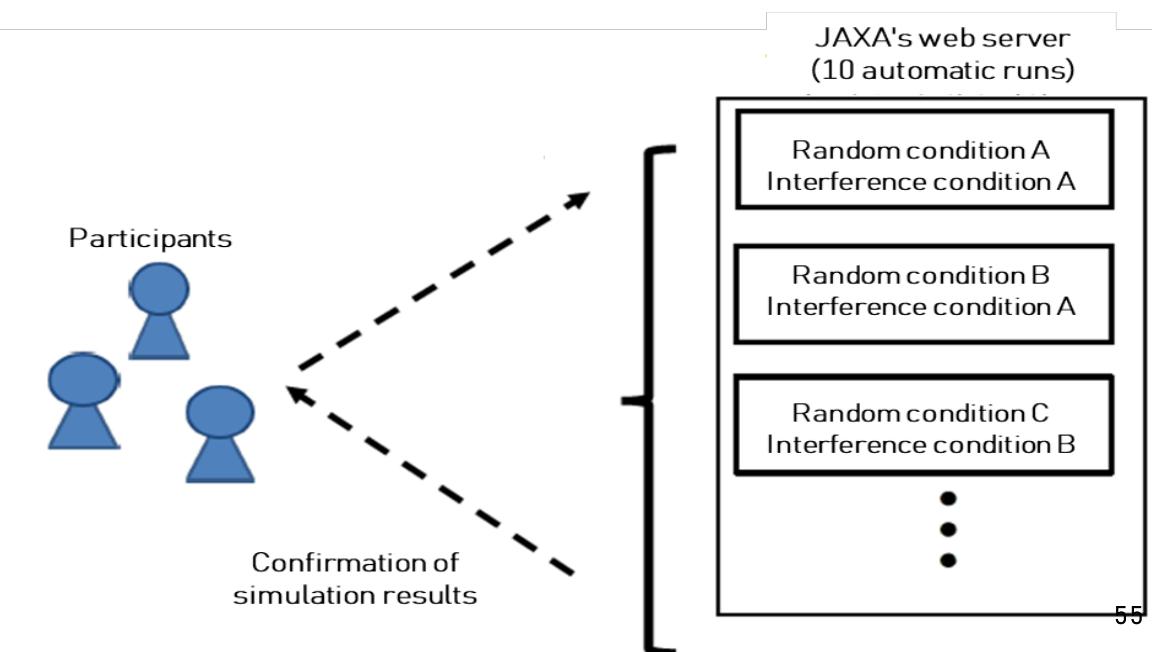
Preliminary round period: **Late June to early July, 2025**



ABOUT THE PRELIMINARY ROUND

Preliminary Round Rules

3. Only one APK per team can be used
4. 10 Runs for each team in the preliminary round
 - 10 Runs per APK
 - Random factor is the same for all teams
 - Score is calculated on the average of 10 Runs





ABOUT THE PRELIMINARY ROUND

Preliminary Round in Japan

Late June to early July, 2025

(The event will be held on one day over the above period)

Event Details

Greetings from the event organizer/Explanation of the rules

Introduction of participating teams and simulation results

Panel discussion with JAXA officials

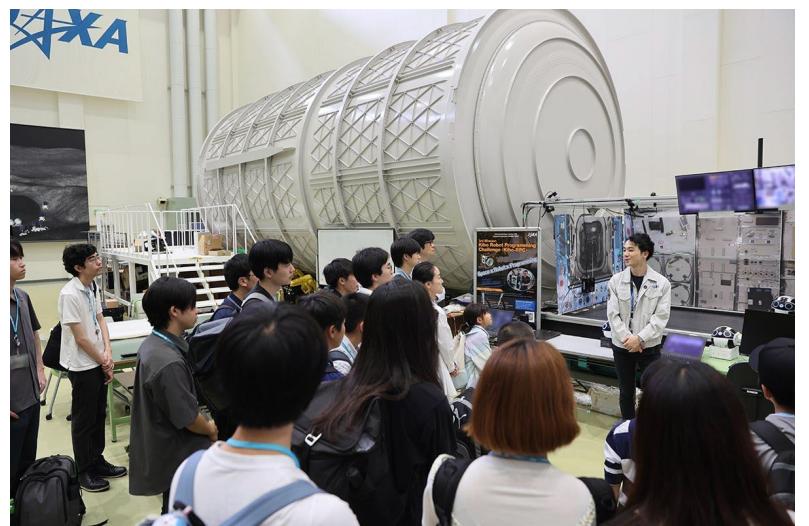
Ranking announcement/award ceremony/interview with the winning team

Kibo-RPC Workshop (Lecture and Networking)

*Details of 5th Kibo-RPC

The last event can be watched on YouTube [☞](#)

[5th Kibo Robot Programming Challenge \(Kibo-RPC\).](#)
[Preliminary Round](#)



AGENDA



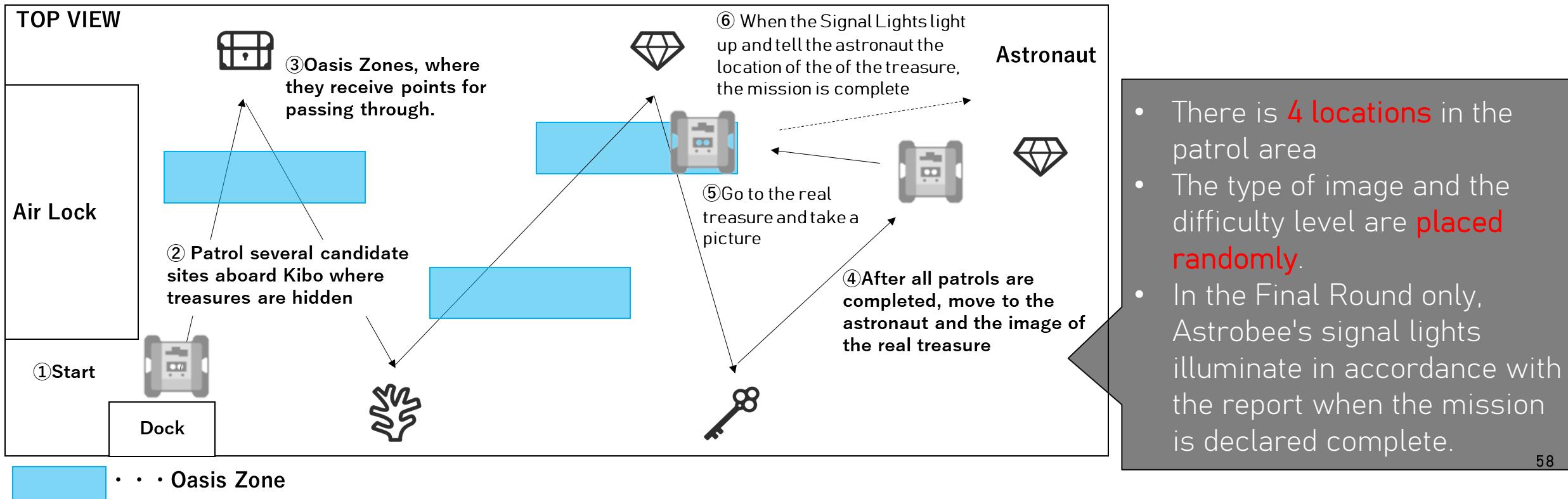
- 1. Overview of the Kibo Robot Programming Challenge (Kibo- RPC)**
- 2. Outline of the 6th Kibo-RPC**
- 3. About the Preliminary Round**
- 4. About the Final Round**
- 5. Q&A**



ABOUT THE FINAL ROUND

Mission Details

- Final Round is conducted by uplinking (installing) the program to Astrobee in orbit.
- Programs for the Final Round must be submitted in advance (scheduled from late July to late August).
- Final Round details and program submission date will be announced to finalists at a later date.





ABOUT THE FINAL ROUND

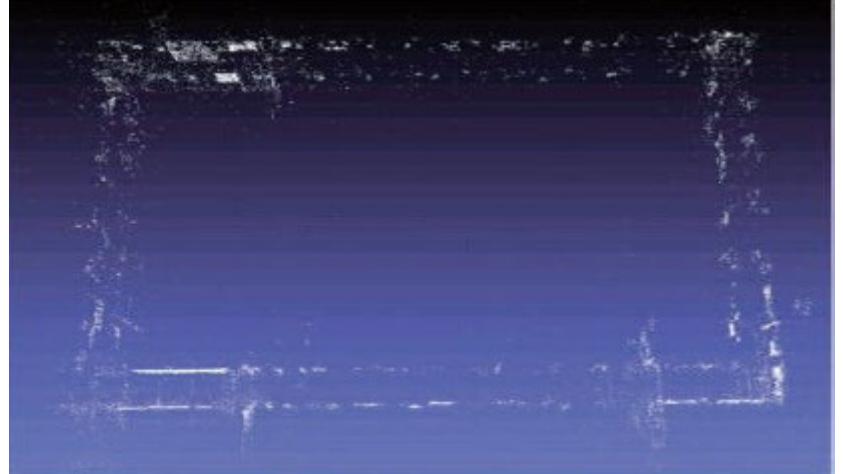
Difference between simulated and real environments

Presumption of accuracy of own position (Sparse Mapping)

- ① Collect initial images of Kibo's interior in advance and create a sparse map.
- ② Self-positioning estimation is performed by matching the images taken by the camera during the flight with the feature points of the map acquired in step ①.



Fewer features means no map matching
and no self-location estimation



<https://www.nasa.gov/sites/default/files/atoms/files/coltin2016localization.pdf>



ABOUT THE FINAL ROUND

Final Run and Final Event in ISS will be held on different days.

APK Final Run on ISS: Late September 2025

Final Round Event on Ground: Early November 2025

Final Round Event Details

Greetings from the organizer/Explanation of the rules

Introduction of participating teams and ISS run results

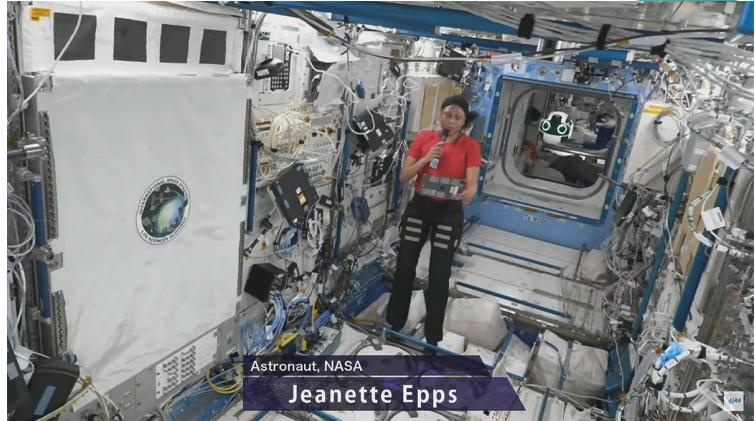
Announcement of standings/award ceremony/interview with the winning team

Kibo-RPC Workshop (Lecture and Networking)

*Details of 5th Kibo-RPC

The last event can be watched on YouTube

[5th Kibo Robot Programming Challenge \(Kibo-RPC\), Final Round on-orbit competition](#)



Astronaut, NASA
Jeanette Epps



The 5th Kibo-RPC Final Event was held in a hybrid format online and at the Tsukuba Space Center



THE 6TH KIBO ROBOT PROGRAMMING CHALLENGE GUIDANCE SESSION



Thank you for your attention!

We look forward to your participation!

Q & A

- If you have any questions, please ask them in the Chat.

*Questions that require confirmation will be answered by email at a later date.



6th Kibo-RPC Competition URL: <https://jaxa.krpc.jp/ja>

JAXA KUOA URL: <https://humans-in-space.jaxa.jp/biz-lab/kuoa/>

Kibo-RPC Secretariat: Z-KRPC@ml.jaxa.jp

