

**\* General Rule:** Check the general rule first before reading this game rule. Please be aware that General rules will apply equally to all events during the competition.

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Robot Gathering	League	Participation	Construction
	Junior/ Challenge	1 Person	1 Robot

## 1. Game description

Robot Gathering is a time record game which aims to gather object at designated area then arrives to final destination. Gathering object mission record will give higher priority at its recorded time, therefore accurate control of robot will be required. Mechatronics related knowledge such as production and programming robots using the principle of dynamics, and laws of physics that is applied to the robot and sensor adjustment technology, as well as programming skills will be evaluated.

## 2. Robot

**2-1. Robot type:** Any Robot which includes wheels and parts that can gather targets

### 2-2. Built on-site

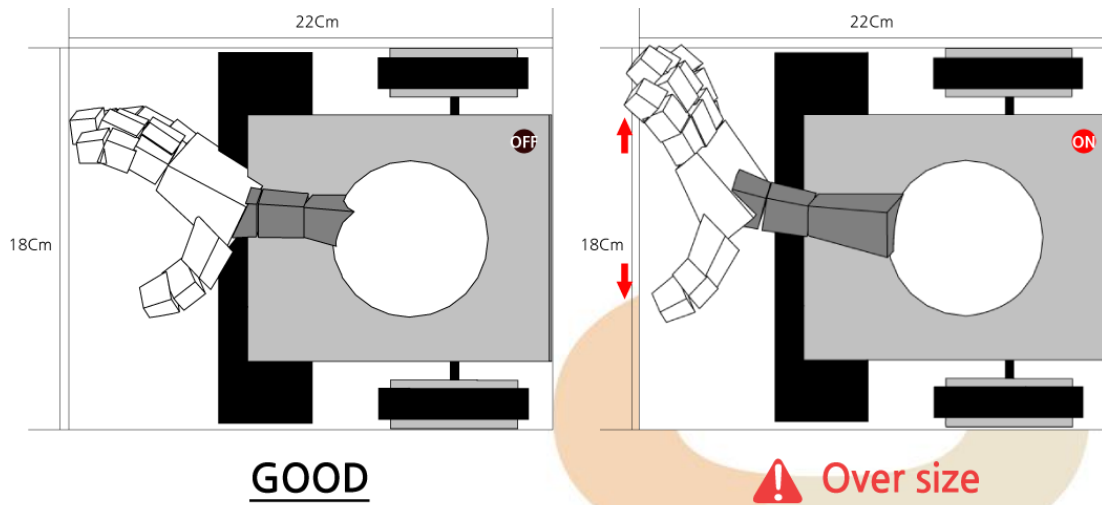
The robot should be built on-site by the participant during the construction time except for the robot controller. Must obey particular standard of size and must be able to be measured at the measuring instrument.

#### 2-2-1-2. Size measurement

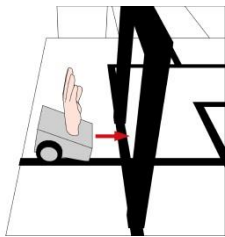
- 1) Self-Check: Participant can check size of the robot while manufacturing and practicing.
- 2) Official inspection: Before the competition, referee will check the size of the robot.
- 3) Ways of Measuring: Referee will check the size of the robot with the measuring materials. Participant cannot give any objection toward the judge.
- 4) Modify: **If it exceeds the size, participant has a minute to modify their robot in front of the judge. participant will be given 1 minute to modify their robot in front of the judge, on a designated desk. If participant fails to fit the standard size, he or she will be disqualified.**
- 5) If size of the robot is different when the actual match begins, will be disqualified too.

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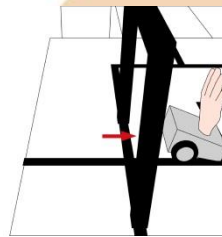
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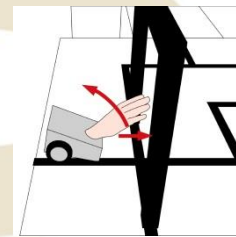
\*When Length and weigh is changed, same rule applies.



<Size Measurement with figure>



<Right Start>



<Wrong Start>

2-2-2. Sensor of the Robot: No restriction

2-2-3. Power

2-2-3-1. Robots should work with an independent electric power supply; it cannot use a combustibile device.

2-2-3-2. There is no limitation on type of battery or voltage.

2-2-4. Operation: No restriction

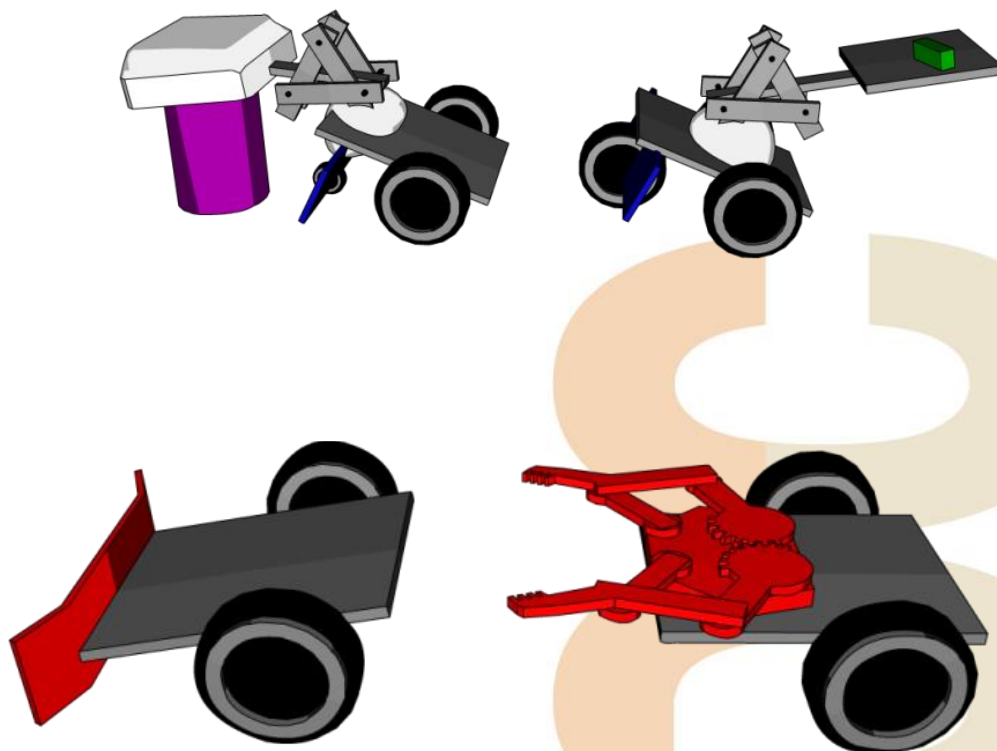
2-2-5. Parts: Allowed to attach parts to push or pull objects

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Examples parts that are allowed.

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**2-3. Robot must move autonomously by the program except the starting point and it cannot be operated by the outer interference.**

### 3. Competition Site

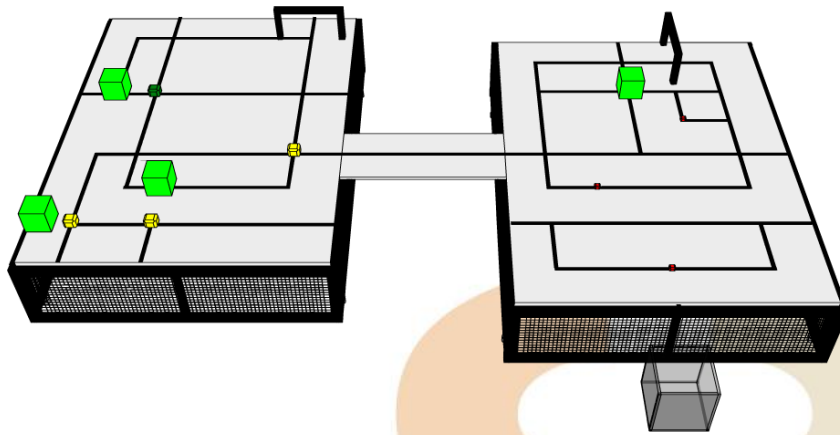
**3-1. Competition site:** Playfield approved by International Robot Olympiad committee.

**3-2 .Size and Composition:** The size of playfield must be 160cm x 12m ( $\pm 10\%$ ) and connecting two playfields.

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<Above the picture is example connection with bridge, arrangement, mission and line, will be announce on the match day>

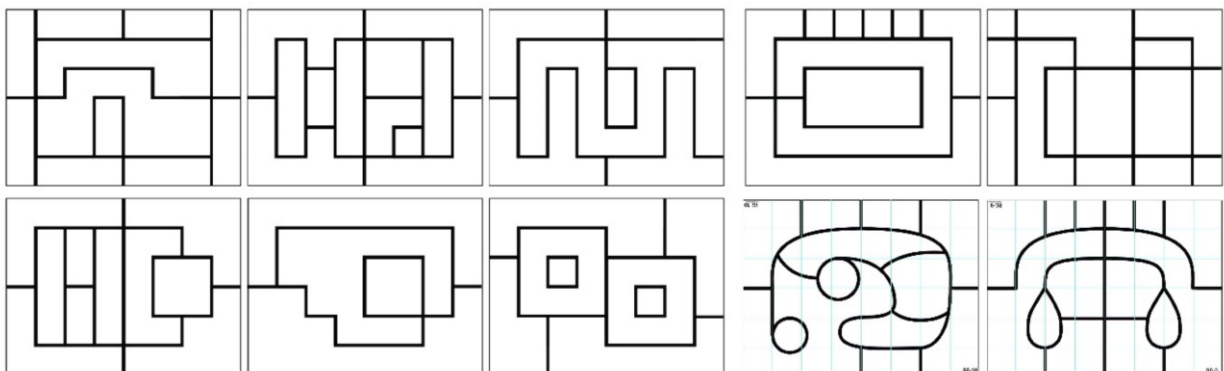
3-2-1. Connection: The size of bridge has to be 25cm ( $\pm 10\%$ ) and will be connected in a straight line or a curved line.

3-2-2. Allowable range of error in the stadium: The slope that is less than  $2^\circ$  ( $\pm 10\%$ ) and a gap or bump that is less than 3mm ( $\pm 30\%$ ) is allowable.

3-2-3. Prevention for falling robot: There will be no special structure for falling robot.

**3-3. Playfield:** It is covered with matt coat polyethylene terephthalate paper which includes advertisement and logo from the organizers.

3-3-1. Mission Map: It consists of connection and intersection of straight line and curve line and it fixes with sheets and tapes in the playfield.



< Example of Mission map for Robot Gathering 2019 >

3-3-2. Line: The color of line is black and its width is 2cm ( $\pm 10\%$ )

3-3-3. Installation of measuring instrument: In order to measure the time, measuring

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instrument will be installed at starting point and ending point, direction can be changed according to the mission.

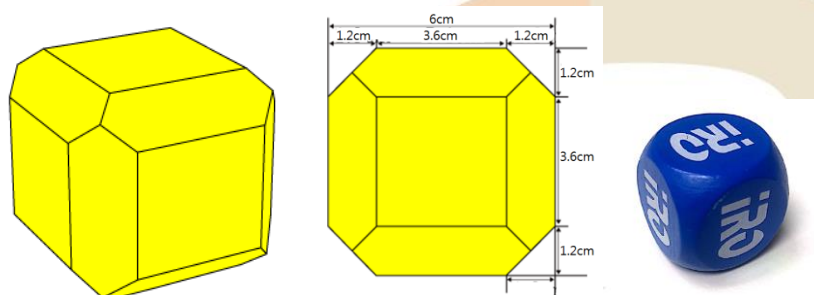
### 3-4. Appendage of Competition

3-4-1. Target: The Weight is between 10~30g ( $\pm 10\%$ ) and can used as polyhedron with two different kinds of size for targets

3-4-1-1. Size of a Target

- 1) Large Cube: 6cm \* 6cm \* 6cm (W\*H\*H,  $\pm 10\%$ )
- 2) Small Cube: 3cm \* 3cm \* 3cm (W\*H\*H,  $\pm 10\%$ )

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<Larges Cube, Small Cube>

3-4-1-2. Target color: Any color can be used.

3-4-1-3. Allocating Targets : Targets can be located anywhere on mission map.

3-4-2. Destination

It will be assigned and allocated according to the mission and it can be divided into inner and outter destination.

3-4-2-1. Inner destination

It will be randomly designated in the playfield.

3-4-2-2. Outer destination

- 1) Size : It will be announced on the match day.
- 2) There will be a space for designated destination outside of playfield
- 3) Installation : It will be in the ground and there will be maxium 15cm space from any side of playfield.

3-4-3. Obstacle

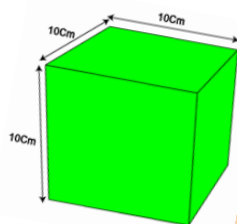
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It will be a fixed object, it can give the physical limitation.

#### 3-4-3-1. Size of obstacle

It will be size of a regular hexahedron 10Cm\*10Cm\*10Cm (W\*L\*H,  $\pm 10\%$ )



<Obstacle>

#### 3-4-3-2. Allocation of obstacle

According to the mission, obstacles can be located in anywhere on the mission map and it will be fixed in playfield.

## 4. Competition progress

### 4-1. Game process

Chance will be given twice. After first trial there will be repair time.

### 4-2. Construction and practice time

Construction and practice time will be given at least 2hours and it will be announced on the matchday.

### 4-3. Allocation of playfield

It will be allocated based on number of participants difficulty level of the game.

### 4-4. Production and Practice time

Participants can practice until the end of announced practice time; however, they're not allowed to practice before their seat's been assigned.

### 4-5. End of Production and Practice time

After production and practice time, participants must stop their robot and follow the instruction of referee and staffs.

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#### **4-6. 1<sup>st</sup> Trial**

After the construction and practice time the 1<sup>st</sup> trial will begin.

##### 4-6-1. Preparation of the game

All participants must take out the robot and be ready for referee's instruction.

##### 4-6-2. Stand by after the game.

When participant finished their 1<sup>st</sup> trial, they have to line up and watch all participants' game until end of that trial.

#### **4-7. Repair Time**

After the end of 1<sup>st</sup> trial, all participants have 30 minutes to repair their robot and practice.

#### **4-8. 2<sup>nd</sup> trial**

Right after the repair time, 2<sup>nd</sup> trial will begin.

##### 4-8-1. preparation of the game

All participants must take out the robot and be ready for referee's instruction.

##### 4-8-2. Stand by after the game.

If a participant finishes his/her 2<sup>nd</sup> trial, they will go back to their seats.

### **5. Competition**

#### **5-1. Perform the mission**

Course of run and order of carrying is not designated but participant can decide it freely.

#### **5-2. Points**

A participant gets points on number of success to put targets in the destination. It will be counted as 1 point per 1 target.

#### **5-3. Start** A participant should start the robot when the referee starts the game.

##### 5-3-1. Miss Start

If participant couldn't start within 5 counts from referee's signal, it will be declared as 'Miss Start' and they have two more chance to restart for this miss start.

##### 5-3-2. False start

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If the participant starts the robot before the referee's signal, it is declared as 'False start' and they have only one more chance to restart.

### 5-3-3. Restart

The chances are only twice and if there is no move after the restart signal from the referee, it will be disqualified.

### 5-4. Arrival

It will be declared as arrival when robot arrives at the line where measuring instrument or intersection is installed and measuring instrument will stop the time recording. (Robot needs to stop at the line or intersection point of measuring instrument)

#### 5-4-1. Arrival mission

When robot arrives at the finishing point, the referee will count 3 seconds. It must be staying over there for 3 seconds at the finishing point.

### 5-5. Time limit

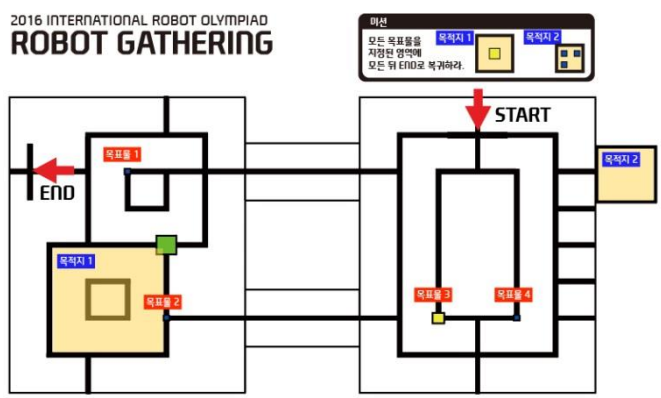
It will be given 2 minutes for the match.

### 5-6. Officialize of the mission

Before the game starts, the line structure, location and number of destination and object also shape of bridge in site of competition will be announced to participants at match day in form of mission paper.

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### Example of the Mission



⚠ 본 미션맵은 대회가 종료될 때까지 외부로 가지고 나갈 수 없습니다. Do not bring the map out area until the game is over.  
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#### 5-6-1. Movement of the target

Targets can be moved to other loaction instead of the destination.

#### 5-6-2. Numbers of moving target

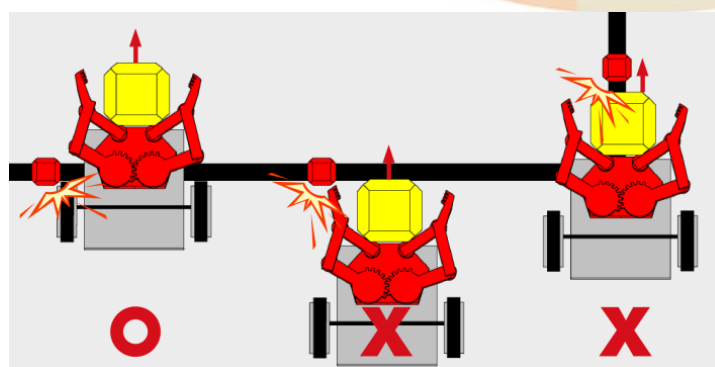
When robot carries object, it can only carry one object at one time.

#### 5-6-3. Exceeding the number of moving targets

While robot is carrying targets, any contact with other target is not allowed, according to 5-6-2, point will not be accepted.

5-6-3-1. If robot touches targets with any other parts of its gripper and other target, won't be considered as movement of target.

5-6-3-2. If robot touches targets which is already allocated in the destination, it also is not considered as Movement of the target. (Rule 5-6-4)



<Examples>

#### 5-6-4. Adjustment of target

The double touch is possible from the target which is moved from the direction, and there are no limitations on target movement.

#### 5-6-5. Loss of target

Robot which had collapsed from outer site of competition cannot be reused.

#### 5-6-6. Crossing

Robot can cross the location where target was located.

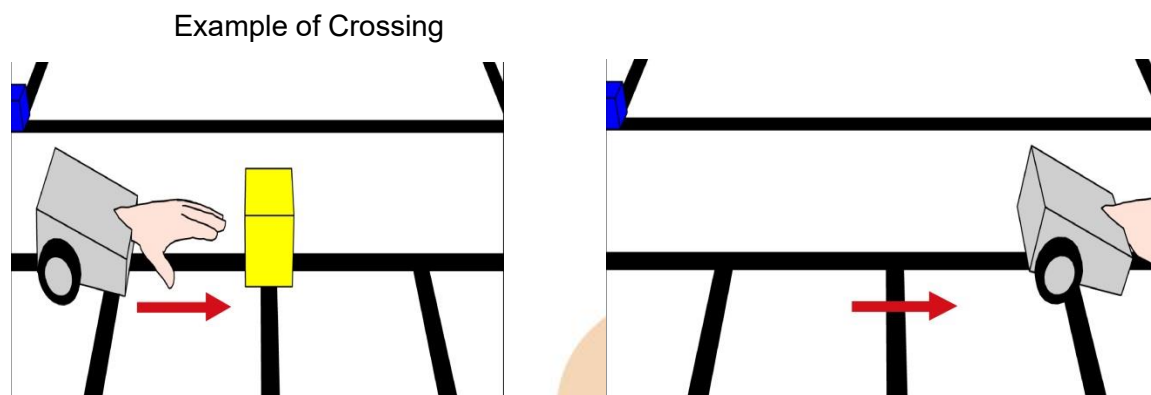
#### 5-6-7. Touching the obstacle

There is only limitation of physical part, the point will not be deducted from the participant.

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## 5-7. End of Competition

### 5-7-1. Robot arrival

If robot arrives at or passes through the finishing line before time limit where measuring instrument is installed, match is over and records the points when it is finished.

### 5-7-2. Time limit

If robot couldn't complete the missions within 2 minutes, it will record the points at the end point of the time.

### 5-7-3. Robot Stop

If the robot doesn't move, the referee will count 10 seconds and if the robot still could not move, will call it a robot stop and count the points at the end point.

5-7-4. TKO (technical knockout): During the match, referee can declare of TKO without 10 counts when referee judge that the robot can't drive properly anymore. (Ex. robot had been stopped over the structure and obstacle, robot drive settled zone repeatedly)

## 5-8. Disqualification

During the match, if participant violates the rule or interrupts the match, will be ended and result will not be admitted.

### 5-8-1. Robot Touch

During the match, if participants touch the robot without judge and supervisor authorization, it will be declared robot touch and disqualified.

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#### 5-8-2. Repair during the match

During the match, additional, remove, exchange, changing the toll is prohibited but during the standby, if the participants has additional battery then the team will be disqualified.

#### 5-8-3. Sensor tuning

Before the match begins, if participants try to tune the sensor, will be disqualified

#### 5-8-4. Disobey of seat allocation

If participant practice or play the game at the playfield that they're not assigned, participant will be disqualified.

#### 5-8-5. False Start

If participant conduct 'False Start' twice, participants will be disqualified.

#### 5-8-6. Miss Start

If participant conduct 'Miss Start' three times, participants will be disqualified.

### 5-9. Rematches

During the match if expected situation occurs, such as blackout or breakdown of measuring instrument, referee can decide to do rematch.

**5-10. Referee will control all situations from and referee have authority to control participants. The judgment of game result is exclusive authorization of referee. The declaration shall be final.**

## 6. Evaluation

### 6-1. Ranking decision factors

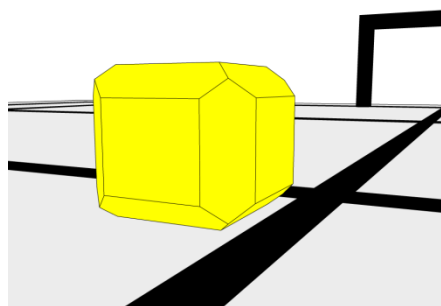
Mission points, time record and stop mission of finishing line.

### 6-2. Mission points

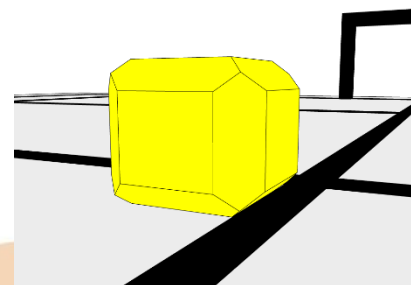
After declaring end of the game, referee will judge points based on final state of the map. Just like examples below, if target is touching to border of the line, won't be accepted as points in this case.

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<Examples>

### 6-3. Time record

Time record is based on the measuring instruments. (If you are declared as TKO, Robot stop by referee, it will not be recorded.)

### 6-4. Final score

Better score out of 1st and 2<sup>nd</sup> trial will be the final score.

### 6-5. Order of priority to result

**Number of target completion > Time record existence > Success of stop mission > Compare to time result**

#### 6-5-1. Order of priority according to trial

If counterparts have same result in a certain Trial, referee will compare result from another trial and decide the winner.

#### 6-5-2. Order of priority according to Tie-Breaker

**If it ties even after applying rule 6-5-1, referee will decide winner from better 1<sup>st</sup> trial score.**