

# FIRA Youth Laws of the Game

## Mission Impossible (U19/U14)

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### Abstract

*The following rules and regulations govern the Mission Impossible event at the FIRA Youth competition. FIRA Youth is an international event aimed at increasing interest in science and technology for junior and senior high school students by exposing them to robotics. The main goal of the mission impossible event is to provide a competition emphasizing creativity, imagination, and on the spot problem solving skills. Teams are allowed to use a limited set of materials to construct and program a robot to solve a particular problem, such as overcoming a wall or collecting treasures on a playing field.*

### 摘要

以下為FIRA Youth青少年比賽項目中的Mission Impossible規則和條例。FIRA Youth青少年是一項國際活動，主旨為讓國高中學生接觸機器人使他們提高對科學和科技的興趣。Mission Impossible項目的主要目標為提供一個強調創造力、想像力和當場解決問題技巧的競賽。隊伍可使用一組有限的材料做一個機器人來解決特定的問題，例如：克服圍牆或蒐集場上的寶藏。

## Latest Version of the Rules for Mission Impossible

### Mission Impossible 最新版本的任務規則

The latest official version of the rules of the Mission Impossible event is always available from the [FIRA Facebook Page](#).

Mission Impossible最新的官方版本規則可以從[FIRA FACEBOOK](#)頁面中取得。

This document also includes in the appendix a set of supplemental regulations, which are rules and requirements for previously held robot mission challenges.

該文件在附錄中列出了一套補充規定，為以前舉行Mission Impossible項目的規則和比賽要求。

## Changes to the Mission Impossible event

### Mission Impossible比賽的變化

An explicit statement was made allowing tools and materials commonly found in robotics kits.

明確的聲明比賽允許機器人套件中常見的工具和材料。

## Mission Impossible

### 不可能的任務

The goal of this competition is to provide an event that requires students to use their imagination and creativity to solve various problems using commonly available items such as popsicles and rubber bands and simple tools such as scissors and hammers. The students are not allowed to use any other items or tools. This levels the playing field, since teams with more expensive hardware do not have an automatic advantage. The game is inspired by the exploits of MacGyver (a popular American TV series in the 80s) and the Junkyard Wars reality TV shows.

這場競賽的目的是要求學生利用他們的想像力和創造力，並使用常用物品，像是冰棒棍、皮筋、及剪刀和鐵槌等簡單工具來解決各種問題。不允許學生使用非指定物品以及工具。這是一個公平競爭的比賽，因為隊伍有更昂貴的硬體也沒有優勢。這個遊戲的靈感來自於MacGyver(一個80年代有名的美國電視劇)和Junkyard Wars真人秀電視節目。

## Mission Impossible - Laws of the Game

### Mission Impossible的比賽規則

The following laws describe the specifics of the marathon event. For general specifications relevant to all HuroCup events (e.g., robot dimensions, playing field and lighting, responsibility of the referees) please refer to [General - HuroCup Laws of the Game](#).

以下規則為描述馬拉松項目的細節。關於HuroCup一般的規範(例如:機器人尺寸、運動場地、照明和裁判責任)請參閱[HuroCup規則](#)。

### **[MI-1]: The Construction Zone**

#### **[MI-1]: 建造區**

[MI-1.1]: Each team has access to a construction zone where they can design and built their robot.

[MI-1.1]: 每一個隊伍都可以進入一個建造區，在那裡設計和製作他們的機器人。

[MI-1.2]: The minimum construction zone for each team is at least as big as one table.

[MI-1.2]: 每一個隊伍的最小建造區至少跟一個桌子一樣大。

### **[MI-2]: The Field of Play**

#### **[MI-2]: 比賽場地**

[MI-2.1]: The makeup and dimensions of the playing field depend on the exact challenge that students must solve.

[MI-2.1]: 比賽場地的構成和尺寸取決於學生必須解決的挑戰。

[MI-2.2]: During the construction phase, each team can request access to the playing field to test their robot. The referee will grant access to the field for short periods of time in first come first served manner. If a challenge task requires significant setup time for testing, the referee may choose instead to create a schedule for testing.

[MI-2.2]: 在建造的階段，每支隊伍都可以要求進入他們的比賽場地去測試他們的機器人。裁判將以先來先得的方式准許他們進入比賽場。如果一個挑戰的任務需要設置時間進行測試，則裁判可以選擇創一個測試的時間表。

### **[MI-3]: Items and Tools**

#### **[MI-3]: 物品及工具**

[MI-3.1]: Participants may use a laptop or mobile phone to program their robot.

[MI-3.1]: 參賽者可以使用筆記型電腦或手機來設計他們的機器人。

[MI-3.2]: Before entering the construction zone at the start of the competition, each team will be informed about the set of items, tools, actuators, and sensors that they will be allowed to use. The limitations on these are not known by the students before the competition.

[MI-3.2]: 在比賽開始進入建造區之前，會通知每個隊伍可以使用的物品、工具、致動器和感測器。在比賽之前，學生們並不知道這些限制。

[MI-3.3]: The maximum number of continuous revolution motors allowed in a challenge will always be less than or equal to four motors. This includes standard DC motors or motors that provide position feedback (e.g., Lego NXT motors). This number is an upper limit on any robot mission challenge, however, a specific robot mission challenge may further limit the number of continuous revolution motors.

[MI-3.3]: 在挑戰中允許連續旋轉馬達數量要少於或等於四顆馬達。包括提供位置回授的

標準直流馬達或馬達(例如:樂高NXT馬達...)。這個數量是任何機器人任務挑戰的上限,然而,一個特定的機器人任務挑戰可能進一步限制連續旋轉馬達的數量。

[MI-3.4]: The maximum number of servo motors allowed in a challenge will always be less than or equal to six servos. This number is an upper limit on any robot mission challenge, however, a specific robot mission challenge may further limit the number of servo motors.

[MI-3.4]:在挑戰中允許伺服馬達數量要小於或等於六顆伺服馬達。這個數量是任何機器人任務挑戰的上限,然而,一個特定的機器人任務挑戰可能進一步限制伺服馬達的數量。

[MI-3.5]: The maximum number of IR sensors allowed in a challenge will always be less than or equal to six IR sensors. This number is an upper limit on any robot mission challenge, however, a specific robot mission challenge may further limit the number of infrared sensors.

[MI-3.5]:在挑戰中允許紅外線感應器要小於或等於六顆紅外線感應器。這個數量是任何機器人任務挑戰的上限,然而,一個特定的機器人任務挑戰可能進一步限制紅外線感應器的數量。

[MI-3.6]: The maximum number of ultrasonic sensors allowed in a challenge will always be less than or equal to four ultrasonic sensors. This number is an upper limit on any robot mission challenge, however, a specific robot mission challenge may further limit the number of ultra-sound sensors.

[MI-3.6]:在挑戰中允許超音波感應器要小於或等於四顆超音波感應器。這個數量是任何機器人任務挑戰的上限,然而,一個特定的機器人任務挑戰可能進一步限制超音波感應器的數量。

[MI-3.7]: The maximum number of touch sensors allowed in a challenge will always be less than or equal to four touch sensors. This number is an upper limit on any robot mission challenge, however, a specific robot mission challenge may further limit the number of touch sensors.

[MI-3.7]:在挑戰中允許觸碰感應器要小於或等於四顆接觸感應器。這個數量是任何機器人任務挑戰的上限,然而,一個特定的機器人任務挑戰可能進一步限制接觸感應器的數量。

[MI-3.8]: Teams are allowed to bring and use their own commonly available tools during the competition. However, the organizers may restrict use of certain tools if they deem a tool unsafe or for other reasons.

[MI-3.8]:在比賽中,隊伍可以攜帶和使用自己常用的工具。然而,主辦單位認為不安全或其他原因的工具可能會限制使用。

[MI-3.9]: By allowing a tool to be used by the student in the construction area, the team leader affirms that the children know how to operate this tool safely and will take responsibility in case of any injuries or other effects resulting from intended or misuse of the tools.

[MI-3.9]:通過允許在建造區使用的工具,隊長確認隊員們知道如何安全的操作這個工具將在任何傷害或有意誤用這些工具所引起其他影響的情況下承擔責任。

[MI-3.10]: The teams are allowed to bring and use commonly available materials without restrictions. Some examples are:

- paper, cardboard, laminated paper, styrofoam,
- popsicle sticks, chopsticks, wooden clothes pins,
- paper cups, paper plates,
- plastic cups, plastic plates,
- paper clips, binder clips, hair pins, needles,
- wires, strings, ropes,
- scotch tape, duct tape, electrical tape,
- pens,
- cable ties,
- magnets,
- rubber bands.

[MI-3.10]:隊伍在不受限制的情況下允許攜帶和使用常見的材料。例如：

- 紙、紙板、厚紙板、保麗龍
- 冰棒棍、筷子、木製曬衣夾
- 紙杯、紙盤
- 塑膠杯、塑膠盤
- 迴紋針、長尾夾、髮夾、針
- 電線、繩子、繩索
- 透明膠帶、膠帶、電工膠帶
- 筆
- 束帶
- 磁鐵
- 橡皮筋

See Fig.1 to see an example of a work area with associated items and tools.

請參見圖1，查看工作區相關物品和工具範例。

[MI-3.11]: The teams are allowed to bring and use materials that are commonly found in robotics kits without restrictions. Some examples are:

- wheels,
- gears,
- timing belts,
- cables,
- LEDs,
- resistors,
- coils and springs,
- wires.

[MI-3.11]:隊伍在不受限制的情況下允許攜帶和在機器人套件中使用的材料。例如：

- 輪子
- 齒輪

- 履帶
- 電纜線
- LED
- 電阻
- 線圈和彈簧
- 線

[MI-3.12] Special purpose items such as ballast tanks, propellers, and remote controls may be provided by the competition organizers, if needed for the mission.

[MI-3.12]如果任務需要，特殊用途的用品，像是潛水艇沉浮箱、螺旋槳和遙控器可以由比賽主辦方提供。



Figure 1: Work Area at the 1st Robot Mission Challenge Test Event

圖一：在第一機器人任務挑戰測試活動的工作區

[MI-3.12]: The teams are allowed to bring and use their own commonly available and safe tools.

Examples of such tools include:

- scissors,
- knives,
- wire cutters,
- glues,
- staplers,
- screw drivers,
- pliers,
- hammers.

[MI-3.12]: 隊伍可以攜帶和使用他們自己常用的安全工具，此類工具包括：

- 剪刀
- 刀子
- 剝線鉗
- 膠水
- 釘書機
- 螺絲起子
- 鉗子
- 鐵鎚

Special purpose tools such as soldering irons or drills may be provided by the organizers if they are deemed necessary to complete the challenge.

如果主辦方認為有需要完成一個挑戰，他們可以提供特殊用途的工具，像是烙鐵或鑽頭。

[MI-3.13]: This document lists items and tools separately as a convenience for organizers.

However, the use of tools and items is not limited by their classification. For example, a team may choose pliers (designated as tools) to add weight to their robot (used as items), or use pens (designated as items) to drill holes into popsicle sticks (used as tools).

[MI-3.13]: 為了主辦方便起見，此文件列出物品和工具的差別。然而，工具和物品的使用不受其分類的限制。例如，一個隊伍選擇鉗子(指定為工具)增加他們機器人的重量(當作物品)，或使用鋼筆(指定為物品)鑽洞進冰棒棍(當作工具)。

[MI-3.14]: The safety of the children is of utmost importance, hence dangerous materials (e.g., aggressive chemicals) or tools (band saws) must not be used.

[MI-3.14]: 孩子們的安全是極為重要的，於是危險的材料(例如: 侵略性化學製品)或工具(例如: 鋸子)是不能被使用的。

## **[MI-4]: Game Play**

### **[MI-4]:遊戲玩法**

[MI-4.1]: The robot mission challenge event starts with the construction phase. During the construction phase children will enter the construction zone with their items and tools. They may also be provided with some additional items and tools from the organizers.

[MI-4.1]: 機器人挑戰任務從建造階段開始。在這個階段期間，孩子們跟他們物品和工具都要進入建造區。他們也可以從主辦方那得到一些額外的物品和工具。

[MI-4.2]: The competition will start with the referee giving a description of the mission.

[MI-4.2]: 比賽由裁判介紹任務開始。

[MI-4.3]: The referee will give a description of the scoring formula being used for this event.

[MI-4.3]: 裁判會介紹本次比賽的得分方式。

[MI-4.4]: The referee will announce any special restrictions or rules that may be in effect during the event.

[MI-4.4]: 在比賽期間，裁判會宣布特殊的限制或規則。

[MI-4.5]: The referee will announce the duration of the construction phase. Whenever possible, the construction phase should last three hours.

[MI-4.5]: 裁判會宣布在建造區的時間。只要有可能，在建造區的時間應該會有三個小時。

## **[MI-5]: Infractions and Penalties**

### **[MI-5]:違規和懲罰**

[MI-5.1]: Only team members are allowed to enter the construction zone or the playing field during the competition. Teachers and parents must remain outside of the designated area.

[MI-5.1]: 在比賽期間，只有隊員可以進入建造區和比賽場上。老師和家長只能留在指定的區域內。

[MI-5.2]: Team members are not allowed to leave the construction zone or the playing field without prior permission of the referee.

[MI-5.2]: 沒有經過裁判的事先許可隊員不能離開建造區或比賽場。

[MI-5.3]: Any team whose members or associates violate rule [MI-5.1](#) to [MI-5.2](#) will be disqualified.

[MI-5.3]: 任何隊伍或隊員違反[MI-5.1](#) 和 [MI-5.2](#)規則，將會被取消資格。



[MI-5.4]: Any team whose members use additional items except those as specified by the organizers will be penalized by the referee. The sanctions imposed by the referee include time or points penalties (for example, the final score is reduced by 30%), or in serious cases may also lead to disqualification of a team. The severity of the penalty is decided on the sole discretion of the referee.

[MI-5.4]:任何隊伍的隊員使用除了由主辦方指定的額外物品，將會被裁判懲罰。裁判判決包括實間、分數的懲罰(例如:扣除總分的30%)或在嚴重的清況之下也可能導致隊伍被取消資格。懲罰的嚴重性取決於裁判。

[MI-5.5]: Any team whose members use additional tools except those as specified by the organizers will be penalized by the referee. The sanctions imposed by the referee include time or points penalties (for example, the final score is reduced by 30%), or in serious cases may also include disqualification of a team. The severity of the penalty is decided on the sole discretion of the referee.

[MI-5.5]:任何隊伍的隊員使用除了由主辦方指定的額外工具，將會被裁判懲罰。裁判判決包括時間、分數的懲罰(例如:扣除總分的30%)或在嚴重的清況之下也可能導致隊伍被取消資格。懲罰的嚴重性取決於裁判。

[MI-5.6]: A team that continues building or modifying their robot after the construction phase will be sanctioned or disqualified.

[MI-5.6]:隊伍如果在建造階段後繼續建造或修改機器人的話將會被制裁或取消資格。

## **[MI-6]: Method of Scoring**

### **[MI-6]:評分方法**

[MI-6.1]: At the end of the construction phase, all teams must finish building their robot and bring it to the playing field.

[MI-6.1]:在建造階段結束後，所有的隊伍必須完成建造他們的機器人，並將機器人帶到比賽場上。

[MI-6.2]: At that time, the referee will test the performance of the robot and will calculate the resulting score given the scoring formula.

[MI-6.2]:到時候，裁判將測試機器人的性能，並根據得分公式計算得分。

[MI-6.3]: 1st, 2nd, 3rd, ... awards will be awarded based on the point score.

[MI-6.3]: 第一名，第二名，第三名...獎項根據積分。