

ROBAFIS™ 2017

Stakeholder Requirements applicable to SYS'TEAM

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1. OBJECT

This document describes the requirements to be satisfied by the set of material and human resources provided by a motor sports team to prepare and participate in a circuit race. This set will be called **SYS'TEAM**.

2. APPLICATION DOMAIN

This Stakeholder Requirements Document is applicable to the implementation of a copy of all the components of **SYS'TEAM** intended for the realization of free tests and a campaign of comparative evaluation between several competing solutions.

SYS'TEAM is a complex system; complex because it incorporates, once implemented, a set of technological products, services, and a human organization.

These requirements are also applicable to the material and human resources and documentation required to verify the correct functioning of **SYS'TEAM** carried out during the conformance verifications before the tests (configuration audit) and its use and maintenance during free tests and during the evaluation campaign.

3. LIMIT OF DELIVERABLES

The deliverables include:

- The development folder, deliverable result of the development engineering of **SYS'TEAM**.
- A functional copy of **SYS'TEAM** comprising all the hardware, software, human and organizational resources and services necessary for participation in the evaluation campaign:
 - the vehicle **SPORT'GT**,
 - the cockpit **FIXED PC** used by the test engineer,
 - the cockpit **MOBILE PC** used by the pilot,
 - the communication infrastructure allowing the remote transmission of command and control data between the pilot, the test engineer and the **SPORT'GT** vehicle,
 - the support system required for the use and maintenance of **SYS'TEAM**,
 - the pilot, the test engineer and the maintenance operator trained in the implementation of **SYS'TEAM**.

The deliverables do not include the race commissioner responsible for managing the competition and the safety of the circuit. The race commissioner is part of the organizing team of the **ROBAFIS™ 2017** competition.

For free tests and operational evaluation, the environment conforming to the stakeholder requirements and its annexes 1-1, 1-2 and 1-3 is produced and made available by the organization of the **ROBAFIS™ 2017** competition.

For development, the environment is realized by each team according to the stakeholder requirements and its annexes 1-1, 1-2 and 1-3.

4. MISSION

Each mission is a competition between two **SPORT'GT** present simultaneously on the circuit.

A mission consists of three successive phases.

Phase 1 consists of moving the **SPORT'GT** from the Paddock to the location marked on the ground designated by the race commissioner, in front of the starting line, using the service and access way to the circuit track and performing one lap of the circuit clockwise.

Phase 1 is conducted by the test engineer, with **FIXED PC**. It is executed in a maximum time of 120 s.

The authorization and instructions to go to the starting line are given by the race commissioner. The two **SPORT'GTs** in the race will perform phase 1, one after the other.

Phase 2 consists of a race between the two **SPORT'GTs**. Each pilot drives his or her vehicle with his or her **MOBILE PC**. The start of the race is given by the race commissioner. The race consists in finishing the first one, after having run the maximum of complete laps, while running the circuit in the clockwise direction; the race lasts 6 min.

Phase 3 consists, with the race completed, to return each **SPORT'GT** in its Paddock by running the exit and service way of the circuit. It is executed in a maximum time of 120 s.

Phase 3 is conducted by the test engineer, with **FIXED PC**.

The two **SPORT'GTs** in the race will perform one after the other phase 3, following the instructions of the race commissioner.

Any maintenance intervention during the mission will be carried out by the maintenance operator in consultation with the test engineer and the pilot, after authorization of the race commissioner. They will be carried out outside the area of the speed ring, in the pilots and maintenance operators moving zone, being careful not to hinder the other vehicle in race and its pilot.

5. CHARACTERISTICS OF SYS'TEAM

The **SPORT'GT** moves in its environment, being remotely controlled, either with the **FIXED PC** or with the **MOBILE PC**, depending on the phase engaged.

The **SPORT'GT** uses only components contained in the kit provided by AFIS. For its realization, it will not be admitted or added (for example, other parts than those provided, materials, sensor or glue), nor modification of any component of the kit. The content of the kit is given in appendix 3. The only additional components required are:

- the energy storage elements integrated in the vehicle,
- the software embarked in the vehicle.

For each team, the technical zone welcomes:

- the tests engineer,
- the **FIXED PC** that allows the test engineer:
 - having the MMI for remote control of the vehicle, used during phases 1 and 3. A remote handling interface can be connected: mouse, joystick,
 - visualizing the MMI used by the pilot on his or her **MOBILE PC** for the duration of the race.

The **MOBILE PC** allows the pilot having the MMI control of the **SPORT'GT**, MMI whose view is shared with the test engineer on his or her **FIXED PC**.

The integration of **SYS'TEAM** includes:

- loading the embarked software in the **SPORT'GT** vehicle (previously assembled before the arrival on RobAFIS competition site);
- loading the operation software in **FIXED PC** and **MOBILE PC**. Integration and functional verification do not exceed 15 minutes.

PC FIXED is a laptop; any other type of device is excluded. The remote connection between the **FIXED PC** and the **SPORT'GT** vehicle is of Bluetooth type (mandatory).

MOBILE PC is a mobile phone or a touch pad; any other type of device is excluded. The remote connection between the **MOBILE PC** and the **SPORT'GT** vehicle is of Bluetooth type (mandatory).

In its category Grand Tourism Sport:

- The ground gauge of the **SPORT'GT** vehicle, in running order, cannot exceed 100 mm (width) x 200 mm (length). The height is not limited.
- The maximum mass of the **SPORT'GT** vehicle, in running order, cannot exceed 1,000 kg.

SYS'TEAM is testable and maintainable. The **SPORT'GT** is designed to perform a mission without preventive or curative maintenance during the mission. At the end of each mission, the energy reserve on board the **SPORT'GT** may be replaced.

FIXED PC has a video output in VGA or DVI or HDMI format that allows the computer screen to be copied in order to project the MMI of the test engineer and the MMI of the pilot in the control centre room.

6. UTILIZATION ENVIRONMENT CHARACTERISTICS

The missions are carried out in an organized environment as defined in annexes 1-1, 1-2 and 1-3.

The climatic conditions common in the operating area are as follows:

- Ambient temperature in the range of 10 ° C to 32 ° C.
- Atmospheric pressure between 1000 and 1030 mb.
- Hygrometry between 40 and 75%.

The zone of the speed ring is defined in appendix 1-1. The speed ring track has a width of 240 mm between dashed lines over its entire length. The speed ring has two long straight lines of 3,700 m and 1,800 m approximately.

The zone of the speed ring is made by printing on a matt white 170g / m² paper support (COALA, matt coated 170, white reference 476147), glued directly on a perfectly flat and horizontal ground. Are printed:

- A "satin" black line representing the border of the speed ring zone.
- Two black "satin" dotted lines representing the course of the speed ring.
- The starting line.
- The marking on the ground of the starting points of the 2 vehicles in competition.

The area of the circuit is bounded by a yellow and black border. The paddocks and the service, access and exit way of the circuit are within this zone, as shown in Annex 1-2.

The Paddocks are black "satin".

The service, access and exit way of the circuit has a width of 240 mm between the lines of "satin" black border.

The pilot and the maintenance operator of each team move in the area of the circuit, outside the area of the speed ring; the maintenance operator of each team move in the event of authorized intervention.

The two test engineers are positioned in the technical zone. The technical zone and the standby positions of the maintenance operators are located in the area of the site, as shown in Annex 1-3. Two tables and two chairs allow test engineers to sit in front of their **FIXED PC**.

The area of the circuit is lighted in a homogeneous manner, except for the shadows produced by the objects present on the plate. The luminous intensity in this zone is between 100 and 300 Lumen / m².

7. OPERATIONAL QUALIFICATION

The operational qualification consists in carrying out three successive races (missions) on a half-day.

Each race consists of evaluating:

- The ability to run the longest distance and complete the race.
- The technical quality of the mission: no manual intervention and no accident with the other vehicle present on the ring that could affect the integrity of the vehicles.
- The ethical behaviour of the pilot, which must not block the other vehicle, if the other vehicle is able to pass it, and must place its own vehicle tightening to the right or to the left of the track, in order to leave free the other half of the track.

After the 6 minutes of race in phase 2, at the signal given by the race commissioner, each vehicle stops at the spot where it is located.

The scale of points is as follows:

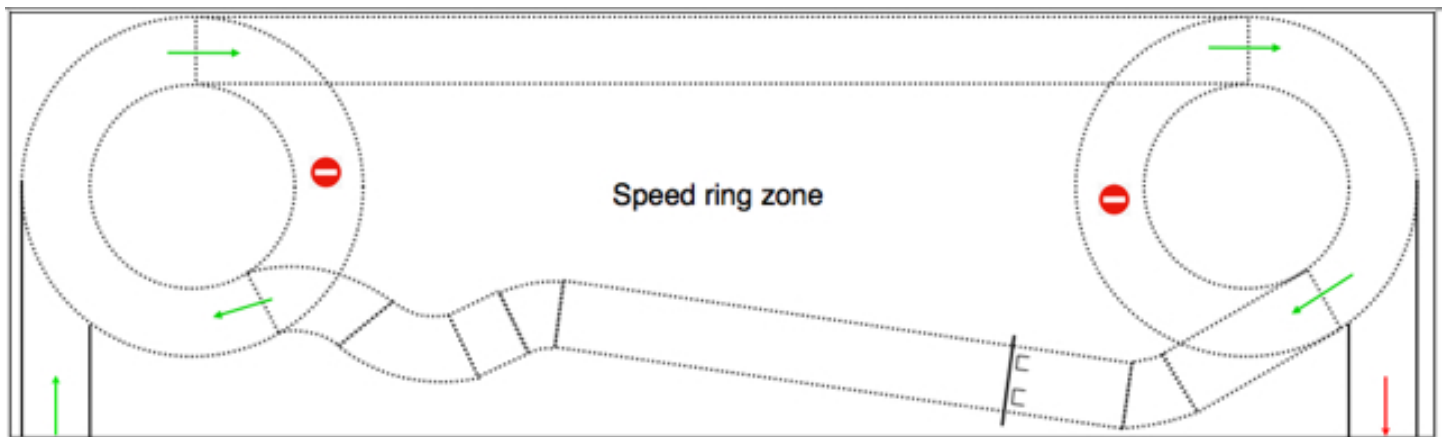
- Bonus for a time not exceeding 120 s to achieve phase 1: +1 point.
- Distance run during phase 2: +5 points per completed lap.
- Bonus for first place finish: +2 points (applicable only if phase 2 is completed and without pilot fault).
- Penalty for manual intervention of the pilot or maintenance operator in case of vehicle blockage: -2 points.
- Penalty for manual intervention of the pilot in case of partial or complete exit of the track: -2 points (*).
- Penalty for "touch" with the other vehicle: -1 point.
- Penalty for "accident" with interruption of the race: -2 points.
- Penalty for curves crossed in a straight line with partial or complete exit of the track (without following the track): -2 points (**).
- Penalty for piloting fault (unethical behaviour of the pilot): -2 points.
- Penalty for abandonment during phase 2 (decision of the pilot and the test engineer not to finish): -2 points.
- Bonus for a time not exceeding 120 s to achieve phase 3: +1 point.
- Penalty for failure to fully complete phase 3: -1 point.

* The track exits without any intervention by the pilot or the maintenance operator, with the vehicle returning to the track and continuing the race, are not penalized.

** The vehicle can run on the edge of the track (biting wheel on the track edge).

The two vehicles having completed the most laps in all completed races without accident, without manual intervention by the pilot and the maintenance operator and without pilot fault, are credited with a bonus of 10 points for the first and 5 points for the second. These points shall be added to the points of the scale.

ANNEXE 1-1 : SPEED RING ZONE



Dimensions of the speed ring: 1500 mm x 5000 mm - tolerance +/- 20 mm.

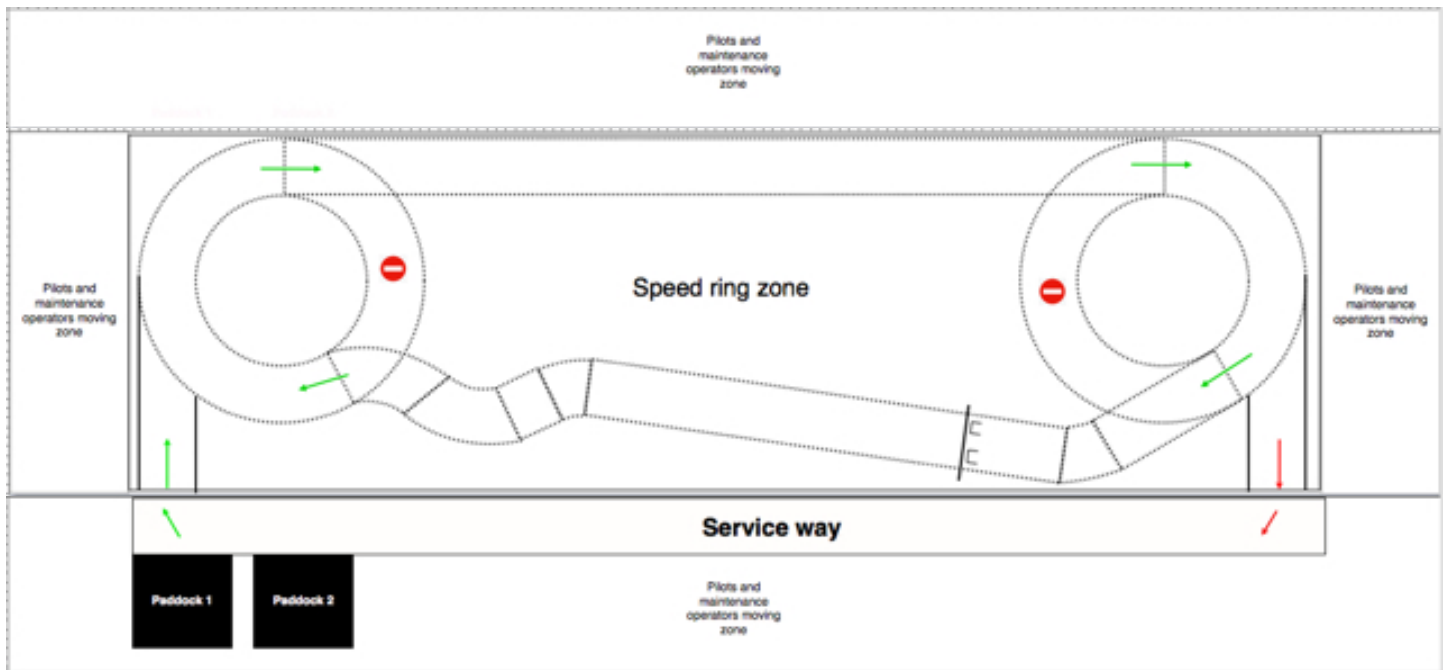
Edge of the speed ring zone: width 5 mm - tolerance +/- 1 mm.

Dotted lines forming the shape of the speed ring: width 10 mm - tolerance +/- 2 mm.

Access: speed ring zone prohibited to any person during free tests and during the operational evaluation:

- to pilots,
- to tests engineers,
- to maintenance operators for intervention ,
- to team members,
- to race commissioners.

ANNEXE 1-2 : CIRCUIT AREA



Dimensions of the circuit area: 2760 mm x 6000 mm - tolerance +/- 20 mm.

Edge of the service, access to and exit from the circuit: width 10 mm - tolerance +/- 2 mm.

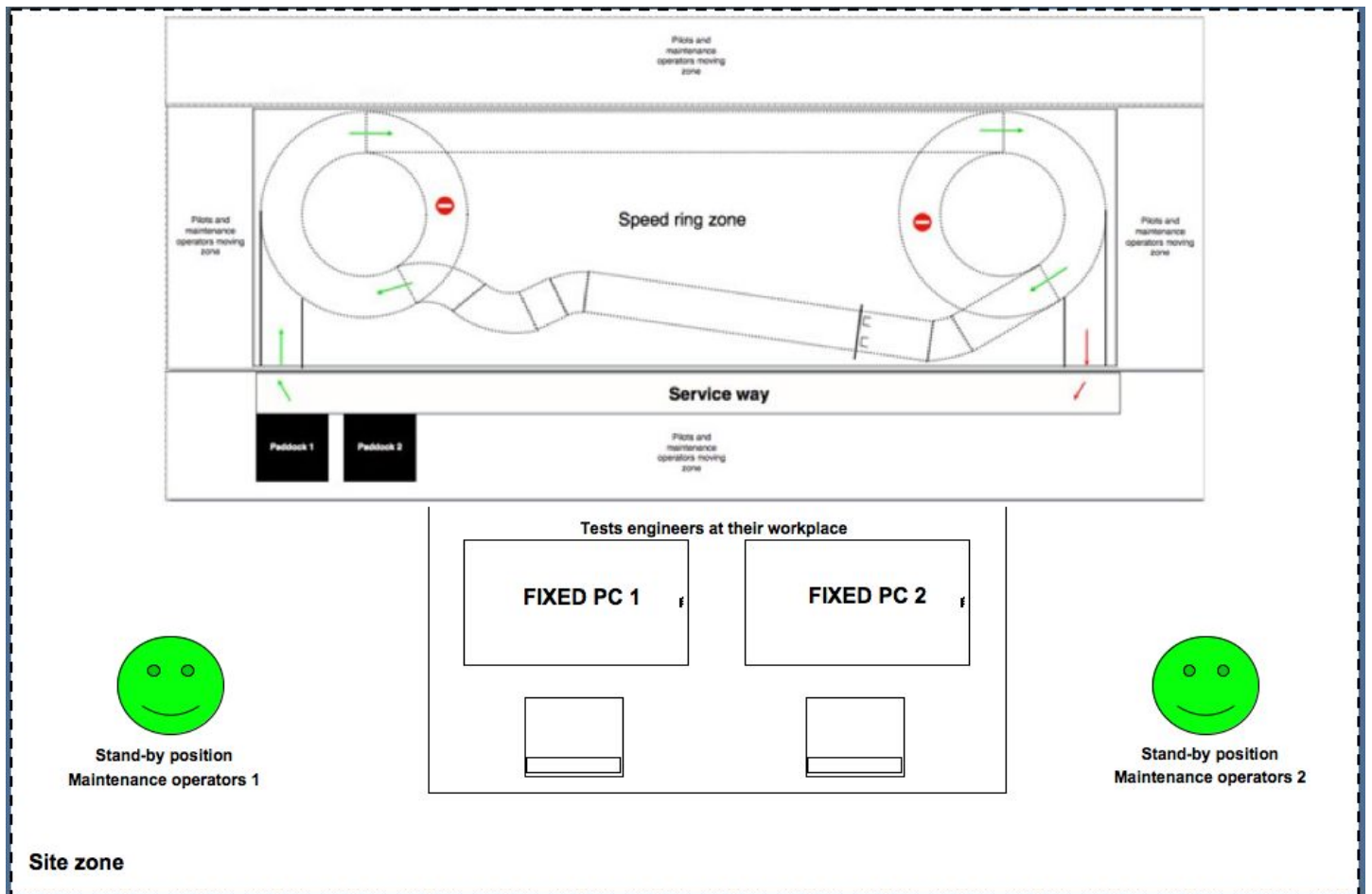
Dimensions of each Paddock: 400 mm x 400 mm - tolerance +/- 10 mm.

Pilot moving zones: width 500 mm - tolerance +/- 10 mm.

Access: circuit area outside the speed ring zone authorized only:

- to pilots,
- to maintenance operators when intervention is authorized,
- to race commissioners.

ANNEXE 1-3 : SITE ZONE



Dimension of tables supporting the **FIXED PC**: height 0,70 m – minimum useful surface: 0,60 m x 0,60 m.

Access: Site zone outside the circuit zone authorized only:

- to pilots,
- to tests engineers located at their workplace in the technical zone,
- to maintenance operators when stand-by,
- to race team members (except during the missions performance),
- to race commissioners.

ANNEXE 2 : KIT DEFINITION

The vehicle uses only components of the kit provided to each team by the organization **ROBAFIS™**.

- PACK LEGO EV3 WITH SOFTWARE LME MONO-STATION AND LOADER including:

- *basic set EV3 Reference 184184*

- *software LME EV3 mono-station Reference 184186*

- *battery charger Reference 184042*

- COMPLEMENT BASE SET EV3 45560

The vehicle will be driven by software that can be developed with the LEGO programming tool, or with any other programming language or application based, for example, on C or Java languages.