



# Engineering And Robotics Learned Young

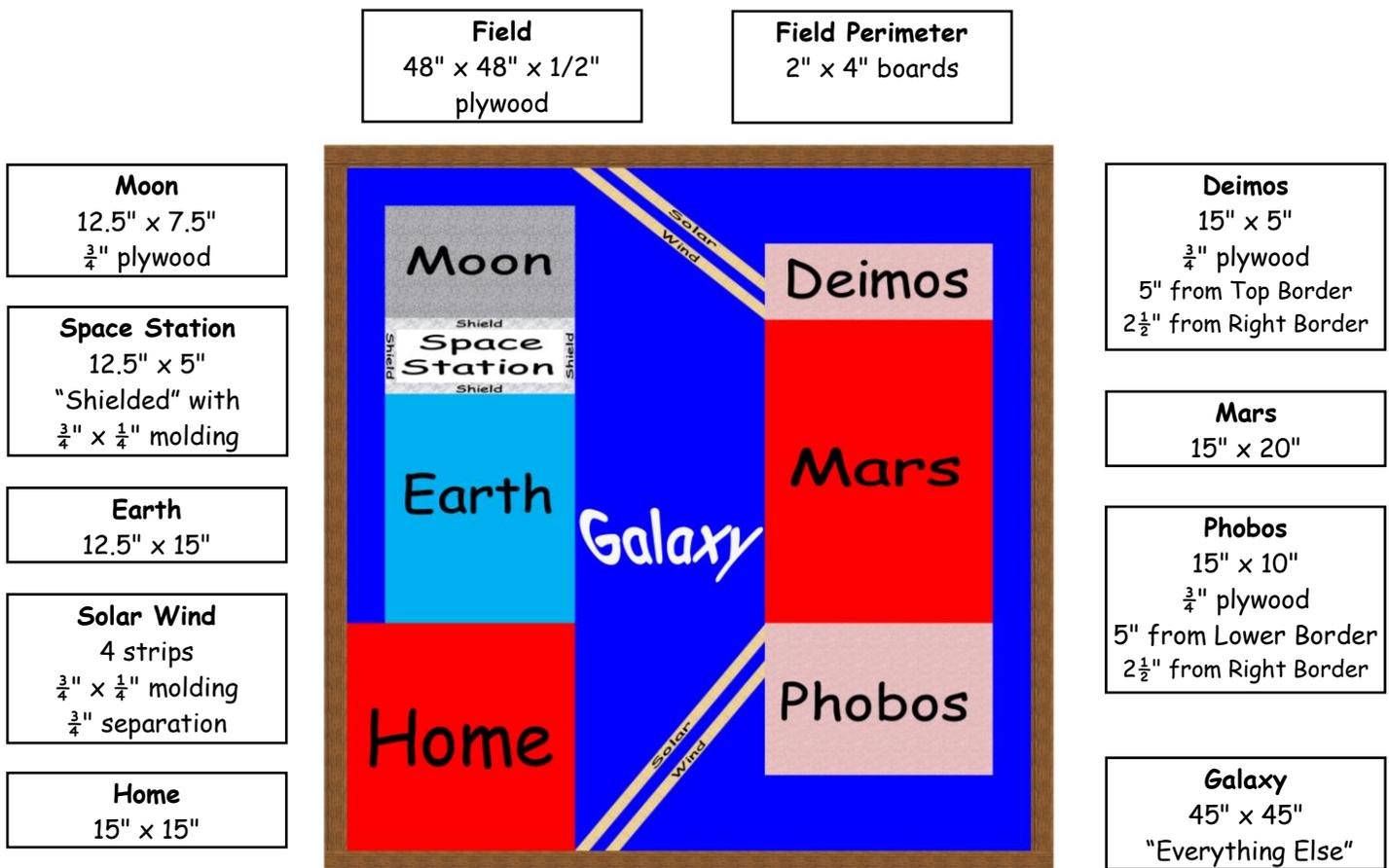
*Engaging Students in Engineering before Stereotypes*

## Galacticville Red Mission Rules

Roboticists, the Global Association of Space Agencies (GASA) needs your help to colonizing Mars! GASA needs your help preparing a suitable atmosphere for humans to live on Mars by building a robot to take Mars Atmosphere Construction Kits (MACKs) to Mars and the moons of Mars, Phobos & Deimos. The MACKs will be used to create an atmosphere so future generations can picnic, bike, hike, and camp on Mars! Please help GASA colonize Mars!

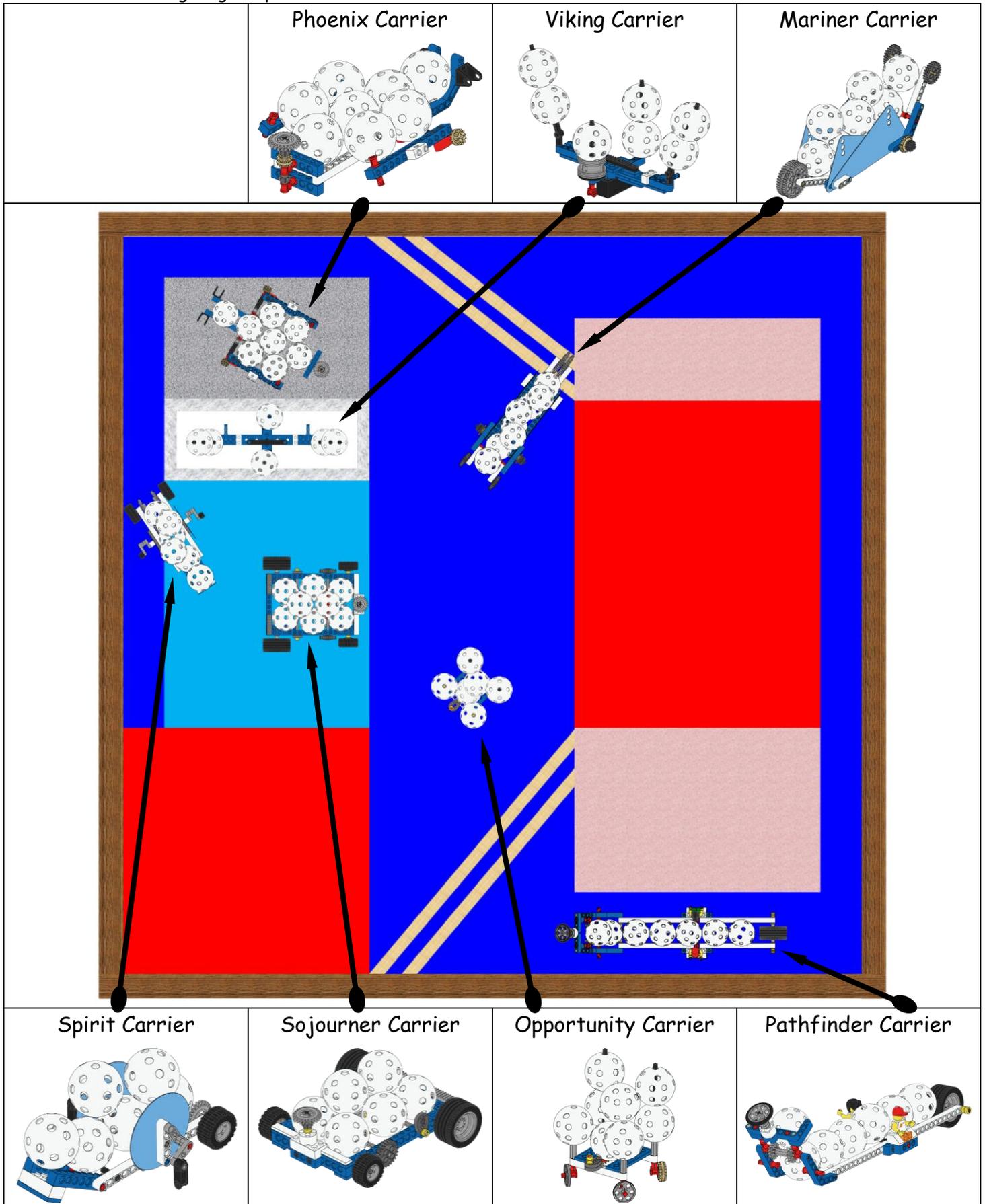
Below is everything that we know about the mission.

- The team must be ready to execute the mission for your EARLY Tournament.
- The equipment available for a team to build a robot is 3 LEGO® Simple & Powered Machines Kits.
- The following diagram presents the environment that will be encountered.



Galacticville

- The following diagram presents where the *MACKs* and *Carriers* will be in Galacticville.



# Mission Rules

1. The team has 2 minutes to complete the mission.
2. There are 52 *Mars Atmosphere Construction Kits (MACKs)* on the mission field at the beginning of each mission. The *MACKs* are represented by practice golf balls. Practice golf ball details are found in the *Mission Object Details* document.
3. There are 7 *MACK Carriers* on the mission field at the beginning of the mission constructed from one LEGO® Simple & Powered Machines kit. Carrier details are in each *Carrier Instruction* document.
4. The team's score is determined at the end of the 2-minute mission.
5. If a *MACK* is moving when time expires, the *MACK*'s scoring position is determined when the *MACK* has come to rest.
6. There are three scoring zones: **MARS**, **PHOBOS**, and **DEIMOS**.
7. The goal of the mission is to place the *MACKs* in the **MARS**, **PHOBOS**, and **DEIMOS** scoring zones.
8. The team scores 2 points for each *MACK* in the **MARS** scoring zone, also referred to as "on **MARS**".
9. The team scores 3 points for each *MACK* in **PHOBOS** scoring zone, also referred to as "on **PHOBOS**".
10. The team scores 4 points for each *MACK* in **DEIMOS** scoring zone, also referred to as "on **DEIMOS**".
11. A perfect score is achieved by having all 52 *MACKs* on **DEIMOS**. Thereby, all 52 *MACKs* are worth 4 points each resulting in a score of  $52 \times 4$ , or 208 points.
12. A *MACK* breaking the plane of a scoring zone is considered in the scoring zone.
13. A *MACK* in multiple zones simultaneously (scoring zone & non-scoring zone, scoring zone & penalty zone, penalty zone & non-scoring zone, etc.) is considered in the zone that results in the greatest points.
14. Only the parts contained in three LEGO® Simple & Powered Machines kits along with nine 20" controller extension wires may be used to construct the robot and attachments (i.e. no other materials such as glue may be used on the robot). The kit parts may not be altered.
15. **HOME** is the 15" x 15" boundary extended vertically.
16. The robot and all attachments must begin completely inside **HOME** at the beginning of the 2-minute mission (i.e. no LEGO parts may be off the playing field when the mission begins). The parts do not have to be assembled together and the parts may be removed from and returned to the field during the 2-minute mission.

17. The team may retrieve their robot without penalty when the robot is partially inside **HOME** by lifting the robot vertically. After retrieving, the robot must be returned to **HOME**. If a **MACK** or **Carrier** remains with the robot when the robot is retrieved without penalty, the a **MACK** or **Carrier** that is now in **HOME** remains in play.
18. If a team touches their robot, including parts that have become separated from the robot, that is completely outside **HOME**, the team is penalized 10 points. The robot must be returned **HOME** to continue the mission and if a **MACK** or **Carrier** remains with the robot when the robot is returned **HOME**, the **MACK** or **Carrier** must be removed from the field.
19. The robot must start completely inside **HOME** every time the robot is returned **HOME** (i.e. after retrieving the robot, no part of the robot may be breaking the **HOME** plane when continuing the mission).
20. The controllers and wires are NOT considered part of the robot.
21. The controller wires may only be used to provide electrical power to robot motors (i.e. the controller wires may not be used to drag or corral a robot, **MACK**, or **Carrier**). If a controller wire is used improperly, the robot must be immediately returned **HOME** to continue the mission and the **MACK** or **Carrier** involved must be removed from the field.
22. The robot shall not have any elastic stored energy when the mission begins or when the robot is returned **HOME**, but elastic stored energy may be created with a motor during the mission (i.e. the robot may not be "wound up" manually).
23. The team may touch a **MACK** or **Carrier** without penalty if the **MACK** or **Carrier** is COMPLETELY inside **HOME**.
24. If a team touches a **MACK** or **Carrier** that is not completely inside **HOME**, the team is penalized 10 points and the **MACK** or **Carrier** must be removed from the field. If a **Carrier** is touched, the **Carrier**, along with any **MACKs** on the **Carrier**, must be removed from the field.
25. A **Carrier** is never considered part of the robot.
26. **MACKs** may only leave **HOME** by using the robot or by "letting go" of a **MACK** or something carrying a **MACK**. For example, a team member may not roll, push, or throw a **MACK** but a team member may put a **MACK** on a properly deployed 'LEGO slide' and "let go" of the **MACK**.
27. Because **MACKs** are very valuable, the team is penalized 10 points for each **MACK** ejected from the field. No penalty shall be assessed for a **MACK** that is removed by rule (e.g. for illegal touching, dragging, etc.).
28. A score of zero is awarded if penalties result in a negative score.

Please contact [Mission.Control@EARLYrobotics.org](mailto:Mission.Control@EARLYrobotics.org) with any questions or comments.

Thank you for maintaining the *Spirit Of The Game!*