**Objectives:**

**Legend for the Pairwise Comparison Chart:**

* 1: indicate the row element is more important
* 0: indicate the row element is less important
* -: indicate the row element and the column element are the same

**Table1: The Pairwise Comparison Table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Time of the refueling period**  **(Speed of Refueling)** | **Able to fill two infantry robots simultaneously (Capability to fill)** | **Able to fill robots with about 50 bullets during each refueling cycle**  **(Accuracy of the distribution)** | **Able to be maintained & carried by two members from the team**  **(Easy to use)** |
| **Time of the refueling period**  **(Speed of Refueling)** | - | 0 | 0 | 0 |
| **Able to fill two infantry robots simultaneously (Capability to fill)** | 1 | - | 0 | 0 |
| **Able to fill robots with about 50 bullets during each refueling cycle**  **(Accuracy of the distribution)** | 1 | 1 | - | 0 |
| **Able to be maintained & carried by two members from the team**  **(Easy to use)** | 1 | 1 | 1 | - |
| **Power Source to last for thirty minutes**  **(Lasting time)** | 1 | 1 | 1 | 1 |
| **Able to detect the docking of infantry robots**  **(Ability to detect)** | 0 | 0 | 0 | 0 |
| **Keep track of the # of bullets in the refueling station** | 1 | 1 | 1 | 1 |
| **A way to avoid the supply station being overfilled** | 1 | 1 | 1 | 1 |
| **The supply station is adjustable (in terms of heights)** | 1 | 1 | 1 | 1 |
| **Total Score** | 7 | 6 | 5 | 4 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Power Source to last for thirty minutes**  **(Lasting time)** | **Able to detect the docking of infantry robots**  **(Ability to detect)** | **Keep track of the # of bullets in the refueling station** | **A way to avoid the supply station being overfilled** | **The supply station is adjustable (in terms of heights)** |
| **Time of the refueling period**  **(Speed of Refueling)** | 0 | 1 | 0 | 0 | 0 |
| **Able to fill two infantry robots simultaneously (Capability to fill)** | 0 | 1 | 0 | 0 | 0 |
| **Able to fill robots with about 50 bullets during each refueling cycle**  **(Accuracy of the distribution)** | 0 | 1 | 0 | 0 | 0 |
| **Able to be maintained & carried by two members from the team**  **(Easy to use)** | 0 | 1 | 0 | 0 | 0 |
| **Power Source to last for thirty minutes**  **(Lasting time)** | - | 1 | 0 | 0 | 0 |
| **Able to detect the docking of infantry robots**  **(Ability to detect)** | 0 | - | 0 | 0 | 0 |
| **Keep track of the # of bullets in the refueling station** | 1 | 1 | - | 1 | 1 |
| **A way to avoid the supply station being overfilled** | 1 | 1 | 0 | - | 1 |
| **The supply station is adjustable (in terms of heights)** | 1 | 1 | 0 | 0 | - |
| **Total Score** | 3 | 8 | 0 | 1 | 2 |

Please note that the bullets that the supply station carries are plastic(TPE90) bullets that are 17mm (-3% - 0%) in diameter and weigh 2.6g(. The level of importance of an objective is based on the total score that each goal is obtained from the pairwise comparison table. Based from the analysis by the pairwise comparison table, the ability to detect the docking of the infantry robots has the highest score of 8 and therefore is the most critical objective. While the goal of keeping track to the number of bullets in the refueling station has the lowest score of 0 and is the least critical objective. This analysis is logically correct because the supply station will not be able to distribute bullets if it will not be able to detect the docking of an infantry robots. This will cause the whole project to be a failure. From the pairwise comparison table, the speed to refuel the infantry robots with bullets and the efficiency to fill bullets to the infantry robots are also two critical objectives that need to be optimized. During the meeting with the Robomaster representative, the client emphasized a lot on the speed to refuel bullets to the infantry station and the ability to refuel two infantry stations simultaneously. Therefore, the design of the supply station needs to optimize the speed of refuel, to be able to dock, and to refuel two infantry robots simultaneously.