

## Game Design Challenge Finalist Team 2415

**Team Name:** WiredCats

**Location:** Atlanta, Georgia USA

**Game Name:** Linked Together

### Game Overview:

This Game Overview elaborates on our 2-minute submitted video, as such there will be overlap and you may find the video helpful to visualize the following written content.

In our game, LINKED TOGETHER, two alliances of mountaineers are stranded atop FIRST mountain because fog lower on the mountain cut radio contact with ground camp. Faced with the hazard of an impending blizzard, alliances must collect and arrange flares to signal for a heli-rescue. Once linked up with base camp, robots retrieve their camping gear and climb the mountain to the safety of an awaiting helicopter.

FLARES are 8 inch (inner) diameter, 10 inch tall, hollow PVC tubes that are available in either NEUTRAL DEPOTS or ALLIANCE DEPOTS and are scored on alliance-specific low, medium, and high COMMUNICATION ARRAY POLES for 3 points each.

Robots start each match at the base of their MOUNTAIN and may be preloaded up to their maximum capacity of two FLARES. If a team chooses to not accept their preload flares, those flares are started in the ALLIANCE DEPOT. The middle NEUTRAL DEPOTS divide the field during autonomous, but once gameplay begins and FLARES are removed to be scored, the middle of the field will become easier to traverse.

In an attempt to be more predictable to veteran tournament staff, LINKED TOGETHER contains 2:30 of robot play, the first 15 seconds of which constitute the BLIZZARD period. During the BLIZZARD, driver vision of the field is blocked by a snowstorm, so robots must be controlled using either autonomous code, or manually using a vision system on the robot. Alliances can earn one of the three available ranking points for exiting their SUMMIT BASE, and receive a two-point bonus when scoring FLARES.

After game elements have come to rest and been scored, drivers control their robots for 2:15 seconds of teleoperated time, continuing to place flares on their communication arrays and exchanging flares for their alliance's CAMPING GEAR. These 30" diameter, Alliance-colored yoga balls are stored in human player stations at opposite corners of the field; Once 6 flares have been scored into a COLLECTING STATION, that human player throws their CAMPING GEAR over their station wall and onto the field, where it will be scored based on its final resting place. If the CAMPING GEAR is in the air when the match ends—either from the initial throw or a bounce—it is scored once it comes to rest. An alliance that ends with both their camping gear on the field earns a ranking point.

In the last 30 seconds of the match, robots race to summit the MOUNTAIN and escape to the safety of an awaiting helicopter! If all three robots successfully climb, the alliance earns a ranking point. Once all game objects have come to rest, the field is scored, and the alliance that earns the most points, wins the match!

### Describe Notable Field Elements:

The single most influential field element—the MOUNTAIN centerpiece—creates a unique and visually climactic endgame that ties strongly to the theme. The SUMMIT BASE parking platform acts as the starting and possible ending location for robots, and provides a 3" buffer to avoid ground damage from robots that fall off the endgame climb. The central location of the MOUNTAIN and two NEUTRAL



DEPOTS creates an initial barrier between both sides that becomes more easily traversable as alliances remove FLARES for scoring.

Present in the initial concept for LINKED TOGETHER, the COMMUNICATION ARRAY POLES come in three heights: 24, 44, and 64 inches that can hold 2, 4, and 6 flares, respectively. By having a scoring mechanism where game objects are placed around the goal, instead of inside it, the audience is better able to track the progress of the match. Since the poles' 4" diameter allows teams only 4" of lateral tolerance when scoring flares, the tops of all the poles are beveled in a semicircular cross-section. Robots can physically align using the poles' raised 4" tall bases or can align using vision, as each pole's base is encircled by a strip of retroreflective tape. Since we expect teams to drop flares from the top of poles, the raised bases of the 4-capacity and 6-capacity poles are filled with insulating foam to dampen the impact's sound.

Each of the alliance's two CAMPING GEAR function similar to Infinite Recharge's Control Panel: they are unlocked by scoring the main game objects, are easy to manipulate, and every robot does not have to manipulate them to be successful. Robots may not intake their opponents CAMPING GEAR.

### **What are robots expected to do?**

While LINKED TOGETHER is largely a pick-and-place game, we have introduced game objectives and constraints that inspire a variety of successful robot designs, instead of only rewarding elevator robots:

- 1) The Flares require one degree of reorientation to be scored on Communication Arrays
- 2) Robots have an increased maximum capacity of two Flares
- 3) Near half of all scoring opportunities require no more than 12" of vertical expansion: Robots must start within a 34" by 36" by 48" box and can extend no more than 12" horizontally out.
- 4) Short robots will find climbing the Mountain easier

If a robot was designed to accomplish every game objective, it must do the following:

- 1) Intake, reorient, raise, and dispatch Flares at four discrete pole heights
- 2) Place flares in both human players' Collecting Stations
- 3) Intake the Camping Gear to hold it while climbed
- 4) Climb the Mountain
- 5) Avoid defense and cross the NEUTRAL DEPOTS
- 6) Score during the BLIZZARD

However, we must also consider objectives teams are likely to pursue for strategic benefit. These self-imposed objectives further complicate their design processes:

- 1) Carry 2 Flares at once to reduce the number of necessary cycles
- 2) Intake Flares at either of their two main orientations
- 3) Have a highly maneuverable drivebase that can also provide power to climb
- 4) Design a short robot to reduce the risk of tipping
- 5) Be able to directly catch Camping Gear when thrown on the field
- 6) Climb holding other robots or multiple camping gear

With one of the hardest aspects of LINKED TOGETHER being Flare reorientation, rookie robots also have the option to push flares over a small bump into the either COLLECTING STATION, wherein the human player can use the UPPER PORT to return flares in a vertical orientation.

**Did you use the Game Design Challenge Element in your concept?**

Yes

**If yes, how?**

The game title, LINKED TOGETHER, plays off the concept of links in a chain and is carefully crafted to simultaneously fit our mountainous theme while embodying unity. Come 2022, teams will have battled the pandemic for two years, so we wanted our game title to highlight the spirits of perseverance and coopertition that make FIRST robotics so great.

Regarding the game itself, robots use a 5' dangling length of chain to summit the 37.5-degree steep mountain (77% grade). We chose this angle of ascent to ensure the mountain is safe for field crew and teams when unloading robots, as this is the typical angle of ascent for a staircase. Additionally, teams that design extremely short robots may not need to use the chain which provides an advantage to flat-bot rookie teams and additional design constraints for top-level competitors. This relatively shallow angle also ensures that the few teams who triple climb on a single chain are only loading the chain at under half its maximum load capacity (analyzed for the 2/0 trade, Straight Link Coil Chain).

The chain also keeps the outer two robots safely away from the edge of the mountain when climbing. Since we expect some robots to climb the chain using a winch, the top link of the chain is connected via a carabiner; this provides teams and field crew with the option to speed up field reset by having teams take the chain off the field with the robot and unwind it from their winch, then return it to the field crew at a later point.