'Snow Problem Tournament Strategy for DESTINATION: DEEP SPACE

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Abstract—This white paper aims to highlight some of the decisions and ideas which shape an effective team strategy. This strategy includes our ideal robot movement, game plan, and place in a playoff alliance.

1 INTRODUCTION

An effective team strategy can take a middle-of-the-pack robot and make it into a competitor, or take a good robot and make it into a champion. Within our own time in FRC, we have gained valuable experience in both making a robot strategy and effectively pitching your team to another team. With our robot close to completion, we decided that it would be helpful for teams to get an idea of how an effective, team specific strategy is formed and how that strategy is pitched and changed come playoffs.

2 OUR ROBOT

In the final hours of our build, our robot has taken shape and we have begun thinking about its place on the field. The key features of our robot which influenced our strategy are our speed, our ability to pick up from the ground, our short time of cycle, and our low center of gravity. A design pitfall which also influenced our game strategy was our inability to climb.

3 POTENTIAL STRATEGIES

Within this section we will outline some on-field game plans which we created for potential scenarios



Fig. 1. Our Potential Sandstorm Plans

3.1 The Ideal Game Plan

Our Ideal Game Plan consists of an ALLIANCE with two robots that can complete a ROCKET on their own while we focus on filling the CARGO SHIP on our own. This allows for each ROBOT to have their own task throughout the MATCH and converge on the HAB PLATFORM in the endgame period.

3.1.1 SANDSTORM

In our ideal SANDSTORM run, we start on the level two HAB PLATFORM with a HATCH PANEL loaded on our robot and a CARGO placed in the closest BAY on the CARGO SHIP. Our robot will deliver the CARGO to the corresponding CARGO SHIP HATCH. In an ideal SAND-STORM RUN, we will be fast enough to make a second trip back to the LOADING STATION to pick up an additional HATCH PANEL or CARGO to help our ALLIANCE fill another BAY.

3.1.2 Tele-op

In our ideal tele-op period, our robot focuses on filling up the BAYS in the CARGO SHIP with HATCH PANELS and CARGO. We stay focused on filling up as many BAYS as possible and maximize our time by avoiding defense.



Fig. 2. Our average game plan for Tele-op

3.1.3 Endgame

We will begin the endgame period by continuing with our tele-op strategy and playing defense if we have enough time. We will break off with enough time to climb up onto the third level of the HAB PLATFORM based on the time it takes for us to climb.

3.2 The Average Game

Our average game plan is based around the most likely situation to be encountered in qualification matches.



Fig. 3. Our projected plan for Endgame

3.2.1 SANDSTORM

In an average SANDSTORM run, we start on either the level one or two HAB PLATFORM with a HATCH PANEL loaded on our robot and a CARGO placed in the closest BAY on the CARGO SHIP. Our robot will deliver the CARGO to the corresponding CARGO SHIP HATCH.

3.2.2 Tele-op

In an average tele-op period, our robot focuses on filling up the BAYS in the CARGO SHIP with HATCH PANELS and CARGO. If our alliance partners cannot do the ROCKET by themselves, then we will complete the first level of BAYS for each ROCKET to help our alliance partners.

3.2.3 Endgame

An average endgame period will begin by continuing with our tele-op strategy and playing defense if we have enough time. We will break off with enough time to climb up onto the third level of the HAB PLATFORM based on the time it takes for us to climb.

3.3 Worst Case Scenario

In the worst case scenario we are the only robot on the field or our alliance partners disconnect in inopportune places. In this scenario the only thing we can do is try to maximize the points the amount of points we can get.

3.3.1 SANDSTORM

During the SANDSTORM PERIOD if we are by ourselves we would want 1-2 NULL HATCH PANELS on the field. As we are unable to place HATCHES on all 3 spots where the CARGO it would be pointless to fill all three bays with HATCH PANELS.

3.3.2 Tele-op

In this period all we will try to do is fill as many bays of the CARGO HOLD as possible as it is far easier and requires less precision to fill compared to the ROCKET. However, with fantastic driving the distance to the ROCKET is less and could be filled faster than the CARGO HOLD

3.3.3 End Game

As with our other end game plans we will try to make it to the level 3 platform. It will be far quicker and worth more points than any of the other objects even if we will not get the ranking points.

4 PITCHING THE TEAM

When pitching your team to another team in preparation for alliance selections, it is important to make your robot effectiveness known, but also to show you are thinking about strategy. Research the teams you are talking to know what they are looking for in a robot. Not every alliance captain will need the same partners. Showing that you are flexible with strategy is also very important when talking with an alliance captain; pride and stubbornness have no place in the playoffs, let alone on a winning alliance. Showing an alliance that you can contribute with your robot, and with good strategy can greatly improve your chances of being picked.

5 ANALYSIS OF GAME COMPONENTS

Going into a tournament it is important to consider one's strategy for the game and to be able to adapt when matches are not going as planned. In this section we will talk about the changes made this year for DESTINATION: DEEP SPACE and the advantages and disadvantages.

5.1 SANDSTORM

Autonomous is gone! This is what we have heard repeated on forums and even at the kickoff event. Teams now have the choice between driving using only the sensors on their robot or running autonomous mode. While many have already dismissed autonomous as a strategy we believe teams should reconsider autonomous as a viable option.

5.1.1 Sensor Drive

Using a camera teams will be able to see the field and have full control of their robot. This is an exciting change to the game as it allows for teams to be able to start their gameplan immediately. Another advantage this offers is being able to start in any position instead of having to make multiple autonomous modes for each side and every position. This is great for teams that do not have greatly experienced programming teams. It allows every team to move the moment the game starts instead of having teams even if it is just moving forward.

Disadvantages of driving using the camera only is quite simply that is very difficult. Teams should practice often while only using the camera to be able to make sure they can line up during the SANDSTORM. Especially if times are using tank drive or other drives without strafe abilities lining up a HATCH PANEL may be a great challenge. Another disadvantage is that we are human. We do not have extremely precise reactions or know exactly the angle they will need to drive to optimize their route.

Overall, we believe it will be great option for many teams but remember to practice often.

5.1.2 Autonomous

The advantage of autonomous is simply precision. A robot will do exactly as it's told. Knowing exactly where the robot will be at the end of the SANDSTORM PERIOD is a huge boost. If driving off the HAB is dangerous code can set it up to do always be safe.

The disadvantage is that it is quite difficult to program a reliable autonomous. It requires experience and accurate sensors to be able to justify making an autonomous mode for this game

5.1.3 What We Recommend

As teams resources and experience varies we recommend using a mix of autonomous and driving. Reliable autonomous modes are far more efficient than drivers. We would love to see teams that use autonomous that accurately places HATCH PANELS with the press of a button. We believe that teams with better autonomous programming should use it more often but always be ready to drive manually if needed.

5.2 Defense

Rules teams should know before playing defense: ALL OF THEM. We cannot stress enough that teams who play defense should have a great understanding of the rules as many of the harsher penalties comes from robot to robot interaction as well as messing with opponents scoring areas.

5.2.1 Differences from previous years

One of the differences from last year is there is no safe place to score game pieces this year. If a team is trying to complete a ROCKET or just trying to fill the CARGO HOLD they are susceptible to pinning and pushing. Another difference is only one defender is allowed on the other side of the field. Even if this is a change in previous games there was never much reason to have more than one defender as it took away too much of the alliances scoring power. Another change is that robots are not allowed to extend outside the frame perimeter when playing defense. Again, this will not change defense much outside making robot to robot interaction safer. However, robots can still extend vertically which teams could potentially use to block the third level of the ROCKET.

5.2.2 Effective Defense

Playing effective defense can be done in this game even if the rules have changed a bit. This year with the field being split and their being open space many teams will consider using mecanum or omni wheels. While these will be great wheels for the game challenge it is very easy to push around these robots. When playing defense teams need to know how their opponents deliver game elements as well as the paths they like to take. If they are predictable, defensive robots can arrive before the team and block access or push them away. Tips for pushing any team is trying to push their corners as it will rotate their robot disorienting them. If a team has trouble lining up then make it even more difficult for them by pushing them in ways that will cause them to need to readjust. However, make sure to not get penalties for pinning as usually 2-3 seconds can really disrupt a team. Finally this year teams can block any of the BAYS or LOADING STATIONS. This means if a team is close to completing a ROCKET a defender can stop them by blocking them (AS LONG AS IT IS BEFORE THE

LAST 20 SECONDS PER G16). You can effective block one LOADING STATION or side of the ROCKET as getting a robot out of the corner is very difficult. While the opposing alliance will be able to still be able to use the other half of their field it can really disrupt teams if they leave their usual pattern. Finally for every team thinking about playing defense: leave the opponents zone before end game to avoid penalties. Watching great defensive teams, they try to leave the opponent's area just as the time is reaching end game. Especially since teams can give their opponent 2 ranking points in penalties if they drive poorly.

5.3 CARGO SHIP Prepopulation

There is has been many discussions on whether teams should load CARGO or NULL HATCH PANELS in the bays before matches and we thought we could share our thoughts on the subject.

5.3.1 CARGO

CARGO is worth points at the end of the game if the alliances decide to load them in at the beginning of the game. The disadvantage to this is that they roll out at the end of the SANDSTORM PERIOD making it risky. Since the CARGO requires teams to place HATCH PANELS on the CARGO HOLD before the SANDSTORM PERIOD is over only teams who feel confident in their ability to deliver the HATCH PANELS quickly should choose CARGO.

5.3.2 NULL HATCH PANELS

Should a team decide to place NULL HATCH PANELS on the bays a team will have the ability to immediately start to score CARGO which will be more points that HATCH PANELS and most likely be easier to score. This might lead to 2-3 more cycles for a team which may not seem like much but could have an increase of 4-9 points which could decide the match this year. Note that the NULL HATCH PANELS are excluded from scoring making them ineligible for using them to get the ranking point for completing the ROCKET.

5.3.3 What to Do

Teams should focus on their strengths. If they are able to score CARGO quicker than the NULL HATCH PANELS are worth it. However, starting with the CARGO is worth more points in the end if a team is able to place the HATCH PANEL on first. If teams successfully place the HATCH PANELS on first they are receiving a free 3 points from the CARGO. We believe as competition develops that starting with CARGO will be more common but both are viable strategies depending on your robot.

6 CONTACTING THE AUTHORS

Team 'Snow Problem may be reached in order to ask questions on our Twitter (@SnowProblemz), or via our Twitch stream during the three day build. After the build, we will still be answering questions on the thread and via email (at gofirst@umn.edu). We are doing this for you, the FRC community, and are happy to answer questions and discuss our designs with you.