# 4607 STRATEGY REQUIREMENTS

**2019 Deep Space Season Goal:**

* Win the Northern Lights Regional and improve throughout the season to be competitive at the World Championship

**Overall Strategic Objectives:**

* Finish 1 Rocket alone in Teleop to acquire Ranking Point
	+ 6 Hatch cycles
	+ 6 Cargo Pod cycles
* Deliver Hatch Panel to top level of Rocket during Sandstorm
	+ Stretch Goal: Return to Human Player Loading Station and retrieve another Hatch Panel during the Sandstorm
* Consistently Acquire the Hab Zone (End Game) Ranking Point
	+ Accomplished by scoring 15 points during the end game
	+ Can be done by actively enabling a teammate to get on the 3rd Level of the Platform or by getting to the 3rd Level on our own

**Drivetrain requirements:**

* Drive anywhere on the field without getting stuck (¾” hump, Platform LVL 1, etc.)
* Have precision when scoring the Cargo Pod and placing the Hatch Panel
* The ability to climb/ lift ourselves or an alliance partner to the 3rd LVL platform
	+ Not necessarily a drivetrain function, mechanism could be used instead
* Fast enough to be capable of running 12 cycles from the Loading Bay to the Rocket

**Game Piece Acquisition (Intake) Requirements:**

* Touch it, Own it, Hold it (the Cargo Pod and Hatch Panel)
* Accurately discharge the Cargo Pod at least 18” out of the intake device
* Acquire both game pieces from floor and Loading Bay
* Propel the Hatch Panel less than 2 feet out of our robot
	+ This is a robot rule
* (Want) Intake Hatch Panels and Cargo Pods fully within frame perimeter
	+ Allows us to steal game pieces from the other side of the field
* (Want) Full width Cargo Pod intake to maximize margin for error
	+ Generally full width over-the-bumper intakes were the most effective in 2016

**Game Scoring Objectives:**

* Finish the Rocket solo with enough time to end on LVL 3
	+ Earn ranking point when Rocket is complete

**End Game Obj.**

* Consistently earn 15 points during end game to gain the ranking point
	+ Can be accomplished by getting to Level 3 ourselves or by actively placing an alliance partner on Level 3
		- Actively placing is defined as being capable of placing a dead alliance partner on top of Level 3

**Robot Archetypes**

Here are all the different types of robots we expect to see broken down by cycling capabilities. End game capabilities are mostly irrelevant for our teleop strategic breakdown. Within each robot archetype there will be varying degrees of proficiency which is covered by the range of expectations in the descriptions.

* Low Hatch Panel Specialist
	+ Robot that only scores first level Hatch Panels
	+ We expect this to be the most common specialist we play with
	+ Expectations
		- 2 Hatch Panels on the Low end of the spectrum, 12 Hatch Panels on the elite end of the spectrum with an estimated average of 4 Hatch Panels
* Low Cargo Pod Specialist
	+ Robot that only scores first level Cargo Pods
	+ We expect this to be a rare robot since Hatch Panels must be scored first in order for Cargo to be scored
		- This robot doesn’t make a lot of sense to build
	+ Expectations
		- 2 Cargo Pods on the Low end of the spectrum, 12 Cargo Pods on the elite end of the spectrum with an estimated average of 4 Cargo Pods
* Low Versatile Bot
	+ Robot that scores both Hatch Panels and Cargo Pods on the first level
	+ This is the ultimate 3rd robot design - Think ‘Snow Problem’s Ri3D robot
	+ Expectations
		- 2 Game Pieces on the Low end of the spectrum, 12 Game Pieces on the elite end of the spectrum with an estimated average of 4 Game Pieces
* Mid Hatch Panel Specialist, and Mid Cargo Pod Specialist, Mid Versatile Bot
	+ “Mid” level robots are capable of scoring in all of the 1st level Cargo Bays as well as the 2nd level Cargo Bays on the Rocket
	+ We don’t think this really gives teams a huge advantage over “Low” teams since it only opens up 4 Cargo Bays/8 scoring opportunities
		- It is unlikely, in a majority of matches, that all 24 1st level Cargo Bays are filled
		- We are expecting most “Mid” tier teams to be teams that attempted to score high but ran into difficulties that limited their capabilities
	+ Essentially this all boils down to: if you’re already putting engineering time and effort into a lift, why not lift all the way to the top and unlock the ability to earn a Rocket RP
		- The exception to this rule is robots that shoot the Cargo Pods to the 2nd/3rd level with no lift - there are probably teams that do this effectively, but with how bouncy the Cargo Pods are, we are skeptical of what kind of success shooters will have
* Elite Hatch Panel Specialist, Elite Cargo Pod Specialist, Elite Versatile Bot
	+ Non-versatile “Elite” robots (meaning they can score at any level) will be somewhat rare
		- Elite Cargo Pod Specialists will likely come in the form of shooter bots, which we are skeptical of
		- Elite Hatch Panel Specialists will be more common and extremely valuable partners
	+ Elite, Versatile Robots are the only style of Robot that is capable of soloing a Rocket RP which is why we expect it to be the dominant archetype among elite level teams
		- On the flip side, this archetype will also be the most pursued style of robot among all teams, even though most would be better served by specializing

Being that 4607 is attempting to be an Elite Versatile Robot (yeah, yeah, I know I’m not listening to my own advice), we can develop strategies around theoretical alliances with and against our defined robot archetypes above. Rather than set up a table of all possible alliance combinations however, we think it makes sense to develop general strategies that are chosen based on pre-match expected outcome.

Everybody is essentially just cycling. Your optimal places to cycle will largely depend on your field of view (which is determined by what driver station you’re in), and the sensors on your robot that assist your field of view/ability to score with an obstructed field of view. In theory, everybody will be able to score low to some degree. So where you score is entirely a function of maximizing everybody’s visibility, and of whether you’re going for the Rocket RP or not. How to handle the latter is outlined below.

**How to Handle the Rocket Ranking Point (RRP)**

Your RRP strategy should be a function of the summation of your alliance’s cycling output compared to the expected summation of the opposing alliances cycling output, with the objective of maximizing your ranking points for each match. In general, end game scores are assumed to be similar between both alliances, but it should be factored in if there is a large end game advantage on either side. Ultimately there are five different situations you will face:

* Your alliance is **significantly faster** at cycling than your opponent
	+ If you have a strong advantage, you should prioritize getting the Rocket RP (RRP), even if it is defended
		- The idea is that even though they’re defending the RP, you’re still going to win even if they’re slowing you down
* Your alliance is **slightly faster** at cycling than your opponent
	+ If you have a small advantage, you need to prioritize winning until it is assured, at which point you can try to finish the RRP
		- Smart opponents will defend your Rocket as you get close to finishing it - you must not go for the bait (“Baiting the Rocket” strategy described later on) and continue fighting through defense to try to finish the Rocket
		- If your Rocket is being defended, go to another scoring objective
			* This forces the opposing alliance to waste a bunch of time as one of their robots is defending nothing
		- When the opposing alliance either gives up defending nothing, or falls way behind you due to wasted time, go back to loading your Rocket to go for the RRP
* Both alliances are **evenly matched** at cycling
	+ If both alliances are evenly matched, your top priority needs to be winning, rather than getting the RRP (2 Ranking Points is bigger than 1)
	+ In this scenario, you’re fine to try for the RRP if the opponent chooses not to defend you (and going high doesn’t slow you down too much)
		- If going high slows you down significantly, stay low, go for the win and forgo the RRP
		- If the opponent chooses to defend at all, you should avoid their defense completely and focus on maximizing cycle points at any scoring location
* Your alliance is **slightly slower** at cycling than your opponent
	+ When you are at a cycling disadvantage, you need to do something to interfere with the opponent to make up the difference (assuming you don’t have a large end game advantage)
		- The most effective form of defense (assuming your opponent is going for their RRP) is to “Bait the Rocket” and let the opposing alliance get close to finishing their Rocket, only to start heavily defending their Rocket late in the match
			* They will have strong incentive to continue going after the RRP which gives you the opportunity to out cycle them if they take the bait, and are slowed down by your alliances defense
			* In general, you want to send your weakest cycler to defend so that your best cyclers can attempt to make up the difference
			* This strategy can backfire if the opponent doesn’t take the bait - leaving your defensive robot to waste a bunch of time defending nothing, however, you were expected to lose anyways so it’s always worth trying
* Your alliance is **significantly slower** at cycling than your opponent
	+ If you are expecting to lose, and no amount of defense can get you back in the game, your best option is to ignore trying to win, and go for the RRP
		- You always want to maximize your Ranking Points, in this scenario, 1 Ranking Point is better than 0
	+ All three alliance members should focus all their effort on a single Rocket until it’s complete
		- If no alliance member is capable of scoring on the high Cargo Bays on the Rocket, this strategy doesn’t work
	+ Additionally, once the RRP is earned, if it’s possible for the alliance to earn the end game RP, the alliance should give themselves additional time to get on whatever Platform Level they are capable of
		- You should continue cycling until you feel like you’re at the point where you may need more time to climb (for scouting purposes)
			* People are scouting how many cycles you do, and quitting cycling early can hurt your numbers - so if you can only get to Platform Level 1, cycle until late in the match

**How to most Effectively Play Defense**

Characteristics of the ideal Defensive Robot:

* Capable of intaking Cargo Pods and Hatch Panels from the opposite side of the field
	+ Must do so from inside the frame perimeter
* Strong drivetrain with smart driving

**Defending the Loading Bay**

Remember that robots must be fully in their HAB in order for you to incur a penalty from touching them. The HAB is around 7 feet long and the opponent would need to push you deep into their HAB in order for you to incur a 3 point common foul. Defending the Loading Bay is certainly plausible for a smart team with a strong drivetrain, but you’re at a visibility disadvantage and you’re also in a penalty-prone situation. I would argue defending the loading zone is the 2nd or 3rd best place on the field to defend.

**Defending the Cargo Ship**

Arguably a better place to defend is around the Cargo Ship. The tolerances for scoring are very tight for Hatch Panels on the Cargo Ship which are necessary for Cargo Pods to score. These tight tolerances will cause teams to miss, and drop, Hatch Panels. The number of drops will increase when defense is introduced. Defending around the Cargo Ship opens up many opportunities to slow your opponent down while also creating short cycle times for yourself if you’re capable of stealing Cargo Pods/Hatch Disks.

**Bait the Rocket Strategy**

My favorite place to defend is the Rocket… but only if you’re smart about it. Baiting the Rocket is a strategy that involves allowing your opponents to fill the Rocket undefended up to a certain threshold (which will depend on the skill of your opponents) at which point you send a defender to lock it down. The opposing alliance has a massive incentive to fight through your defense (and waste time) to go for their full Rocket rather than go to an undefended Cargo Ship or the other Rocket. The Ranking Point is your bait, and if the opposing alliance goes for your bait, you’re giving your alliance a chance to make up ground, or build a lead. If they don’t take the bait, you’ll have a harder time winning the match playing 2 vs 3. It’s a risk reward strategy, but you have to know when to use it, and how to avoid being tricked by it.

**How Things Change in the Playoffs**

* Ranking Points don’t matter = Scoring High doesn’t matter
	+ At least until all the 1st level Scoring objectives are either full or defended
* Baiting the Rocket does nothing for you as there is no incentive to finish the Rocket
* The most valuable place to defend becomes the Cargo Ship or Loading Bay
	+ Hard to say which at this point but I’m leaning towards the Cargo Ship if you’re capable of stealing Hatch Panels or Cargo Pods
* The fastest cyclers, regardless of ability to score high, become the most valuable
	+ If there is a Low Hatch Panel Specialist capable of doing 12 cycles compared to a Elite Versatile Robot that is only capable of 8 similar cycles, the Low Robot will be more valuable in the Playoffs
		- The value of going high isn’t zero… but it is significantly devalued (especially at early and low level events) - the most value comes from versatility in that it’s harder to defend a robot that has more scoring options
* While cycles are the leading sort for most pick lists, end game ability is the next most important factor
	+ End game capabilities can essentially be added to the number of cycles a team can do to roughly determine their value in the playoffs (of course other factors like how they handle defense and things like that will also be important)
		- A level 1 end game is essentially equal to 1.5 cycles
			* But really it’s worthless since everybody who will play in the Playoffs will be capable of it
		- A level 2 end game adds 1.5 cycles of value vs a level 1 end game robot
		- A level 3 end game adds 6 cycles of value vs a level 1 end game robot and 4 cycles to a level 2 end game robot

**End Game Ideas/Strategies**

* The end game Ranking Point should be the primary objective for all end game strategies
	+ You need 15 points
		- The easiest way to get there for an elite team is to either get 12 points from Level 3 themselves and trust an alliance partner to get 3 points from Level 1 or to actively lift/place an alliance partner on Level 3 and get 3+ Points from Level 1+ themselves
		- The other way to get the End Game RP is for two robots to get to Level 2 and the third to score on Level 1
	+ The points earned during the end game seem to be more efficient (more points per time) than cycling, so scoring on the Platform during the end game is likely a better option for closing a deficit than cycling
* After the End Game RP has either been secured (or deemed impossible due to alliance structure) the next most important end game objective should be securing the RRP
	+ Assuming the RRP isn’t already secured, you have the entire end game, undefended, to fill the remaining slots on the Rocket
* If the match is close, and your end game point efficiency is worse than your cycling point efficiency (i.e. you don’t have more than a Level 1 Platform ability) you should be running the most efficient, undefended cycles you can to the closest open scoring objective

**Pre-match Pre-Loading Strategies**

**Null Hatch Panel vs Bonus Cargo Pod for the Cargo Ship?**

* The Null Hatch Panels are almost always a good idea since it’s unlikely that you’ll reach the low game piece cap in most matches
	+ Playing all 6 Null Hatch Panels allows you to do 6 cycles of Cargo Pods each worth 3 points which is more efficient than doing 6 cycles of each game pieces for 5 points each
		- 18 points in 6 cycles (3 pts/cycle) vs 30 points in 12 cycles (2.5 points/cycle)
* Loading the Cargo Ship with Cargo Pods and intentionally letting them fall so you can intake them from the ground and quickly score them in your Rocket is a valid reason to choose to pre-load Cargo Pods
	+ The Cargo Pods will fall and roll towards your Rocket which makes for short cycles assuming you’ve already placed Hatch Panels over 1-2 Cargo Bays

**Pre-Load a Hatch Panel vs Cargo Pod on your robot?**

* In most cases it makes sense to load a Hatch Panel on your robot
	+ The only time you can score a Cargo Pod is when you have chosen to pre-load a Null Hatch Panel
	+ Scoring Hatch Panels early makes your cycles more efficient later
	+ Scoring a Hatch Panel on a pre-loaded Bonus Cargo Pod nets you 5 points which can be a significant lead early in the match
* We believe placing a Hatch Panel (or two) on the top level of the Rocket will be the Sandstorm strategy most often employed by elite teams
* If you choose to use all 6 Null Hatch Panels, and aren’t confident about your ability to get to the Rocket during the Sand Storm, you may be better off pre-loading a Cargo Pod

**Miscellaneous Notes**

* When going for the RRP, start by going high early in the match
	+ This makes it easier to score in the Rocket when it’s more heavily defended later in the match
	+ It also “unlocks” the Rocket and allows lower skilled alliance partners to finish it off while you’re possibly doing other things (vs leaving the top Cargo Bay empty with your robot being the only “Elite” robot on your alliance)
* It might make sense to disguise what Rocket you’re going after early in the match to make it more difficult for the opposing alliance to lock down the one you’re really going for
	+ Maybe fill in the lower levels on both Rockets (same number of points, similar difficulty, and similar cycle time as the Cargo Ship anyways) early to make it less obvious what you’re going after
* Drive coaches are going to need to keep track of where both alliances have been scoring in order to make informed decisions
	+ This is going to be a significant challenge as there is a lot to keep track of
	+ The poor visibility on your own Cargo Ship could mean a lot of wasted time trying to score in a full Cargo Bay if you’re not keeping track of what’s full
* During alliance selections, it will be common to see 3rd level climbers choosing the best cyclers with a 3rd level climb so that they aren’t forced to compete against them
* This is a rare FRC game where an alliance of specialists can be significantly better than an alliance of versatile robots

**Alliance Selection Notes**

Destination Deep Space is a game that greatly incentivizes specialization, and as such, the alliance combinations and resulting strategies in the Playoffs will be as diverse as they have been for many years. The robot that is built to seed high isn’t necessarily built to win in the Playoffs. The number 1 overall pick could very easily be a robot that doesn’t score high. That is almost never the case in FRC games. DDS may seem pretty straightforward on the surface with its linear scoring and relative easy to understand concept, but it will be won and lost during alliance selections and with great strategy.

What does a Playoff Alliance need in order to be successful? First of all, what are all the things a robot might be able to do?

**Possible Robot Attributes**

* Acquire Hatch Panel from Loading Bay
* Acquire Hatch Panel from ground on your alliance’s side
* Acquire Hatch Panel on ground from opponent’s side
* Acquire Cargo Pod from Loading Bay
* Acquire Cargo Pod from ground on your alliance’s side
* Acquire Cargo Pod from ground from opponent’s side
* Score Hatch Panel in Cargo Ship
* Score Hatch Panel in Rocket Levels 1/2/3
* Score Cargo Pod in Cargo Ship
* Score Cargo Pod in Rocket Levels 1/2/3
* Push opposing robots (For Defense or Counter Defense)
* Climb to Level 1/2/3
* Lift an alliance partner above Level 2 or 3

*\*Everybody should be able to do a full send off level 2 at the beginning so that isn’t counted as an attribute*

**What Robot Attributes Help to Seed High?**

Now that we’ve covered all possible robot attributes, let’s discuss what kinds of attributes will lead to Robots seeding high. The most important factor to consider when predicting what robots will seed highly is cycle time. Cycling (scoring the game pieces) is the largest determinant for the outcome of 3 out of 4 Ranking Points. Cycling is the primary method through which to score points, which directly correlates to wins (2 RP’s) and finishing the Rocket Ranking Point (1 RP). The only other Ranking Point comes from acquiring 15 end game points, which no single Robot can do alone, but a Level 3 climb all but ensures you’ll have the RP. The importance of the Climb RP will be directly correlated to the scarcity of the RRP. The less common the RRP is, the more important the Climb RP becomes. It’s generally agreed that the Climb RP is much easier than the RRP. Ultimately it comes down to the fact that the RRP is defendable and the Climb RP isn’t.

I’m of the opinion that the RRP will be very rare in early events, and as such it will have little to do with the final seeding. As teams get better at the game, the RRP will behave much like the 40 kPa RP from Steamworks where it helped to separate the elite robots from the rest of the pack, making the top seeds less flukey. This year the Climb RP feels a lot like the Levitate Ranking Point from Power Up in 2018. The teams that have reliable Level 3 climbs are almost assured the Ranking Point (much like Reliable Double Climbers last year). The difference this year is that even without a robot on your alliance with a special ability, alliances will still be able to accomplish the End Game Ranking Point through teamwork (a rarity last year). With that said, the biggest single Robot attribute that will contribute to seeding high is a reliable Level 3 climb. I would say it’s a fair assumption that teams that are capable of reliably getting to Level 3 are capable of making at least adequate mechanisms for cycling. These are the robots that will most likely be near the top of the rankings at the end of quals. Their exact cycling capabilities will become a huge determining factor for who they choose to select with their first pick. There won’t be very many reliable Level 3 climbers at early events. Definitely not enough to fill all the alliance captain spots. So following the reliable climbers (with effective cycling capabilities) will be the top cycling robots. The robots that can solo the most points will be the robots with the most wins on average. Being that the RRP is an anomaly and the reliable climbers are already in place as the top seeds, we’ll see the top cyclers fall in place as later alliance captains and bubble teams (9-14).

**Alliance Captain Tl;dr:** The top seeded robots will likely have a reliable Level 3 climb and at least adequate to above average cycling ability. The tradeoffs they made as a climber will likely limit their cycling potential below that of a robot that doesn’t climb and is purely optimized for cycling.

**What Robot Attributes will be Common in the Top Picks?**

We will operate under the assumption that teams have 30 robot attribute points (due to resource constraints), and that by allocating some of those to climbing (which helps to seed high), the climbing teams will be less effective cyclers than the best cycling, non-climbing teams. With that in mind, the first pick from a team that can climb will not consider the potential pick’s ability to climb to Level 3 at all (unless somehow the climbs were compatible which is unlikely early in the season). Another consideration is that if the top alliance captains are a poor/below average cycler, and they select the best available cycler who is an alliance captain, the best cycler is very likely to decline and form their own alliance. Cycling generally outweighs the end game points in FRC and this year doesn’t seem to be any different. The factors that will be considered will include the team’s ability to climb to Level 2 (if they can do it quickly, reliably, and efficiently), how many game pieces they can score during teleop, and how they react to defensive pressure. That’s it. Can you score a lot of points while being defended and finish the game on Level 2. If the best cycler (by more than 1 full cycle) can’t end on Level 2, they will still take priority over a slower cycler that can based on the total number of points they can contribute. The role that the 1st overall pick is going to play is that of the workhorse. They’re going to be repping out points (most likely under defensive pressure). It’s unlikely that you’re going to be sending your number 1 pick to the other side of the field to play defense, or otherwise get caught up in activities that don’t relate to scoring disks and balls. Robot attributes that contribute to cycling efficiency include the following:

* Acquire Hatch Panel from Loading Bay
	+ Every team should be able to do this, but 1st round picks must be able to do it faster than anybody picked after them
* Acquire Hatch Panel from ground on your alliance’s side
	+ Assuming the Alliance Captain doesn’t have a floor pickup, a robot with an efficient and effective floor pickup becomes a higher priority in a top pick - without it, you’re not able to correct your mistakes which can have a devastating impact on the match outcome
		- Every miss turns into a trip to the Loading Bay plus your misses get in the way of your next scoring attempt
		- The floor intake also opens up strategic options including having your 3rd robot feed your top pick among other ideas
* Acquire Cargo Pod from Loading Bay
	+ All teams should be able to do this (or if not just throw it through the loading bay and pick it up from the ground)
* Acquire Cargo Pod from ground on your alliance’s side
	+ Your top pick needs to have an effective and efficient Cargo Pod ground intake. There can be up to 20 Cargo Pods on your side of the field alone and there are a minimum of 12 Cargo Pods on the field
	+ The fastest cyclers will be opportunistic - they’ll see a Cargo Pod bouncing by and they’ll quickly grab it and score it in the nearest Hatched Cargo Bay
* Score Hatch Panel in Cargo Ship
	+ This is an obvious must have trait for any top pick
* Score Hatch Panel in Rocket Levels 1/2/3
	+ Scoring in the Rocket has no importance over scoring in the Cargo Ship… it really doesn’t matter where you score as long as you can do it quickly
		- The top picks will likely have a lot of places to score, but it certainly isn’t a requirement
* Score Cargo Pod in Cargo Ship
	+ See above
* Score Cargo Pod in Rocket Levels 1/2/3
	+ Scoring high doesn’t have any bearing at all in the early weeks
* Push opposing robots (For Defense or Counter Defense)
	+ You’re not going to send your top pick out for defense, but it will be important that they are able to fight through defense (or quickly move around it) with an effective drivetrain
* Climb to Level 2

**1st Pick Tl;dr:** The top picks will be all about maximizing alliance point potential through choosing the best combination of end game capability compatibility, and fastest cycler available that nets the most points. Special value is added to teams that have shown that they can score under defensive pressure and have been a reliable scorer throughout quals. Reliability will be a larger factor earlier in the 1st round, and potential will be a larger factor later.

**What Attributes will be Common in the 2nd Round Picks?**

With the top picks, there really isn’t much deviation in picking strategy between the number 1 alliance and number 8 alliance. They will pretty much all be selecting the robots that can help their alliance maximize its points. As you get later in the 1st round, teams will be more willing to select robots with a greater standard deviation in performance. In other words, teams will draft based on potential because they need to in order to beat the top seeds. But really, picking strategy doesn’t change very much. An elite defender might sneak into the tail end of the first round if the pool of effective cycling robots is deep, but otherwise it should be fairly predictable.

The 2nd round where the 3rd robots are selected will create the most interesting strategic differences between alliances. Teams will have their top two scoring robots (assuming the alliance captain wasn’t carried in quals) and will be looking for their 3rd robot to make the difference. Strategies will vary between top alliances and lower alliances, but here are many of the possibilities for attributes of the 3rd robot based on the what has been laid out as the ideal alliance captain and first pick above:

* The best remaining cycler
	+ It will be very common for lower level alliances to select the best remaining cycler and run 3 cyclers in a match in an effort to keep up with the faster cyclers on the top alliances
	+ This is a risky strategy since the top alliance will have the option of sending their 3rd robot to defend all 3 cyclers or using them as a feeder to further increase their cycling advantage - it will be tough for lower seeded alliances to beat superior cyclers without defending them
	+ Also worth considering is that there are only two human player stations for 3 cyclers with this strategy - at least one robot will need to collect from the ground at any given time in order to maximize efficiency
* The defensive cycler
	+ The best chance a lower level alliance has at beating a superior cycling alliance if with the help of a 3rd (or 2nd) robot that acts as a defensive cycler
	+ The defensive cycler’s role is to disrupt the opponent and force them to drop game pieces which they will then pick up and go score
	+ A perfectly orchestrated playoff alliance with two or more robots capable of intaking Cargo and/or Hatch Panels on the other side of the field can always have one robot defend the opponent until they steal a game piece and then switch out
* The elite defender
	+ The elite defender is a robot that can effectively shut down an elite offensive robot with 1 on 1 defense
	+ There will be teams that separate themselves from the pack defensively - generally by playing defense throughout quals and shutting people down
	+ The elite defender must have a powerful drivetrain
	+ The elite defender and defensive cycler are not mutually exclusive positions - when you have a robot that can do both, you have a recipe for a middle first round pick or even better
* The feeder bot
	+ The feeder bot is a strategy I expect to be employed by a number of high alliances
	+ The feeder bot is a fast robot that can acquire game pieces from the Loading Bay and then hand them off to one of the top robots to quickly score
	+ The feeder bot is generally slower at scoring but fast in all other aspects of cycling
* The cycling fullback
	+ The 2nd pick strategy I expect to be most commonly used by high seeded alliances is the cycling fullback
	+ The attributes that make up the cycling fullback are essentially most powerful drivetrain and the quickest cycler combination
	+ The robot will be used to feed, cycle, play counter-defense, or play defense depending on the matchup

**2nd Pick Tl;dr:** The 3rd pick will primarily be a factor of cycling speed and drivetrain pushing power. Special value is added to robots that have been proven to play stellar defense and robots that can intake game pieces from inside their frame perimeter. Additional value is added to drive teams that show smart decision making and an understanding of the game rules.

 **Tradeoffs to Consider**

Destination Deep Space… *IT’S A TRAP!* There are so many game objectives and it’s very enticing to try to design for them all. With every capability you add to your robot, you need to ask yourself if it’s helping or hurting you cycle time. Is the development time you’re spending on the Hatch Panel ground pickup reducing the practice time you would’ve had with your Human Player Station-only mechanism? Is your Level 2 climb mechanism taking up weight/room that could have been better used to make your cycles faster? There are a million examples, but every team is going to need to sacrifice something in order to build the best robot they’re capable of building. Below are some tradeoffs that all teams are going to need to decide on.

But wait… the first question you need to ask yourself is “what is my goal for this year?” If your goal is to be the number one seed, your answers to the tradeoff questions will be very different than if your goal is to make the playoffs for the first time.

* Scoring High vs Staying Low

One of the most obvious tradeoffs in DDS. Do you want to dedicate the additional mechanisms and additional complexity into your design for scoring high in order to unlock the “Solo Rocket Ranking Point”. The biggest reason you go high is to go after the Rocket Ranking Point. This is the penultimate trap in DDS. Very few teams in the world will be capable of Soloing the Rocket Ranking Point. It will probably happen a few times per early event that entire alliances finish a Rocket. So if you’re going to decide to go high and go for the RRP, you better be very confident that doing so won’t significantly slow your low cycle times, because ultimately that’s your tradeoff: unlock the RRP but decrease your cycling efficiency. The “right” answer for a large majority of teams on this question is to stay low.

* Level 3 Climb, Level 2 Climb, or No Climb?

The Level 3 HAB Climb is the ultimate trap in DDS. Many teams will attempt it and few will be reliable Level 3 Climbers. Teams will sink enormous resources into climbing and will wind up with either partially successful to successful mechanisms and less efficient cycling or failed climb mechanisms and less efficient cycling. Either way, by choosing to climb, teams are reducing their cycling potential, which is the primary method to gain points in DDS. Climbing will absolutely be a differentiator for seeding when it comes to alliance selections, but while dozens of robots will attempt to build Level 3 climbers to fight for those top seeds, few will choose to ignore the red herring (for most teams) that is climbing and optimize their cycling abilities. Remember that being the top pick is just as good as being the number one alliance captain…

* Hatch Panel Floor Intake or Not?

The biggest factor that teams need to weigh hear is that by adding a floor intake for Hatch Panels, are you slowing down or speeding up your cycling efficiency. You’re essentially trading off practice time for a more capable robot. In most cases, teams will be better off prioritizing optimizing their Human Player loading mechanisms (and not dropping Hatch Panels to begin with) than building a mechanism to correct their and others’ mistakes.

* Cargo Pod Floor Intake or Not?

The Cargo Pod Floor intake is a lot easier to justify than the Hatch Panel floor intake. There are guaranteed to be at least 12 Cargo Pods on the floor on your side of the field during any given match. That’s a lot of Cargo Pods to ignore by ignoring a ground intake. On the other hand, if you’ve decided to be aggressive in other areas of your design, it may reduce complexity to ignore ground pickup of Cargo Pods. In most cases though, having the capability to pick Cargo Pods up off the ground is going to be beneficial to teams.

* Intaking Hatch Panels Inside the frame perimeter or not?

The only way to steal your opponent’s dropped Hatch Panel is to do so within you frame perimeter. This tradeoff comes into play if you’re designing your robot to be the ultimate defender. The ultimate defender will be able to steal both game pieces from their opponent. If you’re not planning on being the ultimate defender, it becomes a lot harder to justify intaking Hatch Panels from inside your frame perimeter.

* Intaking Cargo Pods inside the frame perimeter or not?

Intaking Cargo Pods from inside your frame perimeter is a lot easier than Hatch Panels. But your tradeoff in intaking from inside your frame perimeter is your intake’s margin for error. You have to be more skilled as a driver to get the ball between your bumpers than you would when using a full width intake. Not to say you couldn’t have both mechanisms… but then you’re trading off complexity.

* Strafing Drivetrain or not?

This is a tradeoff that many teams put a lot of thought into. This year the scoring objectives are fairly small relative to the size of the game pieces. As such, many teams will decide that they need to be able to move sideways in order to finesse the game piece into position. The biggest tradeoff in doing so if a team's ability to play good defense. It’s really hard to play effective defense when you can’t hold your ground (which most strafing drivetrains are incapable of doing)

**Tradeoffs tl;dr:** Everybody needs to make them, which ones you make will determine the level of success you have this season. Make sure to consider all the factors when you make a decision.