



FIRST Robotics Team 2168 Training



Drive Team Manual

“How To Drive Like A Falcon”

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Forward



This document was written to provide guidance to the current and future drivers for FIRST team 2168, the Aluminum Falcons from Fitch Senior High School in Groton, CT. The drive team is the face of the team, and must be held to the highest of standards to achieve the goals set forth. When you consider becoming a part of the drive team please remember that it is not only a large time commitment, but a lot of work as well.

Being a member of the FRC Team 2168 Drive Team is no small order. We play hard and we train harder. There is no substitute for practice, there is no excuse for lack of skill, there is always time to prepare for the competition, and the ultimate goals are to win with class, confidence and the utmost skill. We always look back on where we can improve even in a flawless match, while we may never reach perfection, we will never give up trying. We also know that being a successful team is more than just making practice, committing the game rules to heart, and preparing to have the best strategy. It is about an idea, it is about friendship, it is about when the dust settles we band together as friends, as brothers and sisters, and we stand behind each other no matter what. It is about supporting one another, picking each other up and dusting ourselves off, it is about competing as group of team members rather than a collection of individuals. We are a FIRST Robotics Competition Drive Team and we challenge ourselves to push the limit.

The use of this document by other teams is permitted, however concepts and ideals contained may not apply to all teams.

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Definitions & Abbreviations



<i>Members of the Drive Team</i>	
Driver	The student member responsible for the control of the chassis of the robot
Operator	The student member responsible for the control of the superstructure of the robot
Human Player	The student member responsible to achieve the game requirements for this role. (This role changes every year.)
Coach	The mentor responsible for training and supporting the drive team both on and off the field
Head Scout	The student or mentor responsible for the data of each robot in each match provided to the drive team before every match for strategy analysis
<i>Locations at Competition</i>	
Field	Where the robots will be competing
Drivers Station	Where you will be standing to drive the robot, typically on either end of the field
Queuing Area	Location you will be required to wait with the robot before each match
Pits	Where the robot will be stored, repaired, and maintained throughout the competition
Stands	Area surrounding the field where our team and the other teams will be located during the competition and awards ceremony
<i>Common Scouting Terminology</i>	
Alliance Captain	The team responsible for selecting their own alliance during the alliance selection progress
1 st Pick	During alliance selection the first team to accept an invitation to an alliance
2 nd Pick	During alliance selection the second team to accept an invitation to an alliance
1 st -8 th Seed	The eight teams make up the top eight ranked teams at the end of the qualification matches
<i>Match Terms</i>	
Blue Alliance	The name for a collection of the three teams allied together, seen with blue bumpers. During qualification matches these alliances are randomly selected. During elimination rounds they are chosen. Note that in elimination round this alliance is the lower ranked alliance.
Red Alliance	The name for a collection of the three teams allied together, seen with red bumpers. During qualification matches these alliances are randomly selected. During elimination rounds they are chosen. Note: In elimination round this alliance is the higher ranked alliance.
Autonomous Period	Typically the first 15 seconds of the match where the robots drive without human input. Completing the assigned tasks often results in the receiving of bonus points.
Teleoperated Period	The rest of the match following the autonomous period where the robots are under driver control.



End Game		The last portion of the match, normally signaled, where teams often can perform a specific task to receive bonus points.
<i>Common Drivetrain Designs</i>		
Standard “Tank”	4WD	An arrangement of 4 wheels, each side driven separately, and example of this is a construction skid steer. Pairs of omni wheels may be added to increase maneuverability
	6WD	An arrangement of 6 wheels, each side driven separately, and example of this is a construction skid steer. The center wheels may be slightly lowered or pairs of omni wheels may be added to increase maneuverability
	8WD	An arrangement of 8 wheels, each side driven separately, and example of this is a construction skid steer. The center wheels may be slightly lowered or pairs of omni wheels may be added to increase maneuverability
	Treads	Drivetrain consisting of continuous belts in contact with the floor, much like a military tank
Omni-Directional	Omni	An arrangement of 4 omni wheels (wheels with rollers at 90° to normal rotation) at 45° angles in the corners of the robots chassis allowing for omni-directional movement
	Kiwi	An arrangement of 3 omni wheels 120° apart allowing for omni-directional movement
	H-drive	An arrangement of 5 omni wheels in an H pattern that allows drives similar to a 4WD until the center wheel is powered allowing for strafing capabilities
	Mecanum	An arrangement of 4 mecanum wheels (omni wheels with rollers at 45° angles)
	Swerve/Crab	A design that resembles motorized castors allowing each “module” the ability to rotate and drive
	Hybrid	A combination of the above defined drivetrains. The most common examples are Octocanum, a drivetrain with the ability to switch between Mecanum wheels and traction wheels at any time during the match and Nonadrive, a drivetrain with the ability to switch between traction wheels and the H-drive

Attitude & Perception



As a member of the drive team you represent our team both on and off the field. If your team shirt is on, we expect nothing but the best from you. You are the people whom interact with the other teams the most, working both with teams and against them. Never forget that in one match, a team may be your opponent but in the next, your partner. Always congratulate the teams you work with and are against respectfully. Below are the drive team core values. Review, understand, and live these while at competition.

Core Values

1. Respect

- 1.1. Treat others with respect even if you perceive they do not respect you.
- 1.2. Always remember, you do not simply deserve respect, you must earn it.
- 1.3. Respect yourself; this will always lead to professional and fruitful dealings with others.
- 1.4. Never underestimate the power of a team effort, and the best teams have teammates who highly respect each other.

“Respect your efforts, respect others efforts. Respect leads to discipline, when you have both firmly under your belt, that’s real power”. – Clint Eastwood

2. Knowledge

- 2.1. The three K’s to success on the field. Know the rules, Know the game, Know your role as a part of this drive team.
- 2.2. Take the time to look at other teams robots and inspect them for their strengths and weaknesses so that you can use them to your advantage during matches.
- 2.3. Take time observe other drive teams on the field. Knowing and anticipating the way your opponent and also your partner reacts and plays during a match is one of your greatest weapons.
- 2.4. Take time to evaluate yourself and your role on the drive team. Self-improvement only happens after self-evaluation. Know your weaknesses and work to remove them. Know your strengths and work to make them impenetrable.

“Knowing others is wisdom, knowing yourself is enlightenment”. – Lao Tzu

3. Communication

- 3.1. Communication is the key to a well ‘oiled’ drive team, this must be developed as soon as possible, a solid drive team always has “chemistry”
- 3.2. Many partnerships have been lost due to lack of communication, it is essential to a team and it is essential in the real world.
- 3.3. Communicate your ideas about strategy, ways to improve play, ways to improve the robot.
- 3.4. Communicate your frustrations, there may be a solution. Communicate your triumphs, others will celebrate and most importantly learn.

“The art of communication is the language of leadership”.
– James Humes



4. Confident, Not Cocky

- 4.1. Know that you have the willpower to accomplish anything you want. Do not place yourself above others, even if they are inferior to you. Know that there is always room to get better, and that there is always someone out there faster, smarter, and stronger.
- 4.2. Confidence will give you the ability to remain calm under pressure. It will assist you in making the right decisions in the heat of battle.
- 4.3. Take pride in your teams accomplishments but carry yourself with humility. Fellow teams want to work with people who are eager to meet the task, not ones who glory in their past accomplishments.

“Insecurity will always rent the spaces it occupies, but confidence will own the building and any room it steps in.” - Unknown

5. Gracious ProfessionalismTM

- 5.1. This is the ethos of *FIRST*. It's a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community. With Gracious ProfessionalismTM, fierce competition and mutual gain are not separate notions. Gracious professionals learn and compete like crazy, but treat one another with respect and kindness in the process. They avoid treating anyone like losers. No chest thumping tough talk, but no sticky-sweet platitudes either. Knowledge, competition, and empathy are comfortably blended.
- 5.2. Realize your success in competition is a bi-product of your team's effort and act accordingly. After a win the first cheer you should share is not with yourself, but your fellow team and alliance members.
- 5.3. Always remember that you could be the next team that needs a replacement part, or a hint, or a friendly reminder, or a pat on the back and treat other teams with same consideration.

Tips for Success

During competition it is possible that you or one of the other members of the drive team will become frustrated. Remove yourself from public eye and find a place to relax. This may mean sitting in a corner somewhere. Do whatever it takes to calm down and refocus before interacting with people on our team or other teams.

Nervousness before and during a match is the ultimate path to not meeting your goals in competition. Sometimes as a Driver when you step behind the glass you will get that feeling much akin to when you had 5 minutes to present to some of the most influential people you know. Your hands will begin to shake, your stomach will begin ache with the realization that your team's future rest, in the palm of your hands. Relax, you have been trained to do your job, trust in your fellow drive team members.



Your personal health and wellness will directly impact your performance on the field and therefore the way the team performs as a whole. You owe it to yourself, your parents, your mentors, your team's sponsors, and your team to follow the guidelines below, to help ensure that the drive team performs at the highest level possible. You have worked hard all year and you are one of the best drive teams out there. But never forget, there are a lot of other teams who have worked just as hard as you to win. If you stay up all night, you are not going to be energetic nor have the fast responses required to win. Think about what you really want.

Sleep

1. Before Competition
 - 1.1. Sleep, you must get a healthy amount of sleep during the build season. The build season is rigorous and demanding. It is also your chance to prepare yourself for competition. Always be rested and ready, because what you learn next, might your greatest key to success in competition.
2. During Competition
 - 2.1. Sleep at the end of each day of competition, may be difficult due to excitement and anticipation for the next day. Remove yourself from all distractions and get to sleep at a reasonable hour.
 - 2.2. Remember the rest of the team has done all they can do in six weeks. They are now depending on the drive team. For two minutes you hold your team's dreams in your hands, don't substitute those dreams for your own late night of fun the night before. Be rested and ready.

Diet

3. Before Competition
 - 3.1. Make it a regular habit to eat properly during build season, limit your junk food intake and look for healthier alternatives, you may not realize it but junk food in some cases will make you tired and un-motivated.
 - 3.2. It may be cliché but a good breakfast will start your day correctly, consider having a bowl of basic cereal (low sugar content) a glass of juice and some fruit.
4. During Competition
 - 4.1. Hydration, Hydration, Hydration... drink lots of water, juice is acceptable in moderation. However, no soda, and absolutely no energy drinks. Remember, it only takes a couple hours to become dehydrated, even if you're sitting in an air conditioned room.
 - 4.2. No candy or items high in sugar.
 - 4.3. You are highly discouraged to rely on sugar and caffeine at a competition, when you come down from their effects your driving performance really suffers.
 - 4.4. Try to find and eat real food, this may mean leaving the venue or bringing in your own.



Exercise

Although it might not be possible for everyone, it is advised that you go to the gym for 10-15 minutes before you start each build meeting, during the build season. You don't need to do any major weight, or speed on the treadmill, just something to get your heart rate up and keep you healthy. During competition, staying stretched out and loose will help you avoid getting hurt when carrying the robot as well as keep your energy high during the day. It may be acceptable to toss a ball around or some other physical activity at competition. A quick run or 15 minute exercise may help you clear your head in the morning and give you drive for the rest of the day at competition.

Balance



While being on the drive team is a huge responsibility, all members of the drive team must balance their work and dedication to the team with the other parts of their lives. Student team members must understand that school work comes first. You must be in good academic standing to be on the drive team.

Keep track of when your schoolwork is due. Know when your tests are, and how much time you will have for homework per night, and plan out your homework load accordingly. If you get assignments in every class, due the next day...skip robotics. If you can't be spared for one night in the shop (which should not be the case, ever, but it always seems to happen at least once per season), at least leave early.

Robotics can be a tool to prepare you for the future and teach lessons that will prepare you for life in the real world. However like all tools, they are to be used at the right time and in coordination with other tools. Your primary education is your most important tool, make time for Robotics, but always make sure you have given the proper amount of time to your primary education. Like Robotics, use of your time must be approached systematically. Make a schedule that gives priority to your primary education, while allowing you to effectively perform your role on the team. Organization is one of the keys to the success in any busy person's life.

For some people Robotics can be addicting because it is so much fun and it inspires the initiative to be better and do more. However Robotics by itself will not provide you with a degree, or a job, or a family for that matter. It is merely a mechanism to support the right goals for your future and your community's future. Treat it as such.



The only way to become the best drive team possible is through hard work and training. Always remember that a good drive team can win with a mediocre robot. But a great robot cannot win with a mediocre drive team. The previous statement should not be taken as a cliché. In fact 99% of the time, it is absolutely the truth. It is your responsibility to prepare yourself both mentally and physically. Your coach can teach you the tools to success, but you have to learn how to make the tools your own. There is no substitute for preparation, you either practice to win or wait to lose.

You can expect to attend at minimum, weekly instructed driver training, as well as continued practice on your own time. It will be the responsibility of the student drivers in collaboration with the driver coach to schedule and attend these extra practice sessions.

Rules

Every member of the drive team is expected to know the rules completely. Specific focus on the rules directly pertaining to your role, is absolutely critical to your performance on and off the field. The drive team as a whole must strive to be perfect in their understanding and application of the rules to avoid penalties, which would lower both our score in the match and our reputation as a collective team.

Many, many, matches, regionals, and in some cases championships have been decided by one mere penalty. Is it your responsibility and you owe it to the rest of the team to know the rules of the game. It should be second nature when you're on the competition field, to know the field. In some cases your perception of distance is only thing between you and a game changing penalty. If the driver coach is talking about the game rules during practice and it is the first time you are hearing about the rules in discussion, than you are letting the rest of your team down. This carries to competition. Good teams with a good scouting system will take note of rule violations by other teams, during play on the field. In some cases the number and type of penalties your team acquires will factor into whether or not your team gets selected into an elimination alliance. Support your team, support your success, and know the rules.

Offensive Driving

Every match that you will play as a driver or an operator will be a unique experience. In laymen's terms, some matches you will be able score unhindered by the opponent as well unhindered by an alliance partner (think about it). While in other matches you might become the sole recipient of the opposing alliance's defense or your alliance partner's mishaps. The important thing is, in either situation; remain calm, cool, precise, and effective.

When learning about offensive driving you must consider three things, driving principles, driving strategies, and driving styles. While driving principles remain constant, a mix of driving strategies and styles if often required during any given match.

There are basic perspectives that we can use categorize offensive driving. But before we categorize, let's talk about the four basic principles for offensive driv:



Offensive Principles

1. Drive it like you stole it

- 1.1. During the build season you will participate in build sessions, as a result you will develop a sense of ownership. This sense of ownership will cause you to tend to want to be careful with the robot while driving/operating. This is the opposite of what we want to do. The robot is built robust for a reason, be willing to push its limits.
- 1.2. Your job is to drive the robot to win. The pit crew's job is to fix the robot and keep it in perfect working order so you can perform your job.

2. Protect your assets

- 2.1. Some games will require you to extend outside your bumper zone, while others games will inspire mechanism designs from other teams, that can accidentally damage your robot. In either case the mechanisms that you score with, are your assets, protect them. You wouldn't drive down the street with your car door open and expect it not to be broken off.

3. Avoid the hall affect

- 3.1. Too many drive teams play on the field, with their focus on the score that must be made at the end of the "hall", without noticing the open doors of opportunity along the way.
- 3.2. Learn to be a role player, not a sole player. Too many good alliances have fallen because one team can't see beyond their own goal post. Play with your alliance partners, not next to them, learn to share the field. More often then not good alliances will take advantage of the confusion generated by the opposing alliance getting each other's way. Don't give them the advantage. Like in pro sports the winning teams pass the ball to their team mates. Learn to pass the "ball".

4. Finesse

- 4.1. The good drive teams approach scoring with finesse. This approach allows for precision scoring while "protecting your assets" and avoiding the "hall affect".
- 4.2. Slamming tubes on a peg, or ramming balls into a goal, is not always necessary and sometimes can cause unnecessary damage, loss of game pieces, or cause your robot to get hung up on field elements.
- 4.3. Time is priceless, let me say it again, **time is priceless**. Too many teams waste time because they approach the game with brute force rather than finesse. Five properly played seconds can change the outcome of the match. Learn to play with finesse, don't waste time.



Offensive Strategies

1. Positional / Defined Role

- 1.1. This style of offensive strategy is based upon each member of the alliance being specified into a certain role in the upcoming match.
- 1.2. Often this results in a purely offensive robot, a mostly defensive robot, and a mostly offensive robot. The ability of the third robot to change strategies midway through a match, can be a huge asset to the alliance as a whole.
- 1.3. By defining roles, you allow each robot to travel the whole field in a controlled manner, this may involve selecting certain tasks for each robot, which includes but is not limited to, each robot handling a specific game piece.

2. Zone

- 2.1. This offensive strategy revolves around you identifying and staying in certain locations on the field. Each member of the alliance has an assigned area allowing the alliance as a whole, to competently cover the necessary areas of the field.
- 2.2. Running this strategy will keep alliance partners from interfering directly with each other's movements on the field but can complicate the motion of game pieces.
- 2.3. This strategy can be highly effective when the alliance is properly organized and each member is used to their full potential.

Offensive Styles

1. Aggressive

- 1.1. This style of driving uses brute force to meet your strategy goals and is typically characterized by the need to push through opponents in order to get to the desired locations on the field.
- 1.2. When pushing through opponent remember that pushing them from the side and directly front to back is not always effective. Ramming another team in the corner of their chassis however will result in them rotating away from you.
- 1.3. A strong drivetrain will allow this style of offensive play to be effective against 75% of your competitors, it is therefore important to know the qualities of your opponents and refine your ability to exploit them.

2. Avoidance

- 2.1. This style of driving has you in constant motion, looking for the openings in defense and minimizing your contact with other teams.
- 2.2. Speed and smoothness are the expectations and requirements for such driving.
- 2.3. This style of driving can be highly effective if your opponents are focused on your alliance partners, thus leaving you to do your own thing, and wreak havoc on the score of the match.



Defensive Driving

Many times teams and alliances underestimate the value of defense, but any champion team knows that defense is absolutely necessary. We must understand that there is defense and then, there is smart defense. For some teams, defense implies the consistent ramming or pinning of an opponent. While in some cases this might be effective, it is more likely not the best approach. More often than not, smart defense requires the ability to multitask on the fly, to both protect and attack, as well as to hinder and limit your opponent. There are defined methods to good defense: attack, protect, and lure. In some cases a match might require the implementation of all three.

Defensive Principles

1. Don't play chicken with the Referee
 - 1.1. The referee's are trained in classes to know the rules and enforce them. In some cases one referee will judge a situation differently then the next, but realize that we are not the business of seeing who will blink first.
 - 1.2. Play your best defense, but don't acquire penalties. Be skilled enough to go the line, but never cross it.
 - 1.3. There are times when acquiring the penalty might be worth it for the win. But this is never your call to make as a driver/operator; it is your coach's decision. Know the rules, know the strategy, and defend smartly.
2. Adapt to your environment
 - 2.1. There are a surprising number of situations that can present themselves, in two minutes and fifteen seconds. Unresponsive robots, robots immediately breaking in the match, key game pieces becoming un-obtainable or stuck in certain areas, shifts in the opposing alliance's anticipated strategy, these all represent changes that can happen at any instant during the match.
 - 2.2. The ability to adapt on the fly to these changes is essential to your success on the field. Simple things such as moving dead robots to block your opponent and holding your opponents game pieces hostage, are some simple examples.
 - 2.3. Be able to recognize the changes in your environment and take advantage of the situations presented to you.
3. Anticipate
 - 3.1. The ability to hold your opponent to a minimal score or hold them to a specified area on the field is enhanced by your ability to anticipate your opponent's moves.
 - 3.2. You will encounter opponents who will attempt to outsmart you or out maneuver you, anticipate their direction.
 - 3.3. Take notice of your opponent's drive train type and mechanisms pre-match, this will help you anticipate your opponent's moves on the field.



Defensive Methods

1. Attack

- 1.1. This is the most popular method of defense and utilizes an aggressive posture on the field.
- 1.2. Depending on the fire power of the opposing alliance the way in which you aggressively attack is important. On average you will encounter two types of alliances; mediocre firepower and high firepower.
 - (Mediocre) In the case of the “mediocre” alliance you will have one to two robots on the alliance capable of playing the game at semi-effective level and the remaining robot or robots will most likely not contribute much at all. In this case your driving goals should most likely be to hinder the two semi-effective robots on the opposing alliance. In short becoming a nuisance to both, such that it creates confusion and traffic jams for the opposing alliance.
 - (High Powered) In the case of a “high powered” alliance, this means you will likely be facing one to two robots on the opposing alliance that are effective to very effective at playing the game, where the phrase “effectively playing” equates to a combination of skilled driving and a reliable, capable, robot. In this situation one must identify which opposing robot/drive team is the most effective at scoring in the game and play a “shutdown” style defense against that single robot.
- 1.3. Typically teams playing a “shutdown” style defense, like to pin their opponent. The key is to realize that it’s not about holding the opposing team against the wall as much as it is about taking time off the clock while hindering them from scoring. Most games have rules about pinning that require you only pin for a certain time and then back off for a certain time. Thus the goal should be to get in the way the opposing team, and force the opposing team to push against the side of your robot instead of the back or the front.
- 1.4. In some instances you will not be able to get in front of your opponent, in which case you want to attempt to push them from the side. Your opponent will attempt to drive away and you will become ‘magically’ (friction forces between bumper material) stuck to each other, which effectively enables you to slow your opponent down, hindering them from scoring as well as taking time off the clock.
- 1.5. The other way to control an opponent is to contain them in an area of the field if possible this is the best way to control them, as it is not considered pinning. Review the design of the field and recognize the potential areas for this style.

2. Protect

- 2.1. This style of defense certainly has its place in the game, however it is used far less than the ‘attack’ style defense. The ‘protect’ method of defense employs a combination of protecting your alliance partners from the opposing alliances defense as well as protecting your scoring game pieces.
- 2.2. A second facet is to take your opponents game pieces and make them unavailable to the opposing alliance while making them available to your own alliance or some variant of this method. In the case of protecting your alliance partner, this is where pinning becomes effective because your not concerned as much about

hindering the opposing alliance from scoring as much your concerned about keeping the defender off of your most effective scorer



- 2.3. In the case of protecting the game pieces, the goal is to make more game pieces available to your alliance partner(s) while taking away from your opponent and slowing your opponent down in the process. This method generally is used in collaboration with a starvation technique.
- 2.4. In some games the game pieces are unique to the red and blue alliance which requires you to simply keep the opposing alliances game pieces away from them.

3. Lure

- 3.1. This method requires you to understand some of psychology behind the game.
- 3.2. This method can be used where you might be defending against an opponent and you desire to take advantage of the field elements, your opponent's relative position on the field, etc. as a means of defense.
- 3.3. As an example, more often then not the competition will have an end game strategy. Waiting/allowing your opponent to put themselves in a place on the field that allows you to best stop them from reaching their end game strategy is a facet of 'luring'. Additionally while defending your opponent, allowing them to go after game pieces that would give positional advantage and compromise your opponent's ability to score the game piece, is also a facet of luring.
- 3.4. In summary luring requires you to think about game and where you are at on the field, from a field point of view. Each game is going to bring different facets to the method of driving to 'lure' your opponent and give a defensive advantage to your alliance. Work with your driver coach to understand these facets of luring from previous games and it will help you understand how to attack future games.

Position Specifics



Driver

- a) Some teams will call this position the primary driver, pilot, or main driver. The Aluminum Falcons do not follow this flawed perspective. All members of the drive team are equals, under the coach.
- b) Base drivers in particular need to be able to drive without fear of doing some damage to the robot. I'm not saying he/she should have the intent of breaking yours or anyone's robot, but he/she should definitely not be afraid to push the robot to its limits.
- c) Focus on the base of the robot as that is your responsibility, allow the operator to do their job and support them as required.
- d) **Communication between this position and the operator is expected and required.**

Operator

- a) Some teams will call this position the secondary driver, co-pilot, or arm driver. The Aluminum Falcons do not follow this flawed perspective. All members of the drive team are equals, under the coach.
- b) Control game elements/pieces
- c) Protect the superstructure of the robot when playing defense.
- d) **Communication between this position and the driver is expected and required, relay information about positioning and the rest of the field to your base driver to avoid in match problems.**

Human Player

- a) This role changes with every game, understand the rules and do your part to make the drive team function properly.
- b) Do not underestimate the human player's contribution to the outcome of the match. A smart, well practiced human player has sometimes been the difference maker in the result of match or a regional.

Coach

- a) The coach's role can not be understated; an effective coach makes or breaks the drive team in most cases.
- b) Responsible for driver selection, training, and testing
- c) Pre-match strategy is the final choice of the coach and will likely come from and agreement with the other teams on the alliance, there directions are to be respected and followed.
- d) During the match the coach is responsible for watching the clock, the over all field, and communicating with the other drive teams, not micromanaging the driver, operator, or human player.
- e) Some micromanaging may be necessary however it is important to be aware of the entire field as a whole.



Head Scout

- a) Most teams do not consider this position as part of the drive team.
We strongly disagree with this, as the head scout is critical to match performance
- b) During qualification matches they are responsible for reviewing the match list and evaluating the partners and opponents for each of our matches. We expect to treat each and every match as though it is an elimination round, and therefore this position is match-critical.
- c) More information is contained in the standalone scouting manual, please review that document for more information on this critical drive team role.

Practice Drills

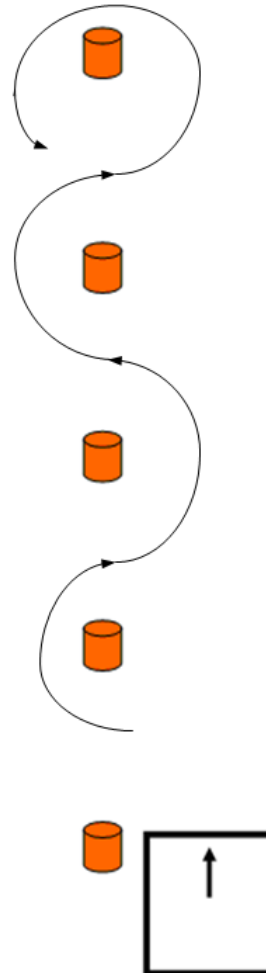


The secret of driver training is with driving old robots, practicing with anything you have available is the best way to make your drivers better. Below are some of the basic driver training exercises used by the team, these can be done with or without instruction.

Slalom Course

Notes: (The diagram is self explanatory)

- Begin slow
- Increase your speed and tightness of turns as you become comfortable.
- Once you have mastered the course in forward, work on it driving backwards
- You will be timed as you show progress, typically you should work to accomplish this in 10 sec +/- 2 sec

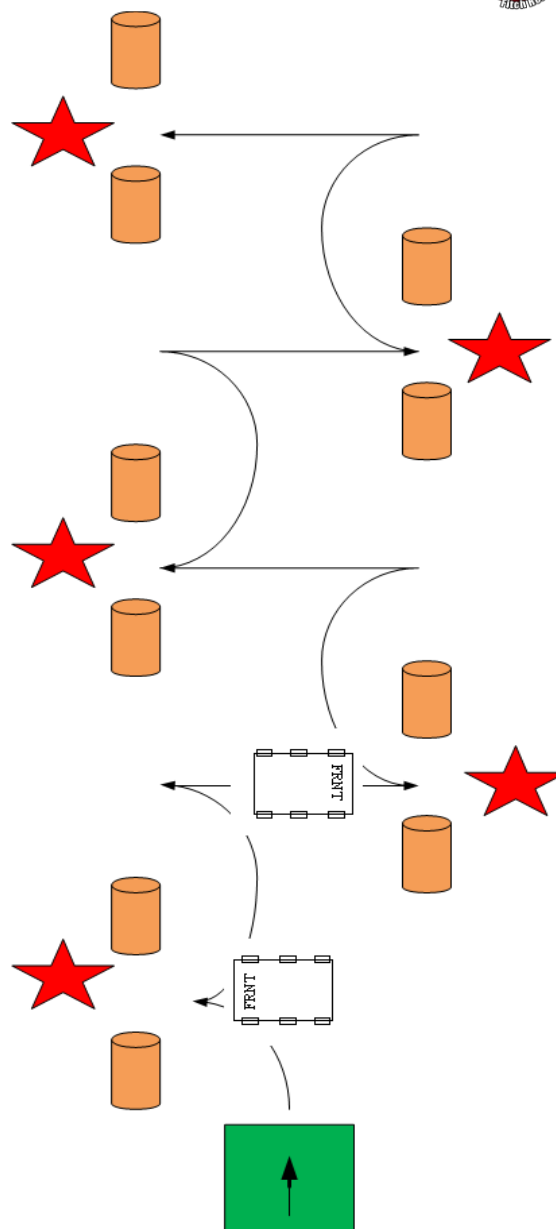




Three Point Turn

Notes: This course is designed to improve your precision in three point turns with direct application to stationary scoring.

- You will be timed as you show progress, typically you should work to accomplish this in 25 sec +/- 2 sec.

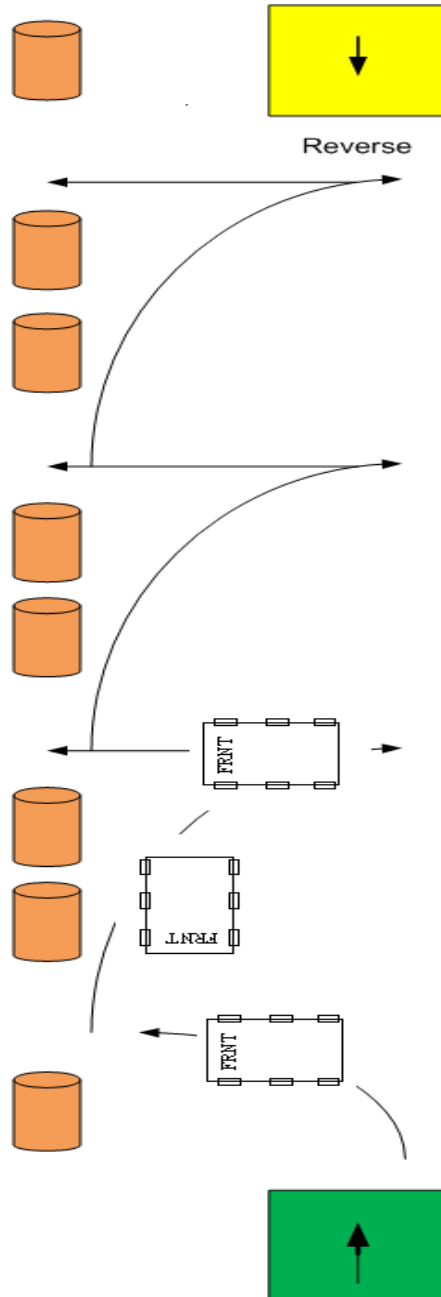




45s

Notes: This course is designed to assist you in moving around obstacles or picking up games pieces with precision and speed.

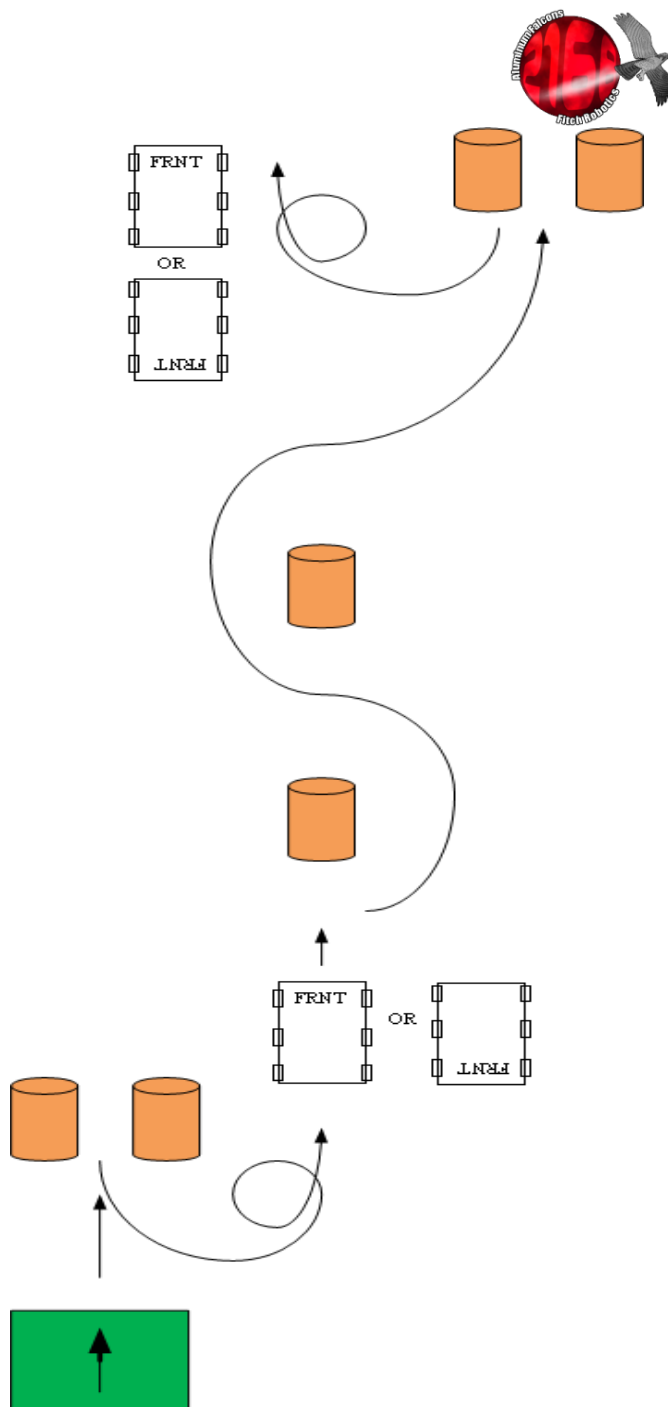
You will be timed as you show progress, typically you should work to accomplish this in 13 sec +/- 2 sec.



Juke

Notes: This course is designed to help you hone your skills in ‘jukeing’ defending robots on the field in a time effective manner. In football this is called a “hitch route”.

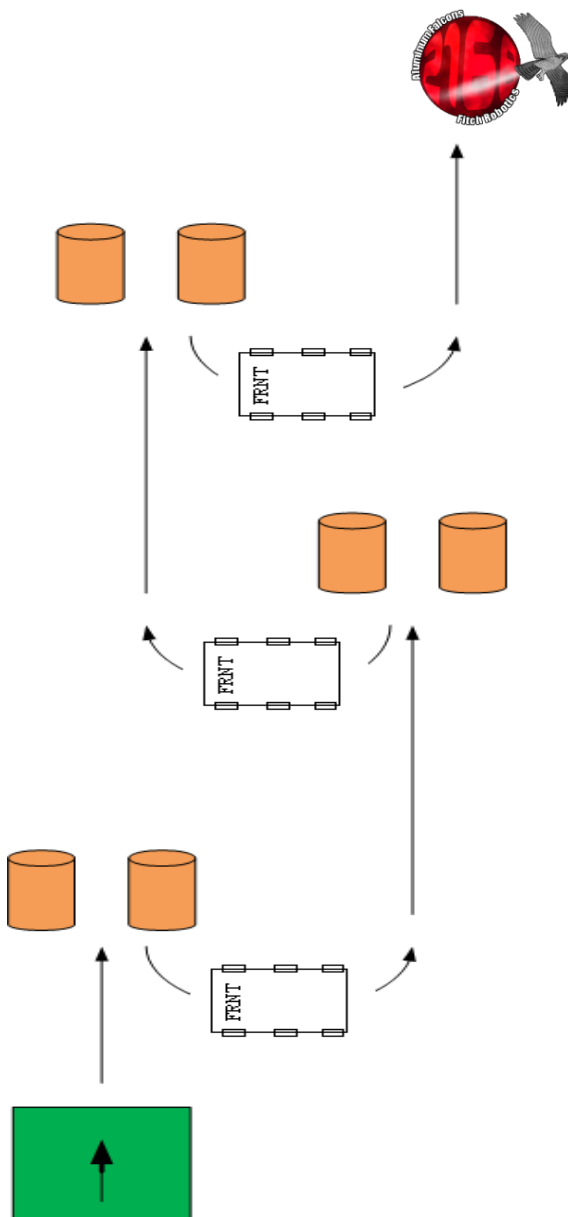
-You will be timed as you show progress, typically you should work to accomplish this in 16 sec +/- 2 sec.



Evade

Notes: This course is designed to help you hone your skills in evading other robots and obstacles on the field in a time effective manner.

-You will be timed as you show progress, typically you should work to accomplish this in 16 sec +/- 2 sec.

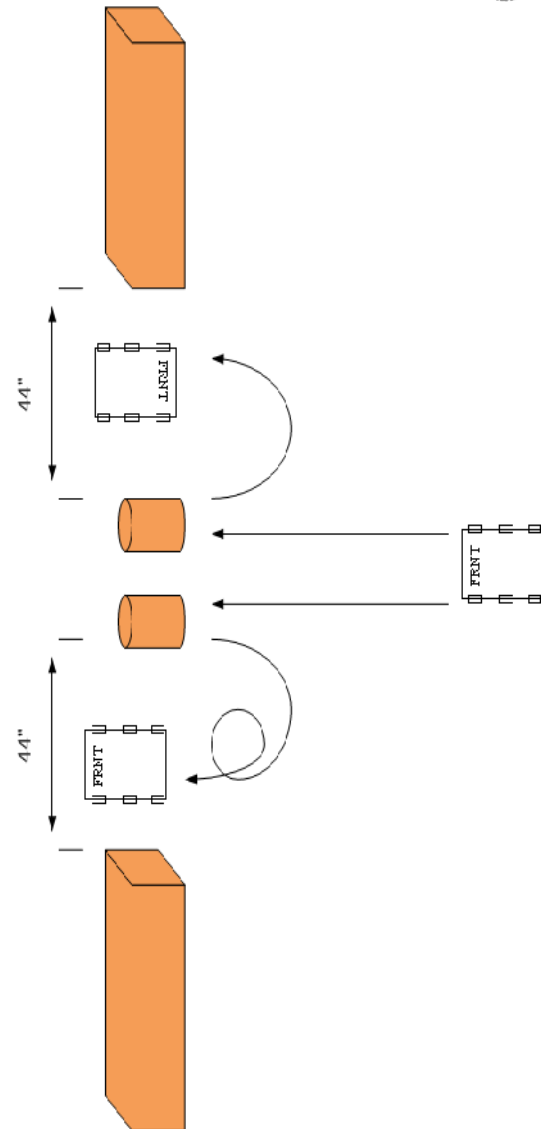




Narrow Escape

Notes: Sometimes a defending robot will use other field pieces as a way to block you or in some cases you will have a narrow window between the defending robot and another robot on the field. This course is designed to help you hone your skills in effectively navigating through a 'narrow window'.

- You will be timed as you show progress, typically you should work to accomplish this in 5 sec +/- 2 sec.
- You should first master driving towards the center obstacle and the backing around it. Once you have done this try spinning around it.



Driver Selection



The students who fulfill the role of official Robot Base Driver, Operator, and Human Player are tasked with a unique responsibility. This responsibility carries with it some of the hopes and dreams of your fellow team members, your alliance partners, and those that support and sponsor Team 2168. Furthermore the drive team bares the partial responsibility of the team to inspire those around them. While inspiration does come through winning, it is not the sole component of inspiration. Adjectives such as committed, respectful, modest, skilled, determined, disciplined, precise, reliable, mature, teachable and communicative come to mind when describing how the drive team should inspire those around them. These are the principles upon which Team 2168's student drive team members are selected.

On FRC Team 2168 we always strive to be better and produce excellence. With that in mind the student drive team operates on a cycle. The goal is to have the same drive team for at least two seasons. This allows us to develop the next upcoming drive team to replace the senior class with a minimum of a year in advance. Thus for those who are not current drive team members and are considering signing up for training, we ask that you be a freshman or sophomore. Special circumstances can require different measures, so if you are a junior do not count yourself out, but realize that preference when the final student drive team members are selected will be given to the freshman and sophomore candidates.

Requirements

From a grade and class point of view, you must be in good standing academically and you are preferred to be a freshman or sophomore in high school. Also realize that this is a demanding role, so weigh this against your schedule and the other activities that you are currently or planning to be involved in.

From a logistics stand point when you request to be involved in driver training, you must realize that you are required to be in attendance for both of team's 3 day regional competitions as well as the possible 5 day World Championship event, which all take place in the March through April time period. Please do not waste other people's valuable time. If you are not sure about your ability to attend all the competitions, talk it over with the driver coach.

From a personal standpoint you should demonstrate at least some of the following character traits, and be willing to develop others.

- Committed
- Disciplined
- Determined
- Reliable
- Honest
- Respectful
- Mature
- Teachable
- Hard Working



From a technical standpoint you will be given the opportunity to learn how to drive and operate the robot and to function as the human player. However you can only be taught so much, beyond this you must possess certain skill sets and work to refine and perfect those skill sets.

Selection Process

The selection of student drive team members is not comprised of a series of written test and driving test. It is an evaluation process that begins at the start of driver training sessions each fall and carries through till 2 weeks before the team's first regional competition. This decision is based input from team mentors and who the driver coach in his/her best estimation will best represent the team on and off the field from a technical, skilled, and character standpoint. The driver combination chosen will represent the best team we have to offer from our current group of students. The driver coach makes the final decision on who will be student drive team members.

Summary

If you decide that you are interested in becoming a student driver team member candidate, talk with your parents first. They have your best interest in mind and will help you weigh all of the factors into making this type of commitment with respect to meeting your educational needs. Also share this driver manual with them, this will give your parents a perspective on the role you need to fill and also the opportunities it will give you. Finally make sure your parents understand that the selection process is much like a sports team. The coach selects the players who will best full fill in his/her best assessment, the needs of the drive team from a skills and a character stand point.



Pre-Match

- a) Report to your coach before each match to review the teams you will be playing with and against. Help to evaluate the teams and determine the appropriate strategy, the coach has the final work on this strategy.
- b) Verify that the robot is ready to go, and ask if there have been any changes that will affect your ability to perform, and go to the appropriate location for queuing.
- c) Manage your time between matches effectively, refresh, review, and prepare.
- d) When directed each member of the drive team is responsible for their role, **the driver** will be assigned to assist the coach with getting the robot on and off the field, **the operator** will be assigned to setting up and removing the controls at the player station, and **the human player** will be assigned to transport the robot to and from the field with the robot cart. The entire drive team should know the entrance and exit points on the field for placing the robot on and removing the robot from the field and use them accordingly. Remember we create an image with everything we do.

Match

- a) Follow your role's requirements and do the best you can, that's all we can ask for.
- b) Keep your eye out for new scoring potentials and strategy shifts.
- c) The clock is primarily the coach's responsibility, if you are not the coach you should not be constantly checking the clock during the regular portion of the match.
- d) Be aware of the different sounds from the field and what they mean in terms of the sections of the match. There is a specific sound at the end of autonomous and at the beginning of the end game, as well as the end of the match.

Post-Match

- a) At the conclusion of every match, please remove the robot and controls from the field as quickly and safely as possible. Report any mechanical or electrical problems to the correct people and report to your coach for post-match review.
- b) Every match will be analyzed for both good and bad points to evaluate strategy changes as well as drive team performance. Video in most cases will be taken of each match so that the drive team's strengths and weaknesses can be viewed and improved upon.
- c) The drive team is expected to spend the remaining time in the stands watching matches to evaluate other teams and alliances.

Elimination Matches



Preparation

The biggest hill to overcome mentally, in elimination matches, is the excitement and anticipation generated from being in them. While it is good to celebrate your accomplishment, celebration can happen when it's over. You must place yourself in a focused state of mind where winning the next match is at the forefront of your mind. Don't attempt to anticipate if you will win or lose to the opposing alliance but rather focus on the strategy and how you can be perfect on the field to lead to a win. Secondly by the time elimination matches roll around you have made it through several practice matches, 8-10 qualification matches, the robot breaking, alliance partners not doing what they said they could, going through pages of data to help generate a pick list, all in all, two very long days up to this point. It is important that once alliance selections have concluded, go 'refuel' and 're-energize'. Hydrate, eat, walk around outside for a bit, clear your mind. Sometimes it might be good to have a clean team shirt to change into, possibly change your under garments. This may seem trivial or unnecessary but a refreshed mind and feeling will go a long way towards your focused success in elimination matches.

Elimination matches are like the 'playoffs', the level of play changes, strategy changes, tactics change, teams become more aggressive. Depending on your team's performance your robot might become a target of heavy defense. The crowd cheers louder, the matches seem to end faster, the air gets hotter, and the expectations are higher. Your state of mind is important, how prepared you are is important. Be charged, be ready, be brilliant, it's the most demanding fun you'll ever have.

Match Process

Elimination matches consist of three groups: Quarter Finals, Semi Finals, and Finals. Each group is a best of three elimination bracket. There are a total of 24 teams making up 8 alliances. Each alliance is comprised of three teams. The bracketing is almost identical to basket ball where in the quarter finals:

1 vs. 8 2 vs. 7 3 vs. 6 4 vs. 5

The winners of each quarterfinal bracket play each other in the semifinals. The semifinals produce two winning alliances. These two alliances compete in the finals with the winner being crowned as the regional champion. In most cases there is not time to return to the pit with your robot during elimination matches, thus you remain in a circuit. A small crew from your team is assembled with tools, batteries, etc. to support the robot mechanically and electrically. The process is very fast passed and requires your complete focus.



Pre-Match

Meet with your alliance partners, driver coach, and head scout to discuss your alliances strategy. Don't be afraid to voice your concerns and ideas. However realize it is your coach's responsibility to make the final call on your team's role in the strategy. Make sure you understand the final strategy and make sure you understand what your teams backup plan is, if certain issues present themselves during a match. Most importantly never underestimate your opponent. Many times powerhouse alliances have been toppled by the most unlikely alliance. Generally speaking teams make their picks because they feel the team they are picking will best complement their alliance. Sometimes these picks are made from good analysis and the resulting chemistry between the teams on the field is surprising. In summary always respect your opponent and play them as if they were the alliance to beat. Above all walk onto the field with a smile, remember you are there to learn and have fun.

Match

Your alliance can only win one match at a time. Follow the strategy chosen, play smart, play hard, play to win. Do not concern yourself with what happens after this match, focus on doing your job in the current match. Most importantly you have already achieved a great deal by arriving in the elimination rounds, don't bite your nails in worry, just go have fun and leave it all on the field. Remember, it takes one match at a time to win.

Post-Match

Until you have won or been eliminated there is no time for celebration or remorse on the outcome. You should always be in mindset of preparing for the next match. Communicate any mechanical/electrical/software issues you encountered during the match to your pit crew. Work with your driver coach, the head scout, and alliance partners to discuss the strategy change if any. Examine where you excelled and where you fell short. Determine how you can improve in both areas. Most importantly be ready to have fun.