

“The Penalties will continue until Morale Improves” ~ A Referee’s Rebuttal

My goal is to examine how the FRC rules & therefore the role of FIRST Referees has changed over the history of FIRST. It’s not to refute the points argued in Jim Zondag’s “Spanking The Children,” but more of another angle on the subject. Apparently Jim & I both woke up on the wrong side of the bed Sunday morning after week 3 Regionals and both decided to write an essay.

In the beginning, the FIRST Robotics Competition (FRC) was small, a few dozen teams, and the games were every robot for themselves. With such a small competition, and primarily limited to a kit of parts that was subcompact compared to the SUV’s that teams get nowadays, primary focus was on individual team strategy & just getting your robot to accomplish the year’s tasks. The referee’s function in these early days was primarily to herd the cats, score matches, make sure teams didn’t go BattleBot on the other competitors, and keep the flow of matches happening. The only penalties were either Disable (DA) for safety, or DQ for unsportsmanlike conduct.

In 1999 2v2 Alliances were introduced, but for two years defense remained a minimal effect on the game. In 2001 the first 4v0 alliance happened, but with no opponents there was no need to play defense. In 2002 we returned to 2V2 & the first “point” penalties were introduced, but rarely utilized – they were per infraction: 1) Warning, 2) -1pt, 3) -3pt, 4) -5pt, 5) DQ. There were also still 7 Disable rules for Safety & 12 DQ for Unsportsmanlike Conduct.

In 2003, penalties per infraction were 1) Warning, 2) Warning, 3) DA or DQ. In these days the drivetrains were almost exclusively Drill or Fischer Price motors, with very substandard & unreliable gearboxes (Dr. Joe’s “Nothing But Dewalts” Transmissions wouldn’t be introduced until 2004). An interesting observation is that in 2003, there were no rematches per (GM3) except for cases of “Obvious Catastrophic Field Failure.” There were still <20 rules regarding robot conduct. Something to keep in mind about 2002 (Zone Zeal) & 2003 (Stack Attack) is that those games necessitated strategies that encouraged high torque & physical pushing matches: In 2002 playing tug-of-war over 100 lb goals, and in 2003 playing “king-of-the-hill.” The escalating violence was a psychological inevitability due to the nature of the game, and because of the referees were powerless to stop actions that were deemed “not extreme enough to DQ”

And this is where I start my refereeing career:

2004: Raising the Bar: Everything changes. The Chiaphua (aka Atwood or CIM) motor was introduced, adding power & reliability teams weren’t seeing with the Drills. 10pt Penalties were added, primarily for potential Safety violations, and formerly DQable offenses such as pinning & goaltending. FIRST also began their quest for automation overcomplication (Autonomous starting in 2003) with “Bonus Balls” triggered by a sensor that would essentially start the game early. The first “Vertical Plane” rule (G28) was initiated as a safety precaution against human player (HP) / robot contact in goal areas, but instead of being able to interpret driver intent, referees were consigned to be garage-door-sensors, watching an imaginary plane & flagging any breach, whether accidental or intentional. There was one rule governing how a robot could score, (G19) which stated that a robot would be penalized for helping the HP score (Only humans could score small balls this year). (G32), the Un-GP rule, which had always been a DQable offense, wasn’t very specific on what was considered a “destructive” strategy, especially after referees had been desensitized to hard hitting robots during the previous two years. I was selected to be an Einstein Referee this year, and remember 469 Guerrillas & 494 Martians attempt to tear each other apart (As I recall I was overruled on handing out DQ’s). There were 33 rules this year. At IRI this year Andy Baker (FRC0045) introduces a “Yellow Card” for (G32) that was judged to be not blatant enough for a DQ (tipping, holding, entanglement).

2005: Triple Play: (G25) now included Ramming specifically, greatly strengthening the ability referees had to prevent robot damage. You would know what ramming was, because your teeth would hurt after a metal-on-metal hit like that. (G17) was the rule limiting robot scoring potential – only one tetra per trip to the human loading zone. FIRST continues their automation silliness with green tetrads that were hard to track in different lighting conditions, such as a competition venue. Penalties were still primarily Safety & UnGP strategies, the one notable one being (G15) a 30pt whopper for “Boarding,” – hitting a defenseless robot while interacting with the HP loading zone. Unfortunately this rule (verbatim “interfere with”) was frequently interpreted to include incidental contact, such as a “whisker” on a robot’s arm tapping against a protected robot. There were 36 rules this year, which became 39 after 10 updates. Incidentally, (G06), which regarded teams staying inside their box, starts being strictly enforced this year, relegating 2 refs to be garage-door-sensors. This job usually goes to the refs that the Head Ref has a problem with.

2006: Aim High: Ballooning up to 48 rules this year, (G22) is the un-GP rule. A focus on zones & “offsides” breaking planes means referees now have to concentrate on watching lines in the carpet more than ever. Even though Bumpers have been around since 2002, the first year they were specifically encouraged was 2005, and 2006 was when they came off the weight limit. This made the ramming call a lot fuzzier, literally, as now there’s not the auditory indicator on what a “hard” hit is. Scoring became a pain – FIRST’s automated ball scoring system, which took the scoring out of the hands of referees & worked perfectly in lab-conditions, could not withstand the rigors of the competition environment, forcing a manual count by additional untrained “scorekeepers” with clickers. Referees also now had to decide in a split second how the game would be played, based on who won the autonomous score, based on untrained volunteers with whiteboards. With all these new duties, not as much focus was placed on G22. Frustrated by what I perceived was a lack of consistency in refereeing, in the offseason I implemented a short “Referee Test” to insure referees at my offseason competitions lived up to a higher standard than regionals.

2007: Rack & Roll: Good news: Refs are now responsible for scoring again. More good news: Fancy computer realtime scoring, which is awesome because you need a computer for the complicated scoring. Bad news: There’s a giant visual obstruction in the middle of the field, making it hard to call (G35) contact rules. Teams are limited to one game piece at a time for the first time ever, and even penalized for more than one. Drivers station penalties are a focus handed down from above. We’re now up to 61 rules. There are 30 different configurations the tubes can be in to be scored, based on 7 different rules. Robots with a tube in hand are immune from the long-standing pinning rules, and as long as an offensive robot isn’t detained for more than 10 seconds at a time, they are allowed to be pinned against the goal as well. But 10 seconds is a long time not to be scoring, & the 3 second grace period isn’t long enough to score & escape. At worst you can effectively hold a robot to placing 4 tubes. This is the beginning of what I consider the Dark-Age of FIRST.

2008: Overdrive: (G22) is the fan favorite of the 57 rules, regulating the specific direction a robot can go around the field (Counterclockwise), and which referees were told to judge harshly. (G26) limits you to one ball, not really a problem when there’s only two of them. FIRST introduces their version of Yellow Cards, which along with (G42) tries to force teams not to play defense, but became toothless due to a loophole in the definition of “Hurdling.” FIRST also does a rollout of an official referee test, but it’s far from comprehensive. I am told that it’s hard enough to fill volunteer spots without having to worry about the quality of said volunteers. (R08) now REQUIRES the use of Bumpers, and so contact outside the bumper zone, which had been coined in 2006, was now official. Incidental contact is presumed innocent, but most referees forget this part. Instead of using upcoming technology like RFID or NFC, FIRST chooses to use IR receivers for scoring that are immediately discarded. The burden of scoring is back on the referees, trying to count robots, flags & balls as they fly by. Incidentally, the field gave off an interesting Pepper’s Ghost effect, preventing teams from seeing their robot at certain locations.

2009: Lunacy: The easy way to prevent robots from playing defense? Force teams to use design constraints that make pushing, ramming, and outside-of-bumper-zone contact almost impossible. Referees are now allowed to Yellow-Card robots for violating Robot Rules, essentially forcing them to be inspectors as well. Prevent HP zone infractions by restraining human players to chairs. Between Pepper's Ghost of '08, & the tongs & seatbelt checks of '09 (Tug on the yellow strap), I felt inspired to go work for Disney. Scoring was taken out of the hands of the refs & given to uncertified scorekeepers. (G18) is introduced to prevent "drawing" penalties, making that a penalty too. We're down to 48 rules for a game about kids playing slow motion tag, and about as fun to watch.

2010: Breakaway: Taking the wrong lessons from the last few years, Ramming is now legal per (G38). In addition to the 1-ball max (G43), we now have rules governing the volume of your robot (G30). Sticking outside of your bumper zone is a penalty. Going wrong way is a penalty. Carrying balls inside your robot is a penalty. Driving over a ball? You better believe that's a penalty (G44/45/46). (G17) sets up an easy DOGMA algorithm to determine scoring:

$$(T_{exp}=T_{sc}-(11+[4*n])).$$

See how easy it is? With this automated scoring system, the referees don't have to ask any questions about the veracity of the score. I SAID DON'T ASK ANY QUESTIONS! THE SYSTEM IS PERFECT! MY LOGIC IS UNDENIABLE! EMERGENCY TEMPORAL SHIFT! Sorry about that... By the way, we're back up to 58 rules, and the end of the Dark-Age.

2011: Logomotion: You had to read 68 rules this year. Safety is no longer a priority, being relegated all the way down to (G26-30). (G48) is back, but it's not a bumper zone anymore, it's a frame perimeter, and ramming is still legal. (G61) still prevents drawing a penalty from your opponents. (G11) is wrong-way during auto, and (G23/G25), though supposed to be used for Boarding calls is used any time a robot sneezes the wrong way at a protected robot. (G32-33) makes Referees watch lines in the carpet again. At least scoring is back to the refs with fancy computers.

2012: Rebound Rumble: The paradigm of FIRST has shifted, at least somewhat. Penalties are now "Fouls" (worth one score) with a second tier "Technical Foul" (worth 3 high goal scores). Ideally this would be to separate the minor foot-faults from the major safety/GP violations. We also have referee hand signals, which seem like a good idea with a few rules, but starts looking like bird flapping at 45 rules. (G22) now limits you to 3 balls. (G16) is wrong way Auton. (G26-27) are your GP contact rules (still no ramming penalty), still with a Yellow attachment. (G14) is inappropriate use of balls to jam up the endgame bridges, also worth Technical & Yellow Card. And in case you wanted to get away with something, (G44) is your Draw penalty, and just for good measure, (G45) is a "Seriously, do I look like an idiot?" penalty for trying to lawyer (G44). Scoring is finally legitimately automatic, which is more than I can say about the FMS on Einstein...

2013: Ultimate Ascent: Technical fouls are now worth 3.3 high goal scores. (G19) is wrong-way auton now, & (G24) limits you to 4 disks. (G29) is the Un-GP contact rule with Technical & Yellow (but still without ramming), and it specified deliberate contact. Scoring is verified at end of game. (G30) is the new improved Boarding rule, not having to break any planes, & thus saving FIRST a lot of money on replacing planes. We're down to a lean 38 rules, and Safety is back to #1 (& #2, 3 & 4)! It's not all good though - Now you're not just penalized for Wrong-Way Auton, you're Technical if you hit anything (G19). You get Technical if your robot doesn't follow robot rules, with a Yellow Letter & (G18) prohibits forcing penalties on your opponents, with a catch: It's now a Capital offense to do so (Technical), Which brings us up to:

2014: Aerial Assist: One wouldn't think that 42 rules would cause so many problems, but it's quality, not quantity. Technical fouls are now worth 5 high goal scores (or 2.5 with one assist each), somewhat high, but when it takes 20+ seconds to score one of those, it can be a killer. (G12) Penalizes you for accidentally possessing an opposing ball, even though this game necessitates balls flying in potentially random directions. (G14) gives you a Technical foul for causing your opponents to take a penalty, swinging the pendulum of justice too far towards the offended, and allowing teams to "Take a Dive." Technical if you touch an opponent in Auton (G15), Technical if you go outside of your Volume too far, Technical for Goaltending, (Ramming is still legal). Even though (G28) says INTENTIONAL contact inside the frame perimeter, I doubt referees have the time or the energy for such nuance, what with the 22 other Technical fouls they have to look out for. (G36) creates a procedural nightmare regarding HOW you can enter a ball onto the field. And finally (G40), likely the creation of liability lawyers that were never children themselves & instead incubated inside a corporate nestegg, creates that vertical plane once again where one casual gesture can cost your alliance 50pts & a match. Oh and that overreliance on the complex automated scoring system is rearing its ugly head again, preventing a smooth cycle from scoring to pedestal to HP, further complicating the issue.

Conclusion

Coming from a history where HP's had to run out onto the field during a match (2003), place Tetras on robots (2005), feed innertubes, floppy pillows, & disks to robots (2007, 2011, 1999, & 2013), treating human players carrying 4 foot diameter balls like 4 year-olds who don't know what "Hot" is, & referees like industrial safety light curtains seems ridiculous. Penalties where referees have to watch a line on the ground opposed to watching for serious robot interactions lead to very disgruntled participants, and unsatisfied, worn out volunteer referees with the potential for a psychoemotional breakdown on the drive home from competition (See: 2008 GLR). Having fewer rules has been a step in the right direction, but attaching 50pt hits to literally half of them is counterproductive. Somewhere along the lines, Yellow cards, originally for Un-GP behavior without enough effect on the match to warrant a DQ, has turned what used to be DQable offenses into half a DQ. (You know, because being unprofessional only ONE time in eliminations is ok). Technical fouls aren't the issue, how and how frequently they are used IS the issue. FIRST has proven it doesn't need 50+ rules to have a good game: As long as the pros from offense completely outweigh the pros of playing a successful defense, FIRST has a good game.

Furthermore, when referees are allowed to use their judgment and not rely on automated gimmickry or complex scoring algorithms, they do better. Whenever I have been asked if I would ref this year, my response is that you'd have to pay me for the privilege, then I go curl up into a ball in a corner whispering "G22... Overdrive... G22..." to myself. The good refs can see the gray areas between the rules. The bad ones aren't, but I think most teams would rather have chaotic good rules rather than lawful evil rules. Referees need fewer, logic-based penalty flags to throw, and teams need fewer potential penalties to receive. The more FIRST tries to control gameflow artificially through rules, the worse the game is. Nobody likes a game with a gazillion penalties. Make a good game, and we'll play a good game. Make a game with a bunch of (R#/G#) band-aids, and you have Lunacy/Breakaway.