

FRC 2026 Scouting Simulation Insights

In the simulation there are 24 robots each with a unique fire rate function.

All the robots are set to the same accuracy

Robot Accuracy	Magazine Size Range	Magazine Hits Error	Fire Rate Hits Error	Volley Avg Hits Error	OPR Error	Weight Based + Max Fire	Weight Based
95%	50-100	7.63%	22.00%	16.32%	20.06%	1.94%	1.54%
90%	70-120	13.86%	20.82%	20.53%	25.86%	1.74%	1.64%
85%	80-120	20.56%	20.56%	26.42%	26.50%	1.59%	1.53%
80%	100-200	28.10%	21.46%	30.93%	26.85%	1.66%	1.68%
75%	125-150	36.17%	20.82%	40.41%	25.72%	1.65%	1.68%
70%	50-150	46.30%	25.72%	52.93%	28.03%	1.80%	1.80%
65%	90-110	57.75%	22.70%	65.93%	25.44%	1.81%	1.81%
60%	60-90	70.69%	26.25%	81.13%	26.94%	2.08%	2.08%
55%	70-150	86.30%	30.51%	92.78%	25.57%	1.92%	1.93%
50%	100-150	104.52%	30.76%	111.75%	25.53%	1.97%	1.96%

25 tournaments with 10 matches per robot 10,000 match maker iterations

Each robot gets a random different accuracy and magazine within the range per tournament (accuracy and magazine size change each tournament)

Accuracy Range	Magazine Size Range	Magazine Hit Error	Max Fire Rate Error	Volley Error Hits Error	OPR Error	Weight Based + Max Fire	Weight Based
50%-100%	50-100	41.91%	28.88%	54.02%	28.30%	11.19%	11.25%
70%-95%	70-120	24.57%	24.63%	31.88%	27.25%	5.04%	5.02%
85%-98%	80-120	11.66%	21.54%	17.74%	26.21%	2.54%	2.45%
50%-75%	100-200	65.02%	27.84%	69.11%	24.80%	6.52%	6.52%
40%-70%	125-150	89.88%	29.23%	93.16%	27.48%	9.30%	9.31%
30%-90%	50-150	89.14%	41.80%	100.12%	31.20%	18.51%	18.55%
60%-95%	20-170	33.29%	33.93%	43.85%	39.84%	7.36%	7.38%
65%-85%	30-130	37.55%	28.73%	47.38%	28.81%	4.52%	4.56%
40%-90%	20-70	65.62%	43.21%	90.42%	33.12%	13.13%	13.41%

25 tournaments with 10 matches per robot 10,000 match maker iterations

All the robots are set to the same accuracy, with Magazine Size Error Chance and Time Inaccuracy (min/max)

<i>Robot Accuracy</i>	<i>Magazine Size Range</i>	<i>Magazine Size error Chance</i>	<i>Time Inaccuracy (min/max) (sec)</i>	Magazine Hits Error	Fire Rate Hits Error	Volley Hits Error	OPR Error	Weight Based + Max Fire	Weight Based
90%	50-100	10%	-0.25-0.25 (0.5)	14.68%	21.91%	23.99%	25.53%	2.24%	2.08%
90%	70-120	40%	-0.5-0.5 (1)	17.27%	21.08%	19.06%	26.57%	3.30%	3.41%
90%	80-120	70%	-0.5-1.0 (1.5)	20.20%	21.42%	19.96%	26.60%	4.25%	4.47%
80%	100-200	45%	-0.3-0.5 (0.8)	32.09%	21.15%	31.46%	28.03%	3.46%	3.52%
80%	125-150	60%	-0.3-0.5 (0.8)	34.00%	20.01%	31.01%	22.89%	4.07%	4.18%
80%	50-150	35%	-0.2-0.2 (0.4)	31.42%	23.60%	33.98%	29.09%	3.20%	3.27%
70%	90-110	80%	-0.3-0.5 (0.8)	55.25%	22.59%	50.98%	24.95%	4.45%	4.66%
70%	60-90	65%	-0.7-0.2 (0.9)	53.80%	23.46%	54.34%	26.08%	3.85%	3.94%
60%	70-150	45%	-0.3-0.5 (0.8)	76.04%	26.91%	76.47%	27.15%	3.43%	3.50%
60%	100-150	25%	-0.1-0.1 (0.2)	74.20%	25.20%	77.41%	24.35%	2.99%	3.02%

25 tournaments with 10 matches per robot 5000 match maker iterations

Each robot gets a random different accuracy and magazine within the range per tournament with Magazine Size Error Chance and Time Inaccuracy (min/max)

<i>Accuracy Range</i>	<i>Magazine Size Range</i>	<i>Magazine Size error Chance</i>	<i>Time Inaccuracy (min/max)</i>	Magazine Hits Error	Fire Rate Hits Error	Volley His Error	OPR Error	Weight Based + Max Fire	Weight Based
50%-100%	50-100	10%	-0.25-0.25 (0.5)	42.99%	29.14%	53.23%	27.35%	11.14%	11.22%
70%-95%	70-120	40%	-0.5-0.5 (1)	29.52%	22.12%	32.71%	26.25%	5.81%	5.80%
85%-98%	80-120	70%	-0.5-1.0 (1.5)	17.95%	21.12%	17.65%	25.64%	4.47%	4.53%
50%-75%	100-200	45%	-0.3-0.5 (0.8)	71.01%	27.00%	70.00%	28.80%	7.30%	7.35%
40%-70%	125-150	60%	-0.3-0.5 (0.8)	100.93%	30.23%	96.05%	25.72%	9.18%	9.22%
30%-90%	50-150	35%	-0.2-0.2 (0.4)	94.83%	41.73%	99.93%	35.02%	18.80%	18.80%
60%-95%	20-170	80%	-0.3-0.5 (0.8)	43.21%	35.22%	43.65%	41.49%	8.51%	8.53%
65%-85%	30-130	65%	-0.7-0.2 (0.9)	44.62%	29.01%	48.09%	29.29%	5.62%	5.69%
40%-90%	20-70	45%	-0.3-0.5 (0.8)	75.08%	42.00%	93.61%	33.57%	14.03%	14.14%

25 tournaments with 10 matches per robot 5000 match maker iterations

Time Based Functions

Each robot gets a random different accuracy and magazine within the range per tournament with Magazine Size Error Chance and Time Inaccuracy (min/max)

Accuracy Range	Magazine Size Range	Magazine Size error Chance	Time Inaccuracy (min/max)	Magazine Shots Error	First Volley Shots Error	Weight Based (Magazine)	Weight Based + Max Fire rate (Magazine)	Weight Based (BPS)
50-100%	20-60	10%	-0.25-0.25	3.74%	22.08%	9.74%	9.49%	14.51%
50-100%	20-60	20%	-0.5-0.5	4.70%	22.63%	11.35%	11.19%	14.72%
50-100%	20-60	30%	-0.5-1.0	5.42%	20.63%	12.46%	12.35%	16.34%
50-100%	20-60	35%	-0.3-0.5	5.98%	24.31%	10.62%	10.66%	13.43%
50-100%	20-60	40%	-0.3-0.5	6.59%	23.13%	11.96%	12.06%	16.02%
50-100%	20-60	45%	-0.2-0.2	7.00%	21.39%	11.66%	11.78%	13.38%
50-100%	20-60	50%	-0.3-0.5	7.26%	21.51%	12.08%	12.17%	13.63%
50-100%	20-60	55%	-0.7-0.2	7.12%	20.68%	12.32%	12.31%	14.94%
50-100%	20-60	60%	-0.3-0.5	7.81%	22.69%	12.12%	12.03%	15.92%

25 tournaments with 10 matches per robot 5000 match maker iterations

Magazine Size Based Functions

Each robot gets a random different accuracy and magazine within the range per tournament with Magazine Size Error Chance and Time Inaccuracy (min/max)

Accuracy Range	Magazine Size Range	Magazine Size error Chance	Time Inaccuracy (min/max)	Magazine Shots Error	First Volley Shots Error	Weight Based (Magazine)	Weight Based + Max Fire rate (Magazine)	Weight Based (BPS)
50-100%	20-60	10%	-0.25-0.25	3.61%	32.43%	10.52%	11.41%	15.01%
50-100%	20-60	20%	-0.5-0.5	4.73%	30.42%	13.33%	13.93%	15.88%
50-100%	20-60	30%	-0.5-1.0	5.57%	29.41%	12.49%	11.64%	17.56%
50-100%	20-60	35%	-0.3-0.5	5.63%	29.33%	11.82%	12.73%	14.49%
50-100%	20-60	40%	-0.3-0.5	6.48%	30.57%	13.02%	12.87%	15.49%
50-100%	20-60	45%	-0.2-0.2	6.51%	31.35%	11.57%	10.80%	16.86%
50-100%	20-60	50%	-0.3-0.5	7.13%	26.98%	11.23%	11.76%	13.88%
50-100%	20-60	55%	-0.7-0.2	7.99%	30.80%	13.28%	13.01%	16.65%
50-100%	20-60	60%	-0.3-0.5	7.80%	35.35%	10.44%	10.44%	15.58%

25 tournaments with 10 matches per robot 5000 match maker iterations

Fire Rate Functions (Time Based vs Magazine size Based)

Time Based (t): The fire rate changes depending on *how long the robot has been shooting*.

Magazine Based (%): The fire rate changes depending on *how much fuel is remaining in the magazine*.

When robot accuracy drops or the scouter makes mistakes every method's error rate increases but the Weight Based + Max Fire and the Weight Based remain both reliable. OPR can still work but only if we have enough matches per robot (with only 10 matches per robot and it resetting every tournament OPR becomes unreliable)

Facts To Notice:

- In the first table (fixed accuracy) the **“weight based + max fire rate”** and **“weight based”** get closer as the accuracy drops, with lower accuracy there is fewer scores compare to the total shots so there is less robots that pass their max-cap meaning the max fire cap matters less and both methods are almost the same.
- **OPR** reliability depends heavily on the number of matches. When OPR did NOT reset between tournaments the error was 12%-14%, however when it did (as it should) and it had only 10 matches per robot the error rate went up to around 26%-31%.
- **Max Fire Rate** is really stable, it stays at around 20%-30% consistently and when spiked it spikes much less then the other methods (not including the two new methods “weight based + max fire rate” and “weight based”).
- **The Magazine Method** is reliable only when the robot's accuracy is above 90% but is good for estimating the number of shots (not hits).

Notes:

- *The two new methods (weight based + max fire rate, weight based) completely dominate the old methods. In the first table (fixed accuracy) they both sit at around 1.5%-2% error rate across every row.*
- *OPR resets every tournament in both tables.*

Robot accuracy 50-100

Magazine size 20-60

Magazine size error chance 10-60