Grid WAR ToDo List

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- **Defining Grid WAR when a pitcher goes longer than 9 innings**
  - ◇ Currently we evaluate such pitchers by taking their runs allowed and truncating their IP at 9. This is not correct.
  - *From Adam Brodie*: For example, we should give Cliff Lee credit for his scoreless 10^{th} inning. The 96.5% chance of the team winning after holding the opponent scoreless through 9 breaks out into something like 95% chance of winning in 9 (made up arbitrary number), plus a 3% chance the game is in a scoreless tie after 9 multiplied by a 50% chance that the team wins in extra innings (I understand the numbers don't add up here, I appreciate this is a quirk of the Poisson approximation, we can ignore that, for purposes of discourse it's more useful to preserve an intuitive 50% WPCT in extra innings than to preserve consistent outcome rates for games where the opponent didn't score through 9) . Now, Lee getting through the 10th scoreless is informative; his team would now be more likely than 50% to win in extra innings, say it's 30% in 10 and then 50% of the complementary 70% Lee's offense doesn't come through immediately, coming out to 65%. That would suggest that rather than the .95 + .5 x .03 = .965 value, his performance would be worth .95 + .65 x .03 = .970. And we can see how this would continue to grow towards some limit should the game have continued to remain scoreless; after 9 innings 97% of instances are determined and the majority of those are wins for Lee's team, 3% of games are undecided, then for each successive scoreless inning Lee records, some portion of the undecided instances get whittled away, with some more wins going to Lee's count.

	Year	Date	Game Type	Pitcher	Team	GWAR	GWAR+	Home Team	Away Team	Off. Factor
4504	2012	2012-04-18	Reg	Cliff Lee	PHI	0.519	0.519	SF	PHI	0
4524	2012	2012-04-18	Reg	Matt Cain	SF	0.519	0.51	SF	PHI	-0.009

  - *From Adam Brodie*: Famous game, Harvey Haddix perfect through 12 game, 5/26/1959, Harvey Haddix allows 1 against MLN over 12.2, Lew Burdette goes 13 scoreless against PIT. So this is one where Haddix actually appears to be penalized for his team's inability to score before extra innings, something we're very explicitly trying to avoid in this framework. If we wanted to truncate the performance at 9 innings, which is a very reasonable approximation, Haddix should be credited with having held his opponent scoreless to that point. His context neutral game-performance win probability is 86.3% compared to Burdette's 96.1%. Based on the plots I'm inferring that these refer to the win probabilities associated with allowing 1 and 0 runs, respectively, through 9 innings. Seems like the sensible solution here in the absence of laborious

machinery to accommodate extra inning performance is to calculate Haddix's performance through 9 IP explicitly rather than to take his RA from his game line and truncating his IP to 9. Given that you're already reporting game exit conditions I assume this is actually a relatively painless extra amount of calculation.

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- **Improving the f grid**
  - Allow different Poisson parameters for each inning. For instance, the first inning should have a higher λ since better batters bat at the top of the lineup.
  - Allow different Poisson parameters for each inning depending on when a starting pitcher is pulled. In particular, middle relievers tend to be worse than starting pitchers, suggesting a higher value of λ for those innings. Closers are often very good pitchers, suggesting a lower value of λ.
  - The distribution of runs scored in a half-inning is not Poisson; more likely it is a zero-inflated Poisson, a more general Conway-Maxwell-Poisson, or a similar distribution on the non- negative integers.
- **Adjust for opponent quality.** Adjust for opponent quality using the full batting lineup of the opposing team, rather than a fixed constant for each team-season.
- **Adjust for fielding.** Perhaps use a version of expected runs allowed that adjusts for fielding, rather than runs allowed, as a base measure of pitcher performance.