



AFTER ACTION REPORT

DATA COLLECTION PROJECT

FINAL REPORT:
An Informal Analysis of Game-play Data from the
Flames of War Community

July 2008

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The *After Action Report Data Collection Project* (AARDCP) is not affiliated with
Battlefront Miniatures Limited or the **Flames of War Miniatures War Game**.

Introduction

Shortly before the “old forum” was laid to rest, there was a thread of near legendary proportions. It started innocently enough, asking a question and proposing possible solutions to a problem that had been observed. The discussion would grow heated from time to time, but in that uniquely *Flames of War* forum manner in which the majority of participants are relatively relaxed. In the end, that particular thread was over 150 pages long. Questions raised in this sometimes serious, often humor laden discussion led to an offer to collect data that could be studied instead of relying solely on anecdotal accounts. Thus was born the After Action Report Data Collection Project (AARDCP).

To be quite frank, I did not expect such a response. I had hoped beyond hope to get to 500 games over the course of just over a year. That goal was met and even a month after the official end date, the reports were trickling in. The final tally at the end of the 390 day collection period was 549 games reported. Not bad for a bunch of guys rolling the bones while pushing lead and resin across felt-covered battlefields.

The end result of the AARDCP is found herein. As I write this, I am still working through the analysis and I am sure that the analysis (by others) will continue after this document is completed. Needless to say, I have found this to be a very interesting experience, both in collecting the data and analyzing the data, but even more so in the interactions with the

FoW community at large. I don't believe I've ever been involved with a friendlier, more helpful, online community than the FoW Forums. It is in this spirit that this report is provided to you.

HOW TO USE THIS REPORT

It is my intent that this report be used as a reference tool, something that goes beyond speculation, anecdotal accounts, and guesswork but does not necessarily replace them altogether. It is a solid piece of information covering a wide range of variables that can help to formulate an educated opinion regarding game mechanics in a general sense. It is not intended to be a definitive answer to any questions. Strictly speaking, data analysis at any level is nothing more than determining if, in this case, actual events will support hypotheses. Such an analysis revolves around the elimination of the perceived variables surrounding the question. The best one can hope for is to narrow down the number of known variables that impact the outcome of a given event.

In the case of this report in particular, a good amount of data will be shared along with some discussion of the analysis itself. This analysis will focus on which variables appear to be the most significant in determining the outcome of a game. This is not to suggest that these variables are the *only* significant variables, but to suggest that, given the scope of this study with this data,

those variables are more prominent than others.

A perfect example of why this data should not be taken as an absolute has more than likely already come to mind for anyone who has given it any thought. In fact, there have been several threads in the past year or so which have touched on this very point. Nowhere does the report pretend to measure the skill of the individual player. It simply can not be done with any amount of certainty. Given that there are at least two players involved in any given game, that fact alone should be enough to make it clear that this data can only be taken to a certain point.

In closing, I wish to thank everyone involved in this mad-scientist project of mine: those who participated in the thread that would not die from which this idea originated, helped to develop the collection forms, participated in the reporting process, spread the word by passing mention in a post, and those who stood silently in support, patiently waiting the final outcome. It speaks volumes for the quality of the game, the players, and the forums as a whole that this project made it all this way. I consider it an honor to be one small part of the whole and I hope to meet as many of you as I can as “belligerents” across the felt fields of *Flames of War*.



The After Action Data Collection Report Project (AARDCP) was conducted in an attempt to identify basic trends within the *Flames of War* gaming community. This process included the investigation into specific aspects of scenario and army list construction and the effect each has on player success. The data included in this study was provided voluntarily by *Flames of War* players using an electronic form posted on the internet as the primary collection method. Data that provided too many validation issues to be handled by such a form were sorted in order to create the requisite population sets for data comparison.

An independent analysis of the complete dataset agreed with the author's analysis of the whole. There

Using online forums provided by Battlefront Miniatures Limited (<http://www.flamesofwar.com>) as the primary communication tool, a thread was established to advertise the project, providing links to detailed information, reporting tools, and quarterly reports hosted on the author's website (<http://www.bardsabode.com/aar.html>). The author's posts on the forums included an image link in the signature line to draw further attention to the project. The thread and signature image were designed to increase recognition and encourage participation.

A reporting form (see Appendix A) was designed to collect basic data identifying

Abstract

Summary of Purpose and Findings

are no specific factors from the data gathered which can be said to consistently predict the outcome of a given battle. This is not to say that one can not find apparent trends, but these trends do not prove to be statistically significant. While a majority of variables were accounted for in the data, it is the opinion of the author (and of the independent analysis) that the outcome is most probably related to the individual players involved over any other variable.

A detailed analysis of the various scenarios

and specific questions posed within the report did not reveal any issues suggesting that the game was seriously unbalanced. This does not imply that there are no issues, simply that when observing game results using the collected data, no significant variables were identified. While there was one instance, the Hold the Line scenario, where it appeared that there may be a slant towards the defender, none of the variables or combination of those variables for which data was collected provided a statistical explanation for this occurrence.

With the collection and analysis of 549 games over a 390 day period, perhaps the biggest contribution this research can provide is a foundation upon which any further research can build.

Methodology

the players and details of each game. The form was created and hosted on the FormLogix website (<http://www.formlogix.com>). Beyond adding newly released sourcebooks to the appropriate validation list, no major changes were made to the form for the duration of the project. Variations were also made available as a fillable .pdf file that produced XML data or in an Excel spreadsheet. The vast majority of reports were completed using the online reporting form.

The study focused on the quantitative

analysis of the data gathered based on measured and definable terminology primarily provided by the Flames of War rules. New or borrowed terminology was used to identify specific populations in the dataset. The primary tools used for creating population subsets were a series of spreadsheets codifying the report data into a series of tables, graphs, and charts addressing the research questions. Using specific aspects of the game, such as era, point value, and force matchups to name a few, statistical analysis (primarily ANOVA and correlation analysis) was used to test the null-hypothesis that in any given game there is an even chance for either player to win.

ACKNOWLEDGEMENTS

There are a lot of people that deserve recognition in helping with this project. The original poster and all of the participants in the "thread that would not die" on the old forums were a catalyst that put this idea in my head. You know who you are! To varying extent, several people on and off the forums helped in the creation of the online form, methodology, and statistical approach. Involvement ranged from offering assistance to finding the site to host the data collection form to trimming out questions that would hamper the collection process. There were play testers who, due to their commitment to play testing, could not give a full measure of participation but reported what games they could and provided moral support. Several times, the project was mentioned on the forums by various individuals that typically encouraged further participation. The sifting of the data was made easier by suggestions by still more individuals, mostly outside of the Flames of War community, on how to better use what tools I had on hand. As my analysis was underway, Martin Nilsson (GUNNM on the forums) was kind enough to offer his help by performing an independent analysis which helped to verify whether or not I was heading in the right direction with my methods.

The biggest thanks, however, can be narrowed to two specific groups of people. First, anyone who participated by turning in a report. There would be no data without you. Second, to the fine people at Battlefront who provided the game that brought everything together to give us the Flames of War miniature wargame. Among those at Battlefront, a special thank to Phil Yates for putting up with my random e-mails over the past year (and then some) regarding this project. I would not have ventured to begin the project without some form of approval from Battlefront (it is, after all, how they make a living) and Phil was gracious enough to encourage me to proceed.

General Results

An overview of the data

A number of factors were studied in the analysis of the game data. Statistically significant findings, however, were uncommon. What follows is a synopsis of observations from the data gathered that appeared to be of some significance in the sample collected. It should be noted that none of these findings can be reliably used as a predictor of a particular battle's outcome.

Overall

A correlation analysis of the various relationships between era, victory points, terrain density, turns played, and points used demonstrated weak relationships at best between any two variables. This held true when sampling only Fair Fights or Defensive Battles separately. The strongest relationship appeared to be a small negative correlation ($c = -0.34$) between victory points and terrain density. This relationship held true when examining only fair fights ($c = -0.30$) or defensive battles in which the attacker wins ($c = -0.39$). All Mid War games combined ($c = -0.37$) exhibited this trend as well.

This negative correlation suggests that a table with dense terrain tends to make for a more closely fought battle in terms of victory point distribution. An examination of all games with greater than 80% terrain density shows that the average victory is still a 5-2 win, demonstrating the weakness of this particular correlation. It is more likely that some other factor or combination of factors is at play.

Free For All

No statistically significant factors were found for the Free For All scenario. However, the data did suggest a few points of interest. In 19 games reported, no tank versus tank battles ended in a draw with only five of these games ending in a 4-3 result. Infantry versus infantry also exhibited similar trends. In 23 games, a victor was most likely to win 6-1 (70.5%)

with only one game ending in a 4-3 score in the absence of a Draw. Six Draw results (26.1%) complete the pattern, showing a 6-1 or a Draw to be more likely than any other result (78.3%).

In keeping with the points of interest above, a generalization can be suggested in how the victory was seized for each matchup. Tank companies will pound each other into submission while capturing the objective from other company types. Mechanized and infantry companies tend towards the Morale victory or a Draw, but an infantry company has an even chance of taking an opposing infantry company's objective.

Encounter

The Encounter scenario showed no statistically significant variables. Of all the scenarios, Encounter raised fewer statistical questions than any other. Perhaps the only noteworthy item is that an Infantry versus Infantry battle is nearly as likely to end as a Draw (44.0%) as any other result. A 6-1 victory (28.0%) was the second most common result. When compared to Free For All, this suggests that the Delayed and Scattered Reserves rule may have a significant impact on the outcome of an Encounter battle involving two infantry companies. Other company match-ups are consistent with those found in Free For All. Data regarding the arrival of reserves, specifically the timing, was not collected, preventing the testing of this specific hypothesis.

A Note on Terminology

To be considered statistically significant, analysis shows greater than 5% probability that a result is unlikely to have occurred due to chance. These items triggered further analysis of correlation, a measure of the strength of a relationship between two variables. If there is a correlation, this shows that a change in one variable is mirrored by a change in another variable. This does not mean that the two are directly related. It only means that there is a possible causal relationship. A causal relationship is where one event (the cause) leads to a second event (the effect) that is a direct consequence of the first event. The risk is in making a spurious correlation where the events appear to be connected but are not, in fact, directly related. For example, one could make the spurious correlation that an increase in people wearing warm weather clothing leads to an increase in ice cream sales. These two are not directly related. They are, however, both connected to a change to warmer weather. This simple example is often used to illustrate how a correlation can be drawn between two items when a third variable is actually at play. It is important to keep this in mind while reading the results as it is possible that variables outside of those collected and analyzed are at play.

There are two basic descriptors used in portions of this report. The P-value from ANOVA analysis was, in part, used to determine statistical significance and will be indicated with the symbol p . When less than 0.05, it indicates a result showing statistical significance. The correlation value is indicated by c . This is a number ranging from 1.0 to -1.0. A result of 0 represents no correlation. A figure closer to 1.0 or -1.0 indicates a positive or negative correlation. A positive correlation suggests that an increase in one variable appears to be linked to an increase in the second variable. A negative correlation suggests that an increase in one variable appears to be linked to a decrease in the second variable. These figures are provided as a reference to the actual statistical analysis to support the strength or weakness of the indicated trend.

Hold the Line

The defender is favored to win with a 2:1 advantage across all battles reported as reflected in the initial comparison of victory points to era, points value, and terrain density. This advantage is defined by defending infantry companies as a whole. With all three variables, Tank v. Tank battles found that attacker victories tend towards a 5-2 score with defenders winning 4-3.

Tanks had the most difficulty when dealing with infantry, going 13-30 (30.2%) in the 43 games reported. When facing infantry, tank companies appear to be at a disadvantage in higher point value games (>1500), losing at a 5:1 ratio. Below average terrain density also appears to favor infantry in these battles, although this is a weak correlation ($c = 0.11455$) so is most likely not a determining factor. In examining this relationship, ambush opportunities were analyzed. It was found that the ratio of defenders with eight or more platoons was consistent regardless of whether the attacker or the defender won the battle. It is significant that there is an observable decrease in the victorious attacker's score as game length (measured in turns) increases ($c = -0.8067$).

Mechanized companies also ran into difficulty against infantry with a 7-18 record (28.0%). The only notable item is the failure of mechanized companies to earn a 6-1 victory ($p = 0.04911$) in these battles.

Infantry versus infantry battles in the Late War era appear to favor any result other than a 4-3 win by either side with no such victories in the twelve games reported, all of which were 1500 point games or larger. When a 5-2 victory is obtained in any era, it is most likely the defender ($p = 0.01852$) at a 2:1 margin. While terrain favors the defender, it is not a significant factor in determining the attacking company's score ($c = -0.1572$) by itself.

Fighting Withdrawal

The timing of the attack relative to the withdrawal of the defender is essential to examining this scenario. The range of scores for the attacker is consistent, but the defender is twice as likely to win a 6-1 victory over a 5-2 or 4-3 victory. This trend is particularly notable ($p = 0.00074$) in tank company versus infantry company battles where infantry enjoys a 3:1 ratio of 6-1 victories over 5-2 or 4-3 victories. The timing of the withdrawal of platoons in danger of breaking or being destroyed is one possible explanation for this trend.

Infantry versus infantry battles favor the defender at a 2:1 ratio ($p = 0.00200$). As with the scenario overall, the 6-1 score is the most likely result for a defender victory, holding steady with a 2:1 advantage over other defender victory results. While all scenarios reflect a general trend for an increase in 4-3 scores as the game length increases, this is especially true ($p = 0.02723$) for infantry companies battling in a Fighting Withdrawal.

Breakthrough

This scenario exhibited no notable statistical irregularities. In 18 battles ending before or at the beginning of turn six, only one was a 4-3 victory. In all games reported as six or fewer turns, only five of the 37 (13.5%) games were 4-3 victories. A full third of all games seven turns or longer resulted in a 4-3 score. When facing a tank company, infantry never suffered a 6-1 loss.

Cauldron

The scenario appears to be well balanced with P-values well within the range of error with $p \geq 0.10194$ in all but three cases. Of the remaining three, only two fell outside the acceptable range. The burden rested on the bloody infantry with 34.1% of all games featuring infantry on both sides of the table. An additional fourteen games (31.8%) featured tanks attacking infantry. All but two of the tank versus infantry battles were 1500 point battles. Ten of these battles (71.4%) were fought on average (40%-60% terrain).

Roadblock

With only nine games reported, no strong conclusions were able to be made regarding this scenario beyond the fact that it was the least played of all of the scenarios. Across the nine games, including at least one game of every matchup except for tank versus mechanized, there were no indications of any statistically significant factors.

EXAMINATION OF ARMORED UNITS IN INFANTRY COMPANIES (IINO/IHAS)

The primary catalyst for this study was the presence and impact of infantry companies with significant armored support. The term most often used on the *Flames of War* forums is **Infantry In Name Only** or **IINO**, the presence of armored platoons in what is deemed by the observing party to be ahistorical, unbalanced, or otherwise unsuitable for an infantry company. While efforts have been made to define IINO in more precise terms, it has been a point of contention. In this report, the author has chosen to approach this question with three related terms.

Infantry with Heavy Armored Support (IHAS) is an infantry company having more than one platoon of fully armored vehicles. This was the primary definition utilized in the research.

The second and third term borrow from IINO and provide two levels of scrutiny. **IINOa** includes all IHAS companies as well as those including a combination of fully armored and open-topped vehicles based on the nature of the supporting vehicles. The most common example is any combination of a tank platoon and a tank destroyer platoon. **IINO b** includes both IHAS and IINOa, adding any infantry company based on any combination of supporting vehicles that, in the author's view, might be questioned. Admittedly a very subjective decision, this included the presence of a presence of heavy tanks such as Tigers, with or without a second armored platoon.

The focus of the question is whether or not such companies gain an advantage in battle by virtue of having a significant number of armored vehicles. To study this question, force descriptions provided by participants were used to determine if a force was to be considered as an IHAS force. These forces were used to determine if there was a significant change in the overall results when comparing IHAS to "regular" infantry companies. As needed, determinations were made to further classify IINOa and IINO b forces to examine their impact on the individual scenario.

Overall

A total of 94 companies were labeled as falling into the IHAS category. Of these, 34 were found in Fair Fight battles, including two battles with IHAS on both sides of the field. Given that there is no true attacker or defender in the Fair Fight battles, these were discarded as being insignificant to the question at hand. A brief summary of their participation is included in the appropriate section below. The remaining 60 companies make up 5.46% of all companies reported. Fighting Withdrawal battles hosted the largest number of battles involving IHAS forces with 19 games (22.1%) of the 86 games reported.

In examining the five core defensive battles from the rulebook as a whole, the defender's win percentage increased from 56.2% to 62.5%, a difference of 6.3%. Sixteen of the battles involving IHAS forces included the IHAS force as the attacker against a non-IHAS defender. An additional sixteen battles pitted a non-IHAS attacker against an IHAS defender. Two further battles included IHAS on both sides of the battlefield. The three categories combined show the attacker's record as 14-20 (41.2%). Removing a 5-11 record with IHAS as the defender, IHAS attackers held a 9-9 record versus infantry of any type.

IHAS forces were split between the eras with 36 battles fought in Mid War and 54 fought in Late War. Respectively, these forces were included in 22.2% and 24.2% of all battles involving infantry forces for each era.

Free For All

Tank companies defeated IHAS infantry with a record of 5-1-1, compared to going 8-8-6 against regular infantry, a shift of 16.7% in the win column. Against Mechanized forces there was little change with IHAS forces holding a 2-1-0 against the regular infantry record of 4-5-3. IHAS infantry lost both battles against regular infantry. Two battles were fought with IHAS forces on both sides, resulting in a victory (rather than a draw) each time.

A total of 4 IHAS forces fought in Mid War with 13 being fielded in Late War. These forces engaged in 16.0% and 30.9% of the battles involving infantry in each era respectively.

Encounter

IHAS infantry in Encounter were 3-7-7 overall, holding their own against tank (2-2-3) companies while faltering against mechanized (0-2-1) and regular infantry (1-3-3). A total of 4 IHAS forces fought in Mid War with 13 being fielded in Late War. These forces engaged in 16.0% and 30.9% of the battles involving infantry in each era respectively. The era split matched that for Free for All.

Hold the Line (15-4)

Through 18 battles, IHAS forces were involved in eight Late War and 10 Mid War conflicts. Tank and mechanized forces were defeated 5-1 and 4-0 respectively. Attacking IHAS against defending regular infantry was 1-1, while on the defense, IHAS was 4-1. One battle included forces on both sides with the attacker winning (resulting in a win/loss total of 19 games).

Examining the reported force builds submitted, an additional 14 IINOa forces and 24 IINOb forces were identified, sometimes matched against one another. IINOa forces were a combined 7-6 while IINOb forces were 14-18. Removing one, two, or all three classifications from the results had a minor impact on the overall Hold the Line record of 47-81 (36.7%). Removing IHAS improved the attacker's record by +.1%. Removing IINOa and IINOb created a -1.9% and -2.3% change in the attacker's record respectively. Without any of the three categories included, the attacker's record on Hold the Line is 25-49 (33.8%), a change of -2.9% overall.

Isolating the infantry versus infantry matchups, the removal of the IHAS related battles has little impact on the overall results with attacking infantry dropping from a 14-20 record to 9-14, a loss of 2.1% in win percentage. While IHAS attackers appear to fair better at 4-1, the defender record of 2-5 is not significantly different than the trend for the scenario as a whole.

The same approach used with IINOa (which includes IHAS games) shows a similar trend. The 14-20 records drops to 7-13, a loss of 6.2% in win percentage. The most liberal category, IINOb (inclusive of both IINOa and IHAS), brings the final regular infantry attacker total to 5-9, a loss of 5.5% in total win percentage.

Fighting Withdrawal (12-8)

Nineteen battles involving IHAS were waged using this scenario. Against tank and mechanized forces, they held an even record of 2-2 and 1-1 respectively. When attacking regular infantry, they also held even at 3-3. When defending, the IHAS forces were 5-1. One Late War battle witnessed IHAS forces on both sides of the fight with the attacker winning (resulting in the win/loss total adding up to 20 games).

In addition to the IHAS companies, 17 IINOa and 20 IINOb companies were fielded based on a subjective analysis of the force lists provided. IINOa forces earned a 9-8 record with IINOb forces managed an 11-18 record. It was not uncommon for the various classifications to meet each other in battle with one IHAS versus IHAS battle, and ten battles total between variants of IINOa and IINOb. Removing any battles including the three classifications from the overall record resulted in a 24-16 (60%) record for attackers in Fighting Withdrawal. The removal of IHAS alone improved the attacker's record by 3.4%. Removing IINOa and IINOb changed the attacker's record by .9% and 5.6% respectively. The apparent increase caused by IINOb reflects the absence of any mechanized versus Infantry matchups, leaving mechanized attackers with an 8-0 record after removing anything qualifying as IINOb.

An isolation of infantry versus infantry forces was consistent. Removing the IHAS forces from the equation had limited impact on the infantry versus infantry battles, resulting in a drop in the attacker record from 10-21 to 6-13, a change of 0.7%. Defending IHAS infantry did enjoy a 1-5 record, but given the sample size, this result was within reason. Neither IINOa nor IINOb removal produced a significant change in the infantry versus infantry record. With attacker win percentages of .321 and .304 respectively, they each compare favorably to the regular infantry battles at .375 and the overall infantry attacker record of .323.

Breakthrough (6-8)

Fourteen battles were fought with IHAS forces involved. These resulted in an 0-3 record against tanks and a 1-0 record against mechanized forces. In five games each, the attacker was 3-2 regardless of which role the IHAS force had in an infantry versus infantry battle. There were

seven battles fought in both the Late War and Mid War era.

Cauldron (0-4)

Three Late War and one Mid War battle was fought by IHAS forces in this scenario. Against tanks, IHAS infantry was handed one loss in each era while they lost two battles while attacking regular infantry in Late War.

Roadblock (0-1)

Only one battle involving IHAS forces was fought in this scenario. The Mid War era fight ended with Attacking IHAS being defeated by regular infantry in defense.

Discussion

The following discussion is provided as a plausible interpretation of the data analysis as a whole and on specific subjects which entered the research conversation.

Discussion of General Results

As has been noted, what is most likely the most important variable in game play is not accounted for in the data collected: player skill. Examination of the game as a whole or broken down by scenario does not suggest any underlying issues with game balance. A notable exception is in the Hold the Line scenario where infantry in defense appears to have an edge. However, even in this instance, only one of the major variable comparisons resulted in a finding of statistical significance. This occurrence, the decrease of the victorious attacker's score with the increase in game length, is to be expected given the arrival of the defender's reserves beginning with turn three. The same trend is seen across the game, but not to the level of significance demonstrated by this dataset.

Regarding the major variables observed,

era did not appear to have a significant impact on the outcome of the game in any scenario with one exception noted above in the Hold the Line scenario. Neither point values nor turns presented notably significant trends. Point value extremes, especially low point value games, do see an increase in higher victory point results for the victor, but not at an unusual rate. Turns played, as previously noted, can be used, at best, to suggest that a longer game is more likely to result in more casualties on the battlefield. This is more a result of game play than scenario or point value choices rather than a pre-existing trigger that determines the outcome and such variation is to be expected. Terrain density appears to provide some benefit, but not to the extent of being a deciding factor. Extremes on the terrain spectrum (less than 20% or greater than 80%) do demonstrate some variance, but this analysis does not include an examination of how the terrain is used by the player. While it can be said that more terrain is better, it can also be demonstrated that too much terrain has a similar effect on game play as terrain that is too sparse.

Discussion of IHAS Results

There was no significant change in the ability of an infantry company to claim victory based solely on the availability of armored support. Regardless of the definition used, the impact of infantry with more than one armored platoon in support (with extreme consideration given as far as one Tiger tank in support) is limited over the whole of the dataset.

The apparent increase in defender victories by +6.3% when removing IHAS battles from the examination of Defensive Battles can not be attributed to IHAS force involvement. While Hold the Line and Fighting Withdrawal games involving IHAS reflected a defender advantage (attacker records of 8-14 and 7-12 respectively), the remaining Defensive Battles presented

IHAS AND TOURNAMENTS

The following observations on tournament play reports including IHAS forces are not meant as formal analysis but are being provided for general enlightenment.

- Tournament play included 29 games reported as IHAS forces (15% of the 193 reported overall) two of which pitted two IHAS forces against one another
- 18 Defensive Battles included IHAS forces, one with IHAS on both sides
- 9 Hold the Line battles were fought with attackers holding a 1-8 record. tank v infantry (1-4), mechanized v infantry (0-3), and regular infantry v defending IHAS Infantry (0-1)
- 5 Breakthrough battles resulting in a 3-0 record for tanks attacking and two wins in infantry versus infantry battles, one each for regular and IHAS infantry companies
- 4 Fighting Withdrawal battles, all infantry versus infantry, resulting in a 4-0 record for IHAS defenders with one battle fought against an IHAS attacker

a combined attacker record of 14-5. The result of removing IHAS battles from the overall equation is a loss of 29 attacker victories to 31 defender victories over 60 games in all. This represents a 16.5% decrease in the number of Defensive Battles being considered, making each remaining game worth 0.3% of the whole requiring only a 21 game swing either way to produce a difference of 6.3%. This is easily covered by the remaining Hold the Line games (39-67) with a 28 game swing in favor of the defender without the inclusion of IHAS forces. Without including any of the three categories defined, Hold the Line still presents a 24 game swing (25-49).

While IHAS (and similar lists) has been determined to be statistically insignificant, some consideration should be given to how these forces are used. The vagaries of player skill, army choice, and other immeasurable factors not examined here should be left to more tactical and/or philosophical discussion with the understanding that the force list is only one part of the equation.

AIR SUPPORT

Over the games reported, 122 games (22.2%) included some level of air support usage. Fifteen of those games included air support on both sides bringing the total number of air-supported companies to 137 (13.7%). No discernable patterns in regards to usage or game impact could be determined beyond the fact that air support slowly became more common in the reports as time progressed.

BREAKTHROUGH AND TURN LIMITS

A question was raised on the forums regarding the possibility of adding a time limit to the Breakthrough scenario (Subject: Should Breakthrough Have a Turn Limit, April 2008). The information here is a follow-up to that thread.

For Breakthrough, 67 games were reported with 39 going to the attacker (58.2%). All of the matchups were virtually even except for those between tanks and mechanized companies, and mechanized versus mechanized. In both of these, the attacker maintained an advantage going 9-1 overall (6-1 for attacking tanks, 3-0 for attacking mechanized forces). That leaves all other matchups with a 30-27 attacker record. Of these remaining matchups, only in tank versus tank matchups (7-5 for attacking tanks) was there a margin of more than one win separating the roles.

In regards to the tank versus mechanized reports, none of the games reported were tourney related. All but one ended before the end of the sixth turn (as did all of the mechanized versus mechanized battles), the exception going 12 turns. Terrain was consistently reported as average (40%-60% density) or greater with the aforementioned 12 turn report not reflecting terrain density. The game won by the defender was noted as having "ended due to time constraint" after three hours of play and it was "definitely undecided" when it was called.

In all, with four unreported game lengths, only 17 games (25.4%) went eight turns or longer. Eight of these were during tournament play. Only five were reported as not being at least average terrain density. In the longer games, the attacker was 10-7, with both roles taking a 6-1 victory once.

While not a definitive study, these facts suggest that the scenario is well balanced and that an increase in game length does not, by itself, significantly impact the outcome of the game.

Conclusions

Use of the data collected to determine a winner is akin to predicting next week's weather. It is possible to provide a rough estimate of a chance for rain, but not for a particular location or amount of precipitation. In any given battle each player introduces a set of variables for which it is difficult to account: experience, rules knowledge and comprehension, customized army list, tactical decisions, and general temperament just to name a few. For every game, you have two complete set of "player variables" that range from very similar to quite different. Combine those variables with a similar range of terrain variables (beyond simple density) for each table and it quickly becomes apparent that it is quite difficult to create generic classifications by which one can accurately suggest a given outcome for a given scenario. In order to control this multitude of variables, one would need to find two players willing to play the same

scenario on the same table using the same forces time and time again. Of course, you would then have to factor in a certain level of learning for each player as they discover patterns in the play of the opponent and resolve their own tactical questions. In short, there is most likely no consistent model to cover all of the circumstances that may arise.

While some basic trends are suggested in the analysis, as a whole the Flames of War game is balanced to the point that the player is likely the most significant factor in the outcome of a given battle. There is limited indication that certain scenarios favor one role over another, but this may be attributable more to player variables than scenario variables. It is possible that these indicators could be used to formulate an approach to tournaments that includes some way of balancing out any perceived imbalance, such as having

each player attempt both roles in that scenario if possible.

The author would caution against the use of this report alone to make any determinations. One might conclude, for example, that Roadblock needs to be corrected or thrown out based on the games reported showing a heavy slant towards the defense role. However, at only nine games, personal experience with the scenario may be just as valuable if not more so than the information contained here. It should definitely be stated that the scenario should be given more than a couple of chances to prove itself as each scenario does present a different of problems and, therefore, each has its own learning curve. A similar argument could be made for a given force list. Familiarity with the tools at hand be, they scenario rules or particular platoon options, is a factor that should be considered.

Research Issues and Opportunities

In collecting research data, there are many issues that must be faced. With such a large number of variables, decisions were made that restricted the analysis to overarching issues concerning the game. There are simply too many variations in force composition to collect valid data without a highly concerted effort by a dedicated group of gamers willing and able to complete a rather extensive survey regarding each game played. Given the scope of this particular project, it was decided very early on that simpler was better. With that in mind, the following observations and suggestions are made to assist any who decide to undertake further research.

While the online form (and the alternative methods) worked well, there are many areas of the form that could be greatly enhanced. Ideally, the form would be online and linked to a database to allow for full validation of the information input as well as providing participants a way to access a report summarizing the data they have personally entered. Properly built, such a system may in itself be a motivator for participants who could use it to track their personal game data.

More specificity is highly recommended so long as it does not threaten participation rates. Form validation should include detailed information from company list to platoon types if deeper analysis as to general army builds is to be attempted. Definitions of some non-game terminology would also be useful, including providing sample images to illustrate terrain density which, in turn, may benefit from more detailed range options being made available.

A large quantity of data can be collected from tournaments. This was the largest missed opportunity for the AARDCP. Early efforts were not followed up and the author would recommend that this be made the first priority of any future endeavors.

Indeed, an online, database driven form as previously discussed could provide the answer to this dilemma without overly taxing tournament directors or other volunteers.

In defining the players and forces, a few additional changes are suggested. The form for this project asked for a "player 1" and "player 2". Asking for the "attacker" and "defender", with the attacker being the player going first in Fair Fight scenarios, would make it easier to quickly use some statistical models. For the Defensive Battles, this determination can be corrected in the data, but the need for this manual operation should be eliminated if at all possible.

Forces may be defined in any number of ways. Options that should be considered would be defining the force by percentage of points spent on tanks, infantry, etc, by number of platoons of predefined type, or by any other method that helps to identify the basic makeup of a force without the need for rigorous translation of descriptions to values. The key is to keep it as simple as possible to encourage form completion.

The timing of reserves, ambushes, and air support use was not made available. While this information could be very interesting, the collection of the details needed to properly analyze these variables would be very involved. If a method could be created to quickly and accurately record and report these instances, a new facet of war gaming research could be introduced.

An important aspect of game analysis is the collection of an indicator of how experienced the players are in terms of miniature war-gaming. This was considered and actually attempted very early on, but in the format used, it was rejected as being overly complicated. However, referring again to the theoretical database above, if the reporting player only

had to report his own "experience level" once while registering with the database, there would be no need for repetition. Collection of that player's opponent's experience is a different matter entirely. A simple checkbox for relative experience or assumed experience should suffice. Obviously, how experience is measured would need to be carefully defined, a problem in it's own right. In creating such a measurement, the recommended approach would be a creation of general categories (novice, experienced, and expert) which could be used in a general analysis. Other indicators of experience could also be gathered (games per year, estimated win percentage, etc.) to possibly break out the general categories into smaller groups. Finally, the data collected itself could be used to validate categorical placement.

Beyond these suggestions, there are additional ways that one might pursue further research on this topic. A qualitative analysis could be performed based solely on the After Action Reports posted on the Flames of War forums. Qualitative analysis could also be performed based on many of the posts found on the forums, but one must use caution to determine what variables are actually at play when doing so. Also, if further study is done, it may be possible to conduct a comparative study of this and other projects in the future.

In closing, it should also be noted that, with a bit of record keeping, it is possible for individual tournament directors to collect a large quantity of data that is specific to their locale. Further research would be enhanced through the creation of a method(s) for coding tournament results quickly and easily. The most important aspect would be to ensure that the coding is as consistent as possible between as many venues as possible to allow for future research to be conducted on a larger scale.

APPENDICES

The remaining pages of this report provide a sample of the data collection form and a variety of tables, charts, and graphs designed to share the raw data in an accessible format. The final, validated format of the data is also included as a reference. Some of the information, mostly personal and force list information has been omitted.

Appendices not included in this file to keep file size to a minimum.