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U.S. ARMY

CAA-2012112

Center for Army Analysis

IRREGULAR WARFARE STABILITY MODEL

JANUARY 2014

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REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*
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1. REPORT DATE *(DD-MM-YYYY)* January 2014	**2. REPORT TYPE** Final		**3. DATES COVERED *(From –To)*** Feb – Jul 2012
4. TITLE AND SUBTITLE Irregular Warfare Stability Model IWSMod			**5a. CONTRACT NUMBER**
			5b. GRANT NUMBER
			5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) LTC David A. Smith			**5d. PROJECT NUMBER**
			5e. TASK NUMBER
			5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Center for Army Analysis** **6001 Goethals Road** **Fort Belvoir, VA 22060-5230**			**8. PERFORMING ORGANIZATION REPORT NUMBER** CAA-2012112
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) None			**10. SPONSOR/MONITOR'S ACRONYM(S)**
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION / AVAILABILITY STATEMENT **Distribution A.** Approved for public release: distribution unlimited.			
13. SUPPLEMENTARY NOTES			
14. ABSTRACT A power law is a special kind of mathematical relationship between two qualities. When the frequency of an event varies as a power of some attribute of the event, the frequency is said to follow the power law. Further investigation of this phenomenon has shown that certain casualty rates during a stable phase of an irregular war seem to also follow approximate power law distributions. If there is enough evidence that this phenomenon is true, then it may be possible to develop a metric to describe the stability of an irregular war. For our case we will take a given violence distribution and see how close that distribution is to the power law. The coefficient of determination will provide the metric and the closer it is to one, the more stable the violence.			
15. SUBJECT TERMS Stability, Assessment, metrics			

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON** Mr. Russell Pritchard
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			
U	U	U	UU	**44**	**19b. TELEPHONE NUMBER *(include area code)*** (703) 806-5421

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

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IRREGULAR WARFARE STABILITY MODEL

SUMMARY

THE PROJECT PURPOSE
When conducting assessments, commanders look for metrics to determine how the mission is progressing. One of the metrics used in irregular warfare is the level of insurgent violence, where the lower the current level, the better the situation is on the ground. This method can fall prey to recency bias, which is the tendency to weigh recent events more than earlier events. To prevent this, a method is needed to evaluate the current violence trend. Was the recent mass casualty attack a timely insurgent strike? Were the last 3 weeks of quiet days merely a lull as insurgents rearm and regroup? This study produces a trend assessment that can be used by commanders to measure progress.

THE PROJECT SPONSOR
The project was sponsored internally as part of the Irregular Warfare (IW) Wargame improvement.

THE PROJECT OBJECTIVES were to:

(1) Create a stability metric to be used on assessments and mission planning.

(2) Integrate the metric into the CAA IW Wargame.

THE SCOPE OF THE PROJECT: The dataset was taken from the following conflicts:

Korean War
Vietnam War
Operation Enduring Freedom (Afghanistan)
Operation Iraq Freedom (Iraq)
British in Northern Ireland
Malayan Emergency

THE MAIN ASSUMPTION
The distribution of violent acts at many different conflicts can be described by a common distribution.

THE PRINCIPAL FINDINGS are**:** The power law distribution is sufficient for describing stable violence in an irregular war. The closer the actual violence is to the power law description of the violence, the more stable the irregular warfare situation.

THE PRINCIPAL RECOMMENDATIONS are:

(1) Introduce the coefficient of determination metric to commanders.
(2) Attempt to integrate the metric into irregular warfare gaming and planning.

THE PROJECT EFFORT was conducted by LTC David A. Smith .

COMMENTS AND QUESTIONS may be sent to the Director, Center for Army Analysis, ATTN: CSCA-OA, 6001 Goethals Road, Suite 102, Fort Belvoir, VA 22060-5230

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1 INTRODUCTION

A power law is a special kind of mathematical relationship between two qualities. When the frequency of an event varies as a power of some attribute of the event, the frequency is said to follow the power law. Many collective human activities, including violence, have been shown to exhibit universal patterns. There is evidence that the distributions of a wide variety of physical, biological, and manmade phenomena follow a power law, including the sizes of earthquakes, craters on the moon, and of solar flares, the foraging pattern of various species, the sizes of activity patterns of neuronal populations, the frequencies of words in most languages, frequencies of family names, the sizes of power outages, and wars. Further investigation of this phenomenon has shown that certain casualty rates during a stable phase of an irregular war also seem to follow approximate power law distributions. If there is enough evidence that this phenomenon is true, then it may be possible to develop a metric to describe the stability of an irregular war. For our case we will take a given violence distribution and see how close that distribution is to the power law. The coefficient of determination will provide the metric and the closer it is to one, the more stable the violence.

1.1 Background

When a nation allocates valuable resources towards a military campaign, national leaders might require an assessment as to know how the campaign is progressing. To measure progress, analysts have developed metrics. Metrics are measures of an organization's activities and performance, and they should support the range of missions and campaign goals. Compared to irregular warfare, conventional wars offer relatively straightforward metrics, such as the quantity of land occupied by the various forces. The closer Allied forces were to Berlin and Tokyo, the closer the nation knew it was to the end of World War II. The unconventional battlefield, however, offers fewer obvious indicators of winning or losing. Therefore, viable metrics are a more challenging aspect of assessing irregular warfare.

Good metrics are observable indicators. They are detectable events within environments that indicate progress towards, or away from, identifiable goals. Developing effective metrics has been a challenge for military staffs. Upshuer established that metrics must track three distinct but closely related elements. These elements are; trends in the war (i.e., how the environment, the enemy, the population and the indigenous government are changing); progress against the campaign plan and the overall strategy, including validation (whether we are doing the right things) and evaluation (how well we are doing them); and performance of individuals and organizations against best practice norms for counterinsurgency, reconstruction and stability operations.

The most obvious metrics are based on quantitative measures. Metrics have counted everything from violent acts to number of people in the local markets, all in attempts to make correlations to overall conditions on the ground. Unfortunately, correlation does not imply causation. This is especially true when the connection is developed using data that were collected over relatively short periods of time. If correlations are only observed in one particular conflict and not tested in others, then it is possible that factors common only to the one conflict are the major influences in the causation. In order to minimize this possibility, it is better to test causation against as many datasets as possible in order to try and eliminate effects common to only one war. One way to do this is to seek a numerical distribution that holds true to more than just a few conflicts. In this case, the power law distribution is surmised to show stability in an irregular conflict.

1.2 Problem and Purpose

Currently, most metrics are either quantitative measures of available statistics or subjective scales that require qualitative judgment. These two types of metrics are combined in order to present an overall stability picture of the campaign. Despite the fact that the overall picture contains some quantitative measures, currently the overall stability picture is based on subjective judgment. Subjective judgment is often inconsistent as the judgments come from many different sources whose perspective and longevity in theater usually differ. Also, these subjective judgments are often subject to recency bias. Recency bias is the tendency to weight recent events more heavily than earlier events.

The purpose of this study is to develop a consistent metric that negates the effects of recency bias and inconsistent subjective judgments. This metric, based on historical data distributions, will provide insight to when conflicts are stable enough to withdraw intervening forces. This metric could also be used as a stability score to analytic products such as wargames. Most importantly, it would show decision makers how the situation on the ground is changing.

1.3 Literature Review/References

- Bohorquez, Juan, et al.,"Common ecology quantifies human insurgency." *Nature*, pp. 911-14, December 2009.
- National Archives. Records of military personnel who died as a result of hostilities during the Korean war, October 1977. http://aad.archives.gov/aad/.
- National Archives. Records on military personnel who died, were missing in action or prisoners of war as a result of the Vietnam war, January 1998. http://aad.archives.gov/aad/.
- R.L. Green. "Sources of recency effects in free recall". *Psychological Bulletin*, (99):221-228, 1986.
- icasualties. "Casualties from Iraq and Afghanistan", 2012. http://icasualties.org/.
- Register of Cemeteries and Graves. Malayan roll of honour, October 2001. http://www.britains-smallwars.com/malaya.

Figure 1. Literature Review/References

Using the power law to help quantify insurgent violence was first highlighted in Bohorquez's work. He proposed that violence in all conflicts follows a power law distribution. The datasets for this paper came from three areas. The National Archives of the United States has an extensive database available with daily casualty figures from for the Korean and Vietnam Wars. The iCasualties.org website provided data for Iraq and Afghanistan. The Malaya dataset was extracted from the Malayan Roll of Honour within the Britain's Smallwars website. Northern Ireland data were collected from Malcolm Sutton's work on the conflict.

1.4 Key Definitions

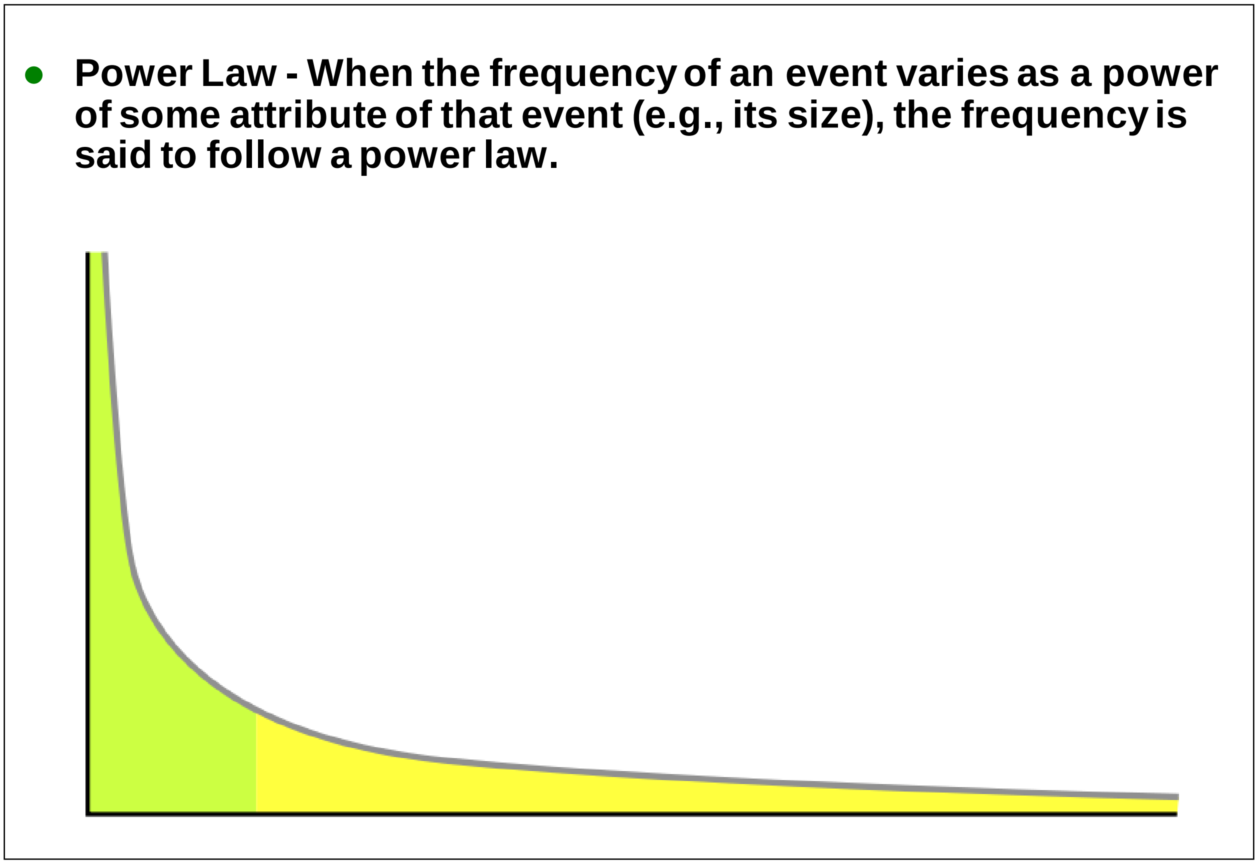

Figure 2. Key Definitions

As seen in Figure 2, a power law is a mathematical relationship between two quantities. When the frequency of an event varies as a power of some attribute of that event (e.g., its size), the frequency is said to follow a power law. Power-law distributions are ubiquitous in biological, physical, and social systems. Power-laws can be considered a signature of behavior found in some complex systems. The magnitude of earthquakes and forest fires, for example, follow a power-law distribution. Compared to many statistical distributions power laws decrease more gradually—they have “fat tails”. The tail of a distribution is the part that is far from the central peak (if there is one). There is a certain randomness associated with the law, but it holds that smaller size events happen more frequently than larger size events. This can be expanded to say that most times nothing much happens, but occasionally, out on the long tail, a large size event occurs. This paper asserts that if this law is followed, a natural stable order exists. When actual events move away from the power law distribution, then it indicates a period of instability. If this assertion proves reasonable, then there are ways of comparing the actual distribution to an established power law distribution. The more similar the current situation is to the power law, the more stable the situation.

1.5 Scope

Measuring violence is a common way to measure progress in an irregular war. The challenge is to determine what metric would be used to measure violence. In Iraq and Afghanistan, extensive effort was put into collecting data that included collecting reports of "significant activities" or SIGACTs. SIGACTs include known attacks on intervening forces, indigenous security forces, the civilian population, and infrastructure. The complexity and effectiveness of these attacks vary. They can range from a single insurgent firing a single shot causing no casualties to a highly coordinated complex attack using two or more weapon systems. Advances in technology have allowed these reports to be extremely detailed and have simplified data collection and retrieval. However, previous wars did not have such an evolved system to collect such data, so any robust dataset is limited to the two recent wars.

Any historical investigation requires using a much sparser dataset, with data principally provided from archived information. The most reliable information is provided on intervening and indigenous security force casualties. Determining the number of insurgent casualties is difficult as there are few verifiable official data sources available. This leaves analysts unable to utilize the current abundance of data when conducting historically based analysis and forces us to choose a metric based on security force casualties.

1.6 Power Law and Violence

Many collective human activities, including violence, have been shown to exhibit universal patterns. There is evidence that the distributions of a wide variety of physical, biological, and man-made phenomena follow a power law, including the sizes of earthquakes, craters on the moon and of solar flares, the foraging pattern of various species, the sizes of activity patterns of neuronal populations, the frequencies of words in most languages, frequencies of family names, the sizes of power outages and wars. The size distributions of casualties in whole wars 1816-1980 and terrorist attacks have separately been shown to follow approximate power-law distributions. Further investigation of this phenomenon has shown that certain casualty rates during a stable phase of an irregular war also seem to follow approximate power-law distributions. If there is enough evidence that this phenomenon is true, then it may be possible to develop a metric to describe the stability of an irregular war. For our case we will take a given violence distribution and see how close that distribution is to the power law. The coefficient of determination will provide the metric and the closer it is to one, the more stable the violence.

1.7 Essential Elements of Analysis (EEAs) and Measures of Effectiveness (MOEs)

The first step in the analysis is to determine whether there is enough evidence to use power law to model irregular warfare violence. Once a connection is established, the next step is to investigate any difference between conventional and irregular warfare. After investigating differences, the next step develops a way to compare distributions. In this case, the coefficient of determination was tested to determine if it could be used as a comparison tool. Finally, the last step was to display the data in a way that decision makers can understand.

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2 HISTORICAL EXAMPLES

To determine if using the power law is an appropriate way to model irregular warfare violence, actual data from historical examples were plotted on a bar graph and compared to a line graph that was created using a generalized power law distribution. The closer the similarity between the bar graph and the line graph, the closer the actual data are to the power law distribution.

2.1 Korea

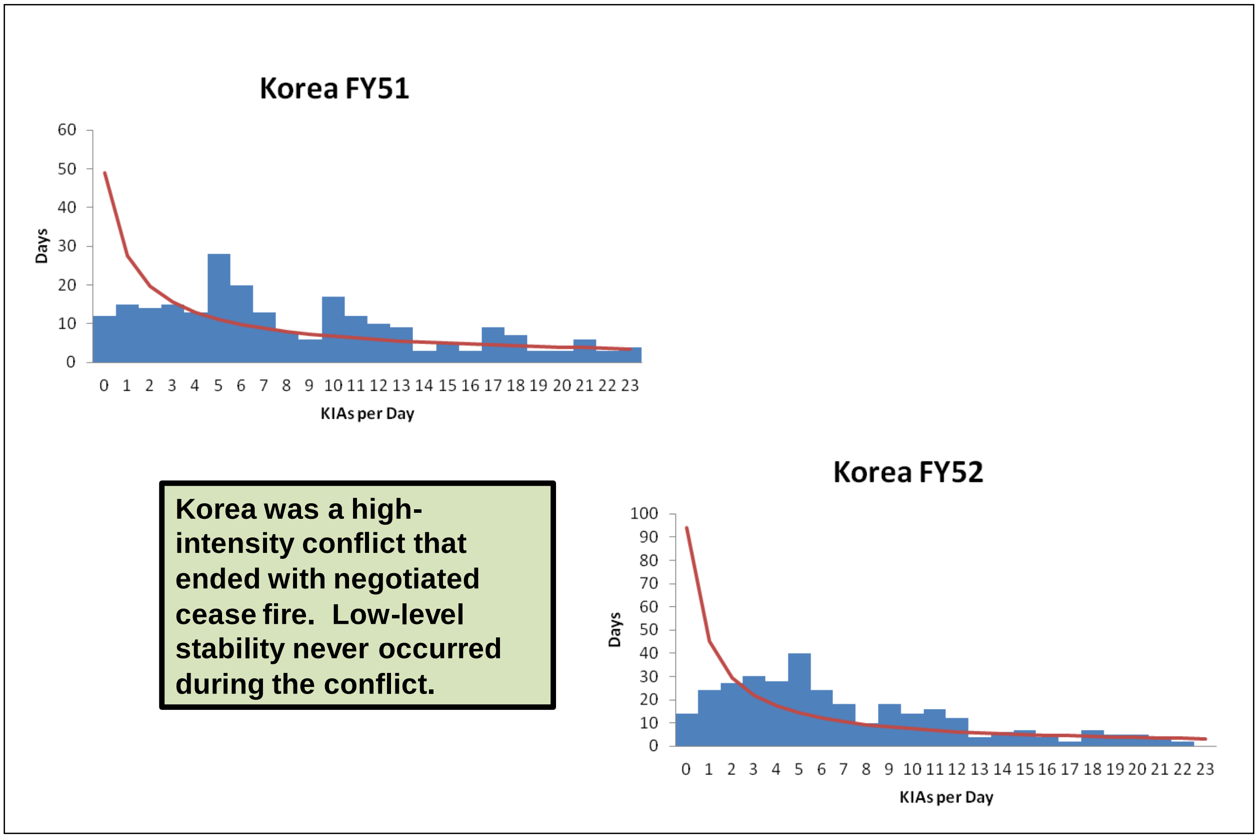

Figure 3. Korea

Korea was a major conflict where combat is classified as mostly conventional, where near peer armies fought battles with over 30,000 U.S. soldiers killed by the time the conflict was ended. In the graphs in Figure 3 above, the blue columns show the actual killed in action (KIA) frequency. The left graph is for fiscal year (FY) 1951. The red line is the generalized power law equation based on the total KIAs. There were 9,427 KIAs in FY 1951.

The fit of the line to the columns is poor, as also seen in Korea in FY 1952. The lack of fit can be explained, because most combat in Korea was conventional. Conventional warfare is far from stable and the intent of each side was to take back ground. Violence was just the byproduct of the conventional conflict. The graphs from Korea show an almost entirely conventional conflict. Other datasets contain wars with a mixture of irregular and conventional conflict. The most recent example is the United States involvement in Vietnam.

2.2 Vietnam

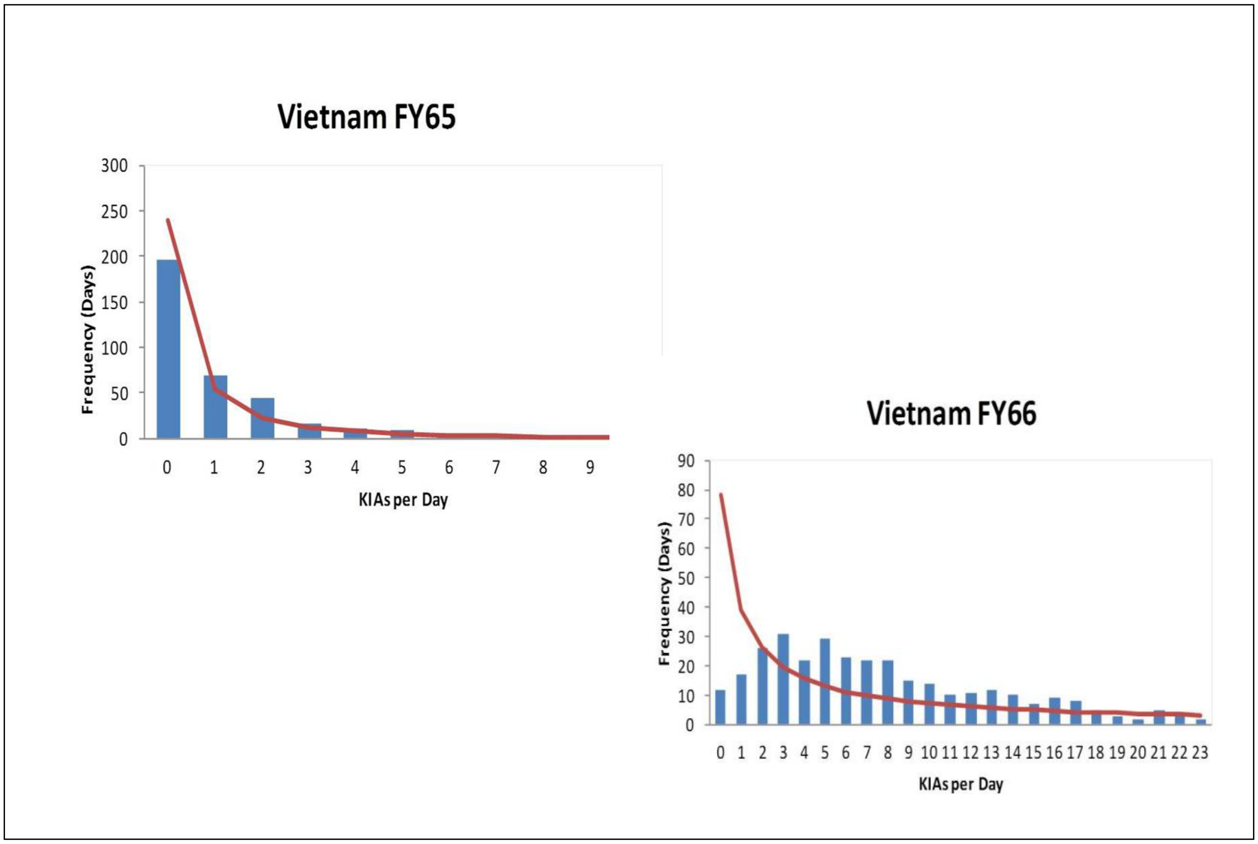

Figure 4. Vietnam (1 of 2)

The next war examined was the Vietnam War. Vietnam had some conventional and unconventional periods of combat with major United States involvement beginning in around 1965. The fit of the Vietnam graphs in Figure 4 is interesting as United States involvement evolves from initial battles in 1965. FY 1965 is the first year of U.S. involvement in the Vietnam War. An inspection of the graph shows that the actual KIA distribution depicted in the blue columns is very close to the generalized distribution shown in the red line. The graphs in figures 3 and 4 show a change as U.S. involvement increases and the situation becomes less stable.

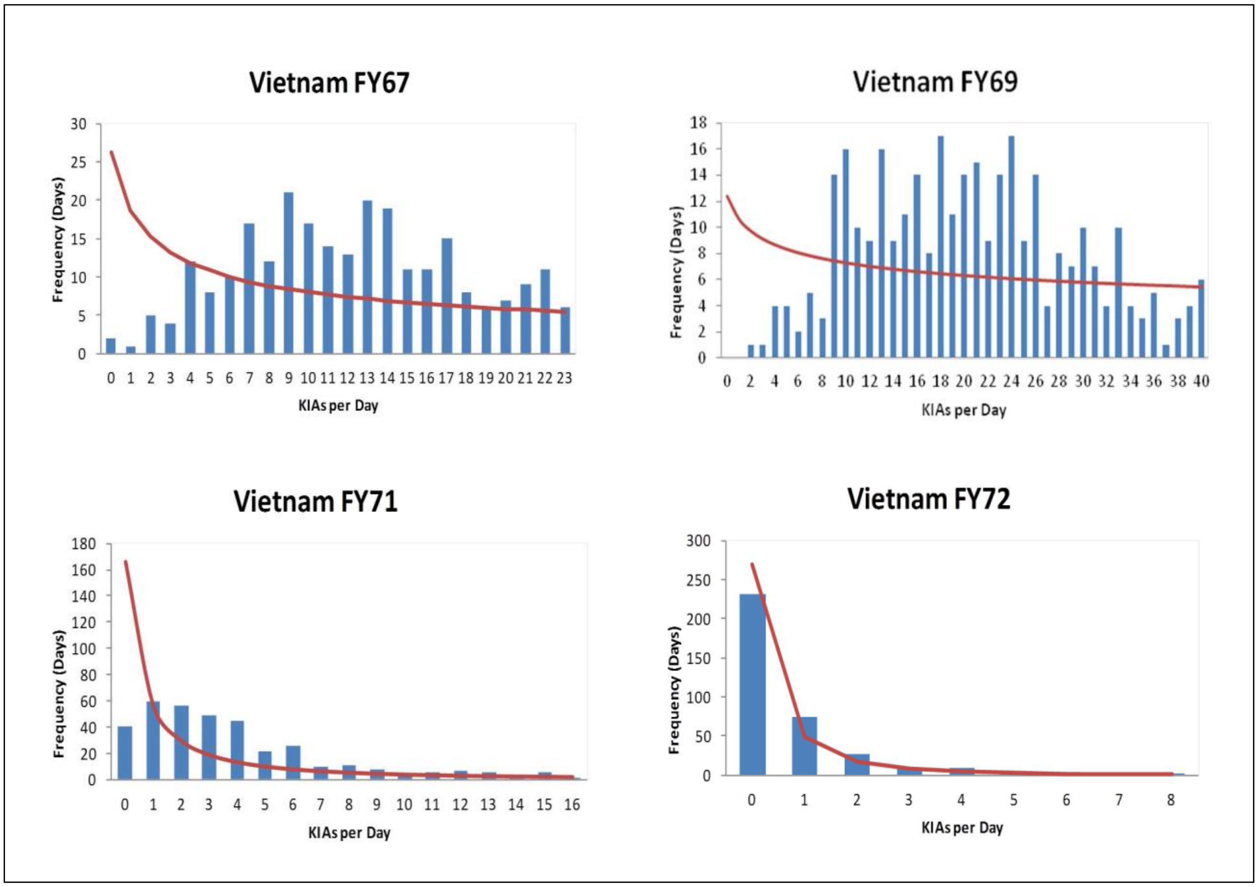

Figure 5. Vietnam (2 of 2)

As seen in Figure 5, conditions continue to deteriorate as seen in FY 1967 and FY 1969. Notice that FY 1968 is not depicted in the graph. There were over 16,000 KIAs in 1968 and the generalized equation from that many KIAs do not form a generalized power law equation similar to the generalized shape. This is to be expected because this many KIAs are obviously far from stable. In FY 1971 there is finally some movement towards stability and FY 1972 shows near stability in FY 1972, which was the year when the United States involvement in Vietnam was winding down. So as Untied States forces withdrew, Vietnam was moving closer to stability. FY 1968 was the most deadly year for U.S. forces and was not close enough to stability to warrant an attempt at comparing it to the generalized form. Korea and Vietnam had long periods of conventional war that made it difficult to become a stable situation. The recent wars in Iraq and Afghanistan allow a closer examination of the use of power law to measure stability.

2.3 Iraq

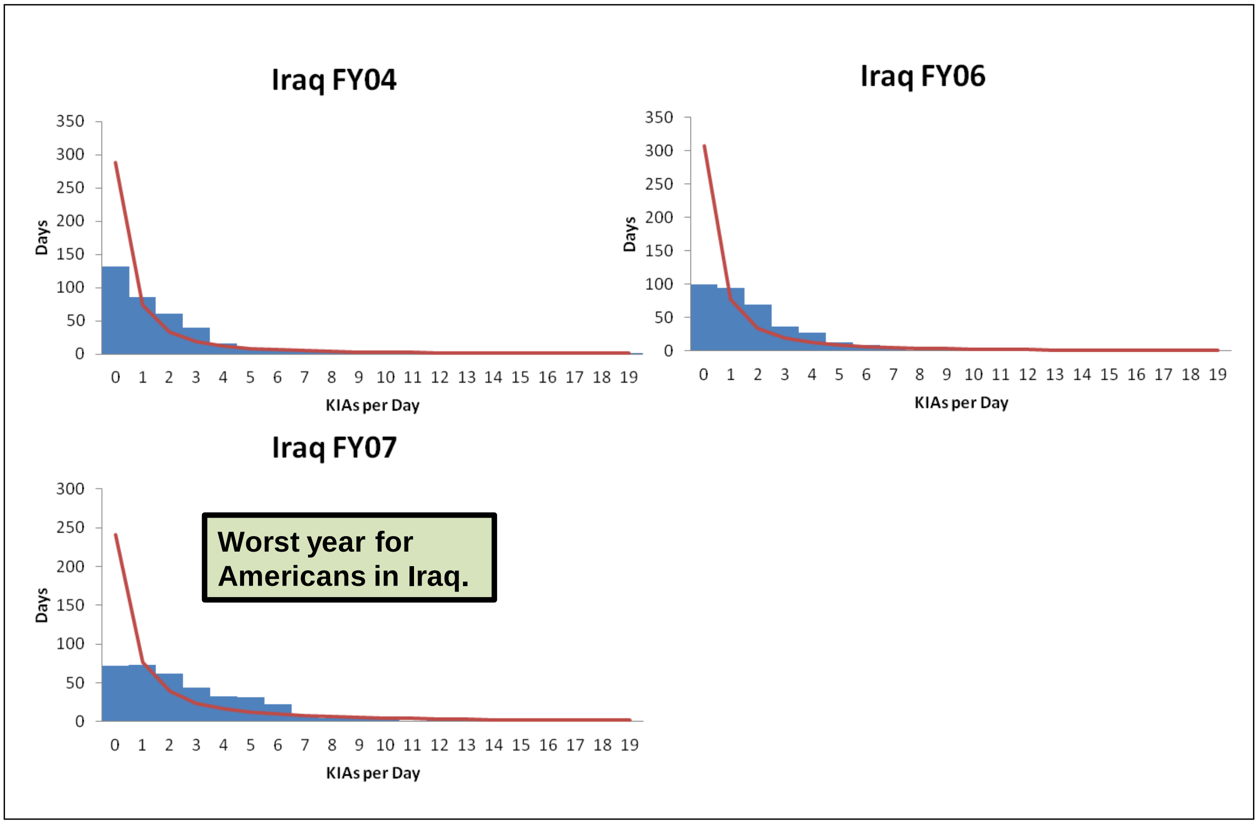

Figure 6. Iraq (1 of 2)

Figure 6 shows that after the initial invasion of Iraq, violence went down for a short period of time. It is an excellent example of how the war slipped into instability and then back to stability. The graphs of years FY 2004 through FY 2007 show the evolution of the violence from the end of the invasion to the height of the insurgency.

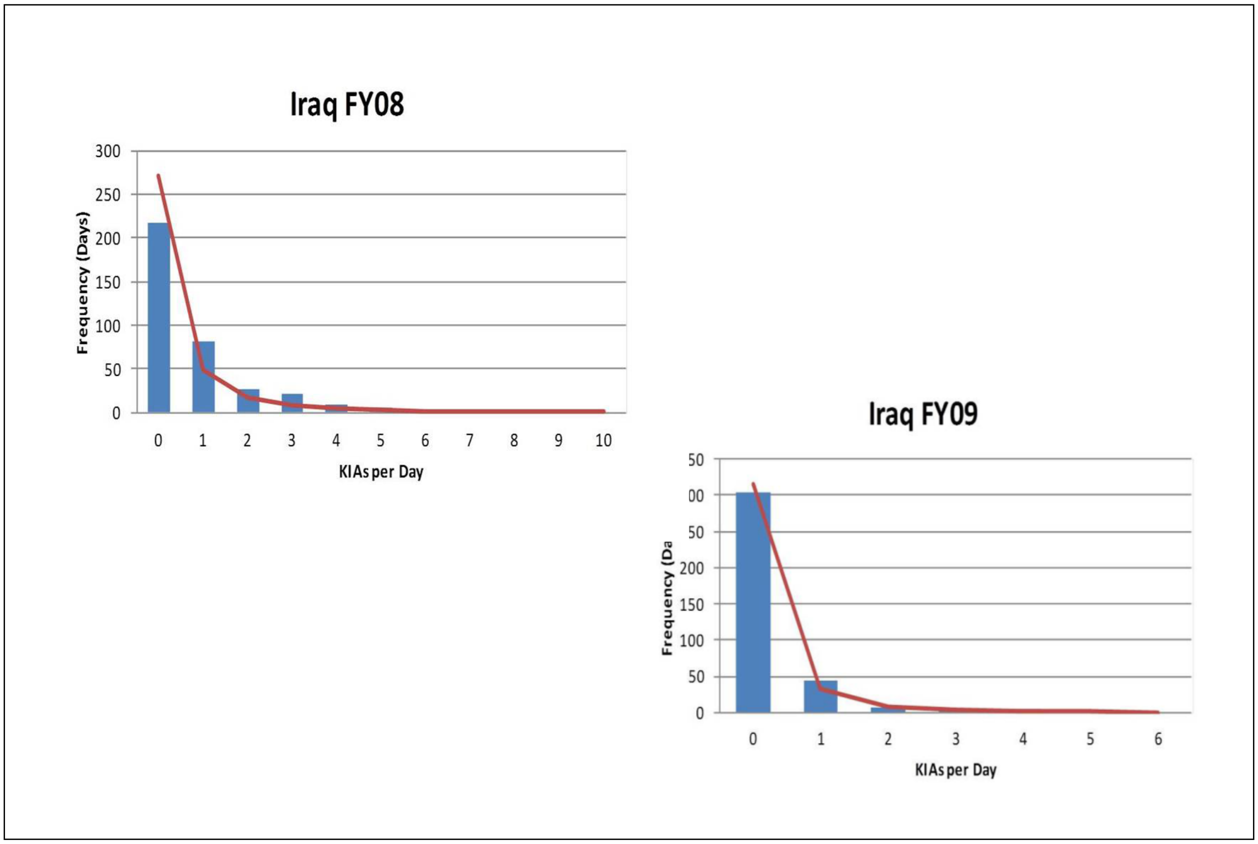

Figure 7. Iraq (2 of 2)

The graphs of FY 2008 and FY 2009 in Figure 7 both show an improvement as the blue columns begin to close in towards the red line function. This indicates that the actual KIAs are approaching the generalized power law equation. Credit for this has gone to the new counterinsurgent strategy or what was commonly called “the surge”. The next step was to examine the conflict in Afghanistan.

2.4 Afghanistan

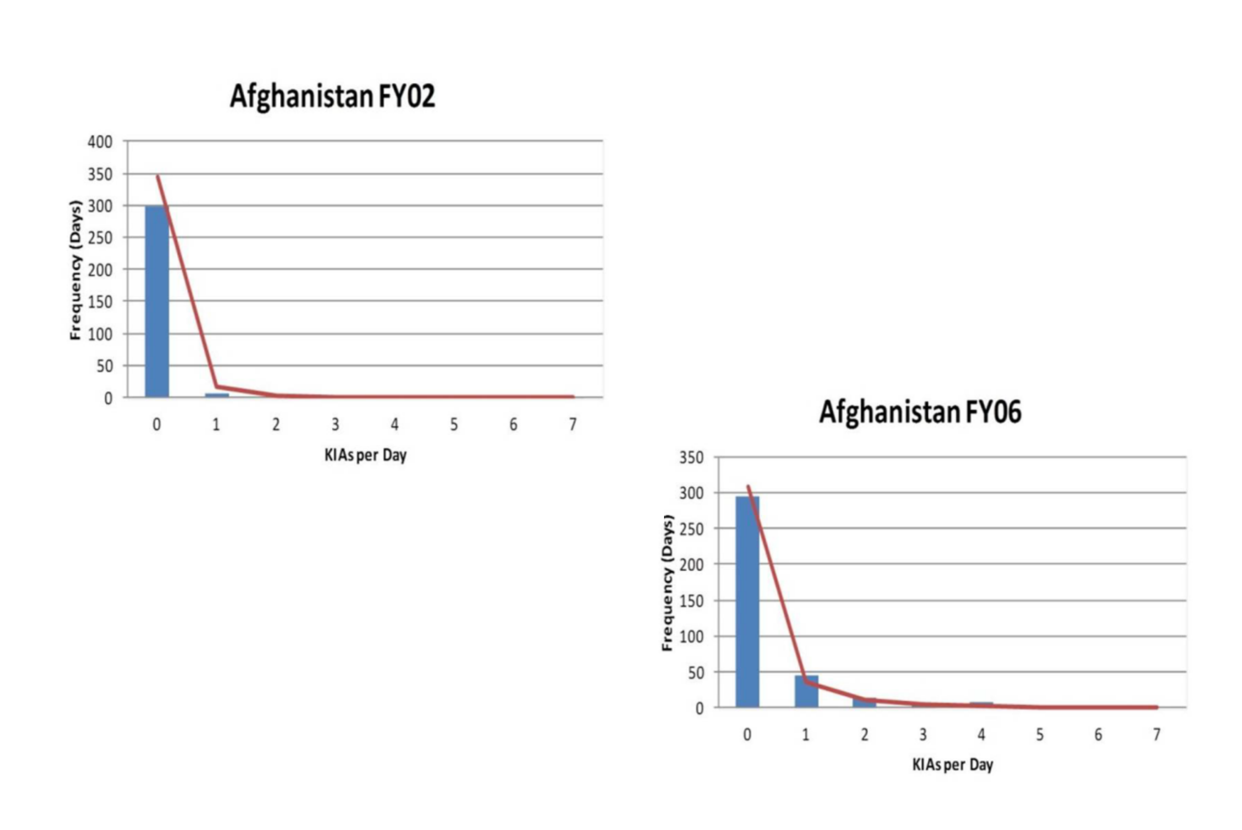

Figure 8. Afghanistan (1 of 2)

As seen in the graphs for FY 2002 and FY 2006 in Figure 8, the trend of graphs in Afghanistan changed very little. This was a period of relative stability within the conflict.

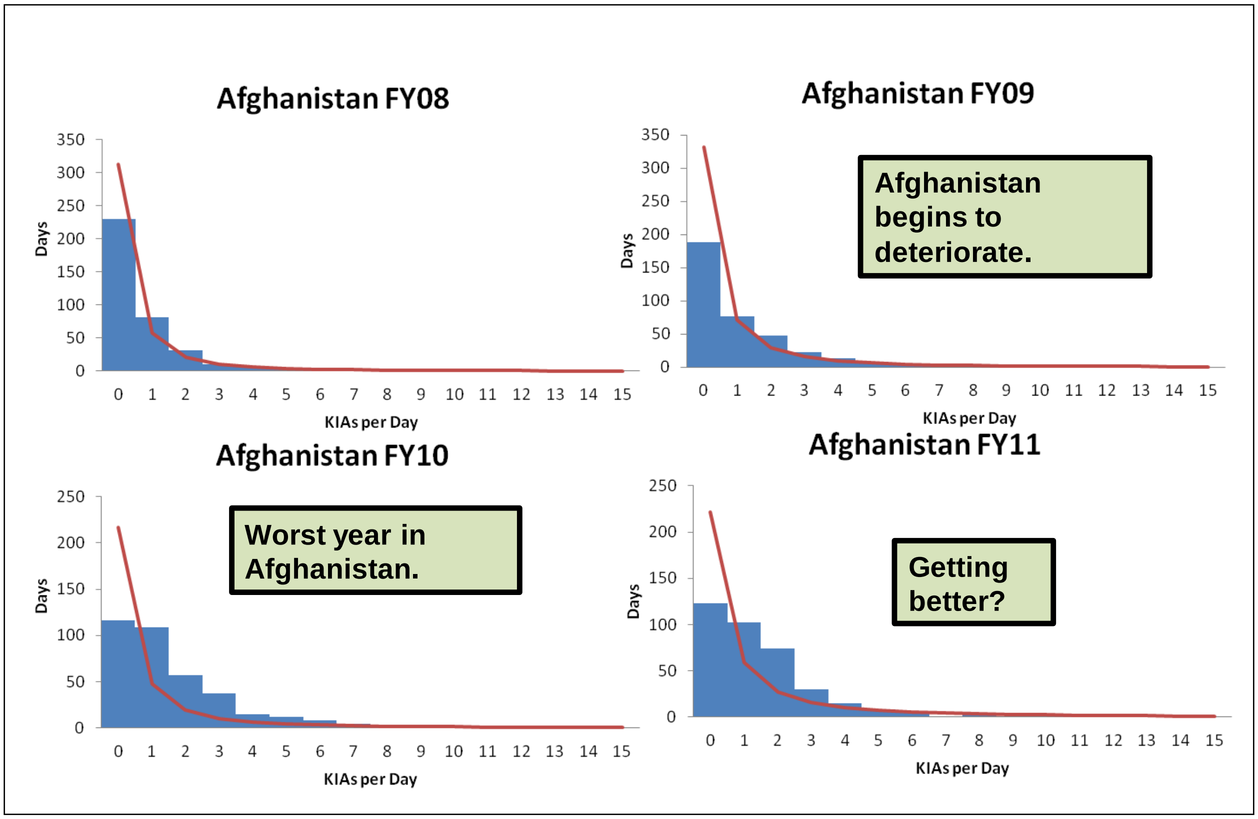

Figure 9. Afghanistan (2 of 2)

As shown in the graphs in Figure 9, stability in Afghanistan began to deteriorate in FY 2008. From the available data in the study, 2010 was found to be the worst year for KIAs in Afghanistan. Affects of the Afghan "surge" strategy were yet to be felt as the data did not extend beyond 2011. All analysis has been done on U.S. wars due to the availability of data. However, sources for Great Britain's small wars were found, so the analysis was applied to Malaya and Northern Ireland.

2.5 Malayan Emergency

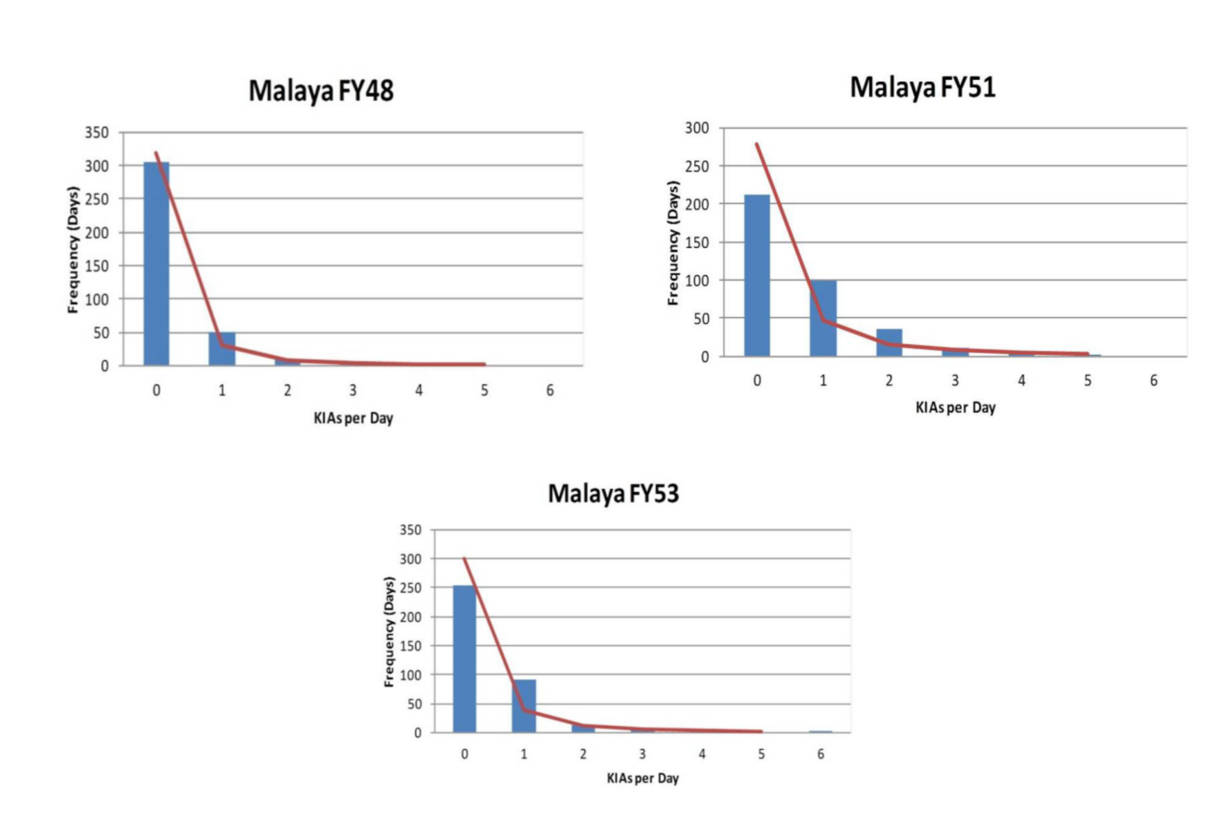

Figure 10. Malayan Emergency

The FY48 graph in Figure 10 shows the initial condition at the beginning of the Malayan Emergency. The blue columns tend to mimic the red line of the generalized function. In FY 1951 there is a change in the situation as the column that indicates days with no KIAs moves from around 300 in FY 1948 to just a little over 200 in FY 1951. FY 1951 was the peak of violence within the conflict. Conditions changed little until improvement is detected in FY 1953. Major British action continued until 1960, however, there was little change in the shape of the distribution from FY 1953. In Northern Ireland there is a more obvious change as the conflict progresses.

2.6 British in Northern Ireland

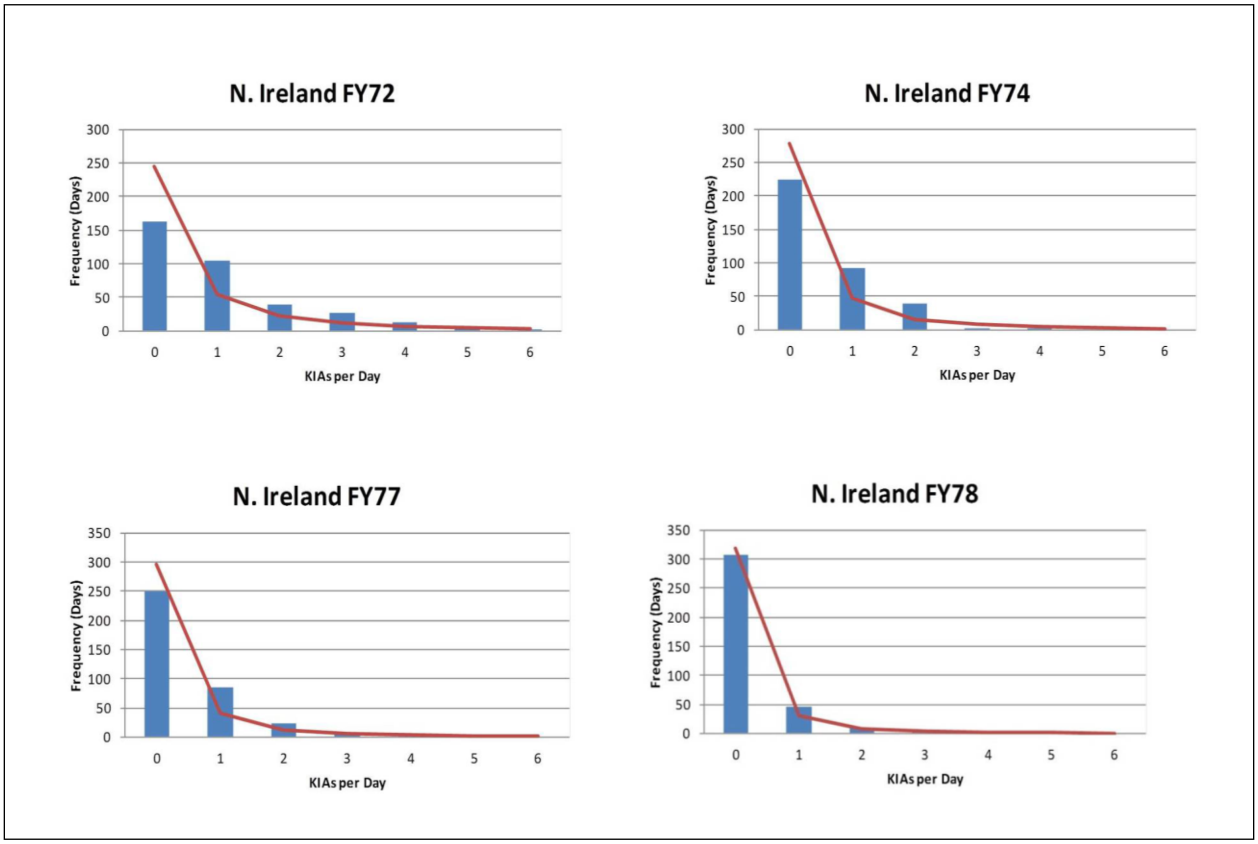

Figure 11. British in Northern Ireland

What was called "The Troubles" in Northern Ireland began in 1969. However, the period from FY 1970 through FY 1972 was when there was an explosion of political violence in Northern Ireland, peaking in FY 1972, when nearly 500 people, just over half of them civilians, lost their lives. The year 1972 saw the greatest loss of life throughout the entire conflict as displayed in the graphs in Figure 11 above. Improvement is seen in FY 1974. This shape is held until steady improvement is seen in FY 1978 and FY 1979, when the conflict stability improved into the 1980s with final peace occurring in the 1990s.

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3 STANDARDIZED POWER LAW DISTRIBUTION

A general form of the power law equation that will display the distribution is shown below. A general form needs to be developed for a corresponding number of KIAs for a given time. For convenience a 365-day time period was chosen, but other shorter time periods could be chosen to support shorter conflicts.

3.1 Generalized Power Law Distribution

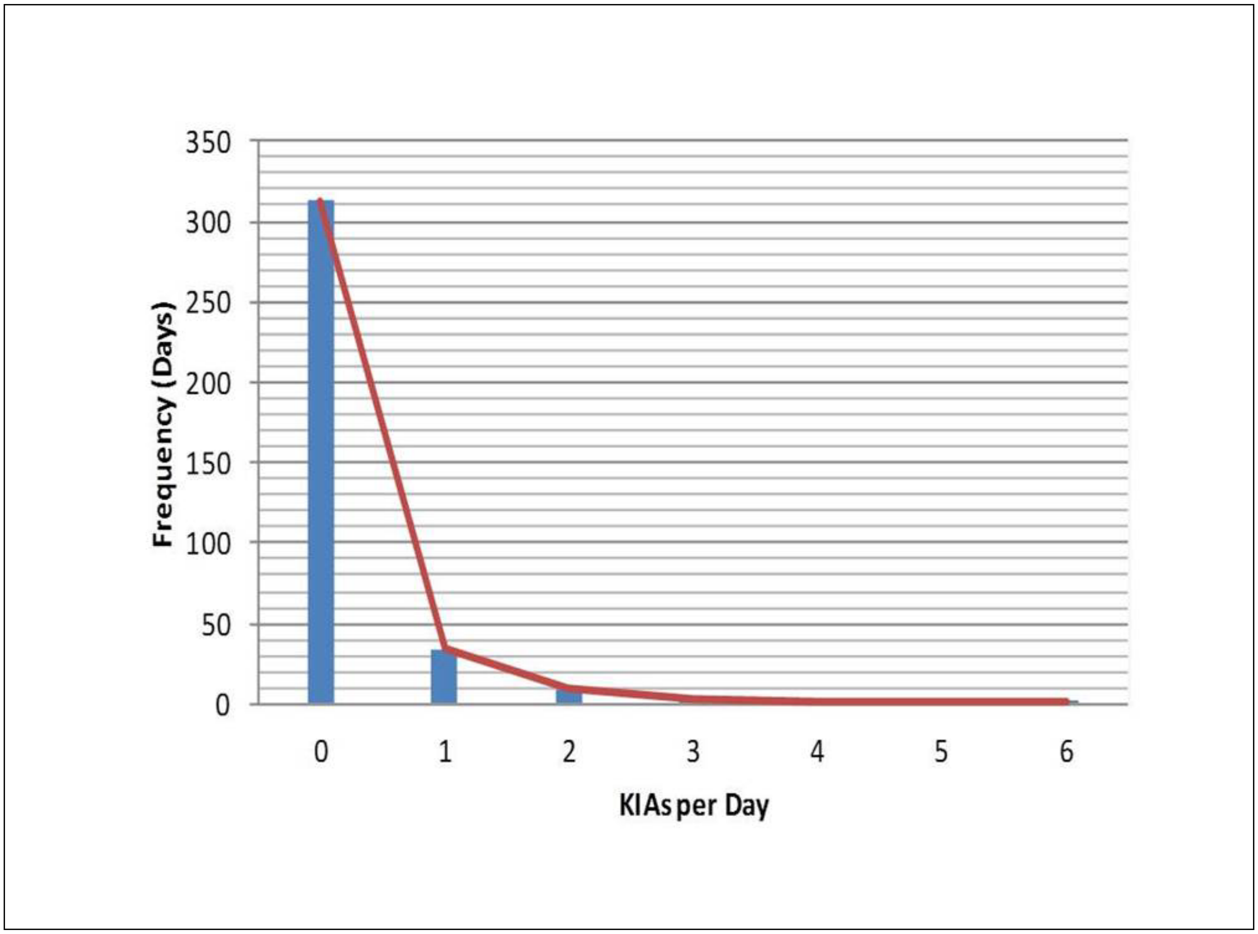

Figure 12. Generalized Power Law Distribution

Figure 12 shows the line graph of the generalized equation. The columns indicate the frequency (in days) for which the number of KIAs occurred.. If all the columns are added together the sum will be 365. So the idea is to find an *A* and *b* from generalized equation where the sum of the areas of the columns, KIAs being the values on the abscissa (the "base") and number of days being the height, equals the number of KIAs.

It was not practical to find an *A* and *b* for every possible KIA number, so selective KIA numbers were used. Initially the idea was to fit a function that would produce an *A* and *b* for a given KIA value. Developing such a function was difficult as accuracy fell off significantly as the KIA number increased; therefore values between the KIA values used in the optimization process were estimated using linear interpolation. Now a generalized function could be produced for any number of KIAs during a 365-day period.

3.2 Coefficient of Determination

- **The closer that an irregular war is to the generalize power law function, the more stable the conflict.**
- **The most general definition of the coefficient of determination (*R*²) is:**

$$R^2 \equiv 1 - \frac{SS_{err}}{SS_{tot}}$$

$$SS_{err} = \sum_i \left(y_i - f_i\right)^2$$

$$SS_{tot} = \sum_i \left(y_i - \bar{y}\right)^2$$

- **The coefficient of determination definition is a measure of how far actual data points are from the estimated function.**
- **The R^2 value can be used as a measure of stability.**

Figure 13. Coefficient of Determination

Inspection of the historical graphs show that it is possible to visually determine whether or not the actual distribution is close to the generalized distribution. However, this inspection is insufficient as an assessment metric since it is difficult to compare the similarity of one graph to another. Because of this, a method of measuring how close the actual distribution is the generalized distribution is required. One way to quantify the how close the distributions are together is to use the coefficient of determination.

The coefficient of determination R^2 is most commonly used in linear regression where it provides a measure of how well future outcomes are likely to be predicted by the model. Within linear regression the R^2 value is between zero and one. The computational definition of R^2 can yield negative values, depending on the definition used, when the predictions that are being compared to the corresponding outcomes have not been derived from a model-fitting procedure using those data. For the purpose of comparing the actual distribution to the generalized distribution, negative values are possible.

To compute the R^2, the first step finds the sum of squares equations above. In this case the values of the generalized function are defined as f_i and the actual distribution is defined as y.

After calculating the sum of squares, then the R^2 is computed. The closer this value comes to one, the closer the actual KIA distribution is to the generalized form of the power law.

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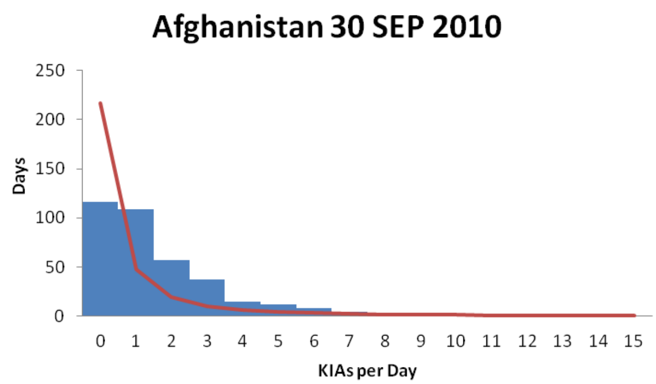
4 METHOD

- **Count the number of KIAs from the last 365 days (595).**
- **From the 365 days, create a histogram that measures the occurrences of the number of KIAs per day.**



- **Calculate the *R^2 (.439)*.**

Figure 14. Method

It is possible to find the R^2 for each of the previous historical graphs. However, this only allows a comparison of the difference between the conflicts. This method, though, can be expanded as a tool to provide a stability metric to commanders who are fighting irregular wars.

Point estimates of stability only provide insight on what is going on at a particular time. In order to be useful, the metric needs to show trends of progress. The examples presented were based on the fiscal years that go from 1 October to 30 September of particular years. These arbitrary time periods allow comparison between different conflicts. To show trends, a new R^2 needs to be determined every day. This is done by calculating the generalized distribution based on the KIAs for the first 365 days of the conflict and by calculating the frequency distribution for that same 365-day period. The R^2 is then recalculated. Then the 365-day period is shifted to the right and new distributions are calculated. If these numbers are plotted over a time period, then stability trends are highlighted. The next section reviews the results from each of the conflicts examined except Korea. Based on the analysis, Korea does not fit the profile of an irregular war, so any further analysis was deemed unnecessary.

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5 RESULTS

5.1 Vietnam Results

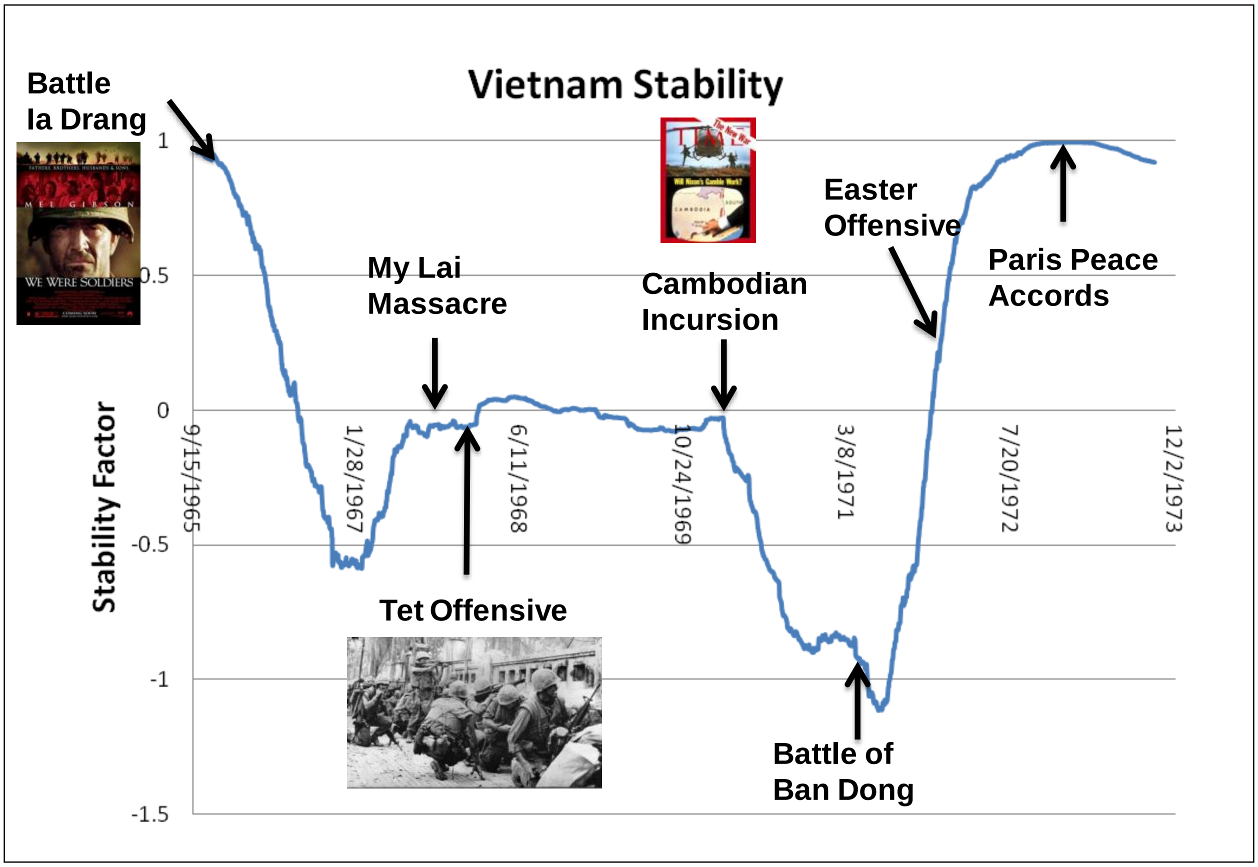

Figure 15. Vietnam Results

The trend for the Vietnam War is found in Figure 15. Major United States involvement in Vietnam began in 1965 with the deployment of the 1st Cavalry Division. Since major combat operations had just begun, there were very few U.S. KIAs before the deployment, so the situation appears stable with the R^2 closer to one. As the war progressed, the stability metric falls rapidly to values below zero. Eventually the stability metric moves to around zero, but this does not indicate much in the way of improvement as that period included the My Lai Massacre, the Tet Offensive, and the Cambodian Incursion. Improvement does not happen until around mid-1971 and the situation is relatively stable as U.S. troops begin to withdraw in 1972 and 1973.

5.2 Iraq Results

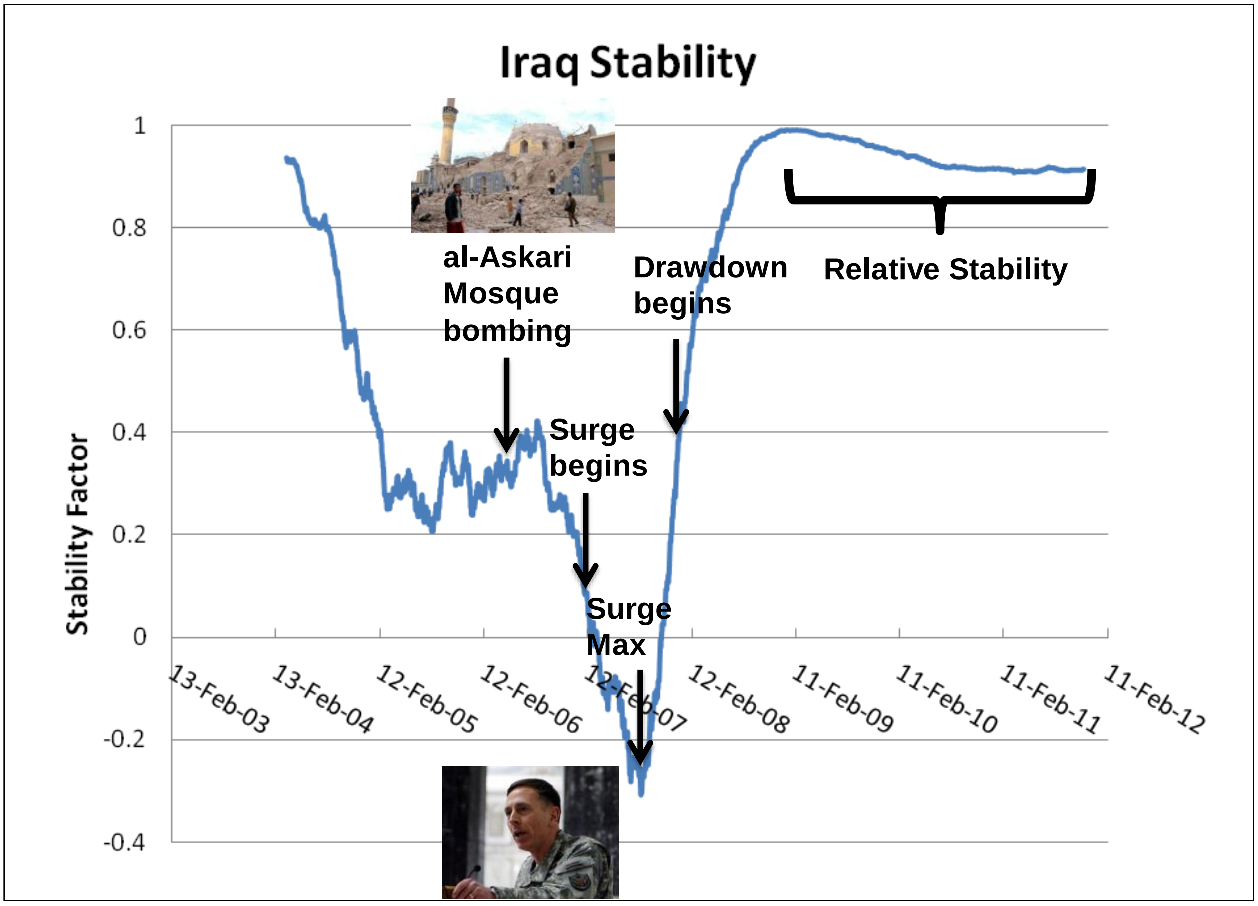

Figure 16. Iraq Results

The trend for the Iraq War is found in Figure 16. Stability begins to deteriorate in early 2004 as the insurgency began to gain support for different disaffected groups. Stability seems to stabilize, but is still low through the beginning of 2006. On February 22, 2006, the al-Askari Mosque was bombed. The attack on the mosque, one of the holiest sites in Shia Islam, is believed to have been caused by Al-Qaeda in Iraq. Although no injuries occurred in the blasts, the mosque was severely damaged and was followed by retaliatory violence. After this point, the stability metric rapidly falls to a low at the beginning of 2007. This period also coincides with what was commonly referred to as "the surge". After the surge maximum, the stability trended up and continued to improve even after the coalition drawdown started. In this case actual historical events support the stability metric.

5.3 Malaya Results

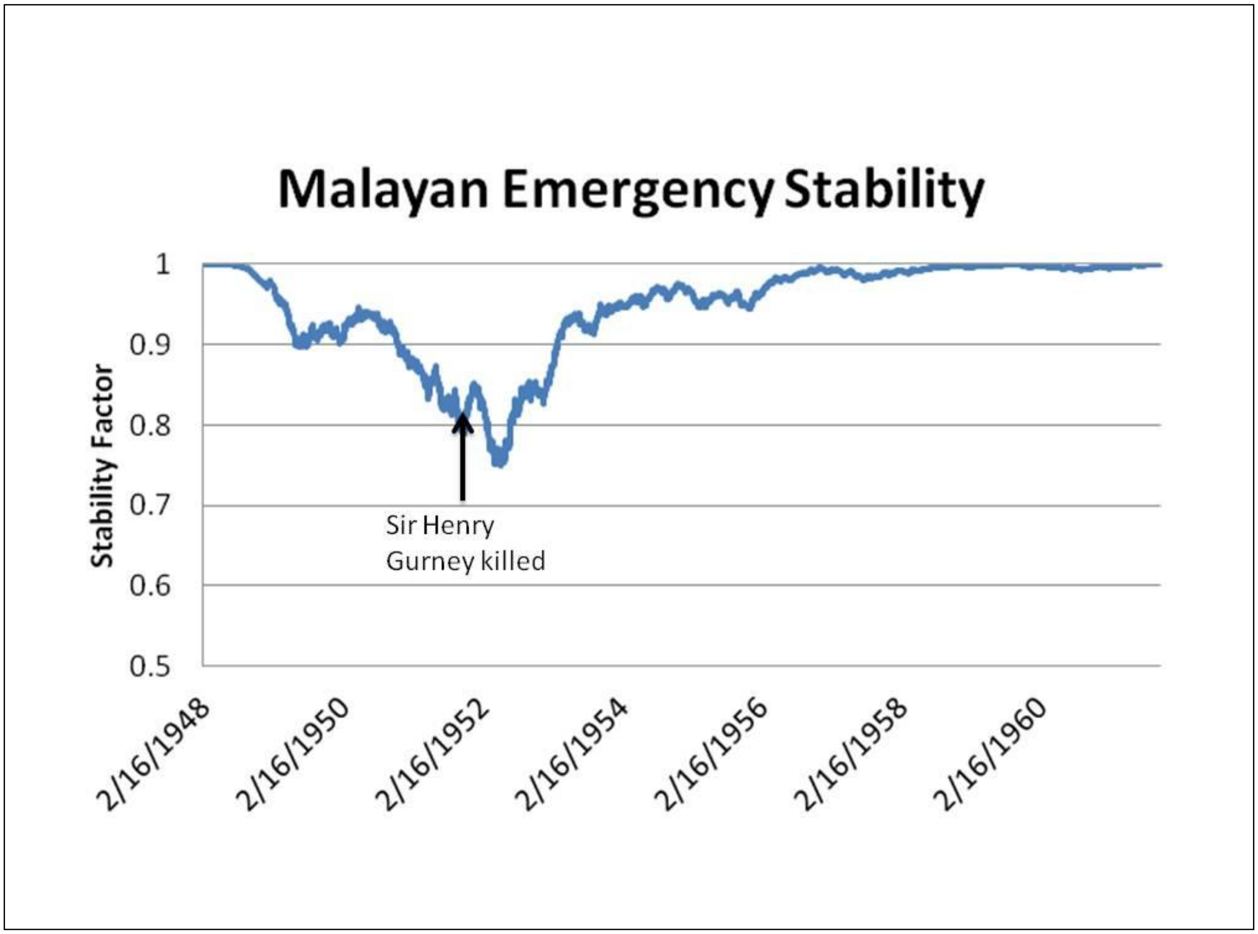

Figure 17. Malaya Results

After the Japanese withdrew from Malaya after the end of World War II, instability increased in the British colony. On 16 June 1948, the first overt act of the war took place when three European plantation managers were killed at Sungai Siput, Perak. This date coincides with the start of the downward trend of stability. On October 6, 1951 Malayan insurgents ambushed and killed the British High Commissioner, Sir Henry Gurney. The killing has been described as a major factor in causing the Malayan population to reject the insurgent campaign, and also as leading to widespread fear due to the perception that “if even the High Commissioner was no longer safe, there was little hope of protection and safety for the man-in-the-street in Malaya.” Gurney's successor, Lieutenant General Gerald Templer, was instructed by the British government to push for immediate measures to give ethnic Chinese residents the right to vote. He also pursued the Briggs Plan, and sped up the formation of a Malayan army. The Briggs Plan's central tenet was that the best way to defeat an insurgency was to cut the insurgents off from their supporters amongst the population. The graph in Figure 17 above shows an increase in stability shortly after the start of the Briggs Plan.

5.4 Northern Ireland Results

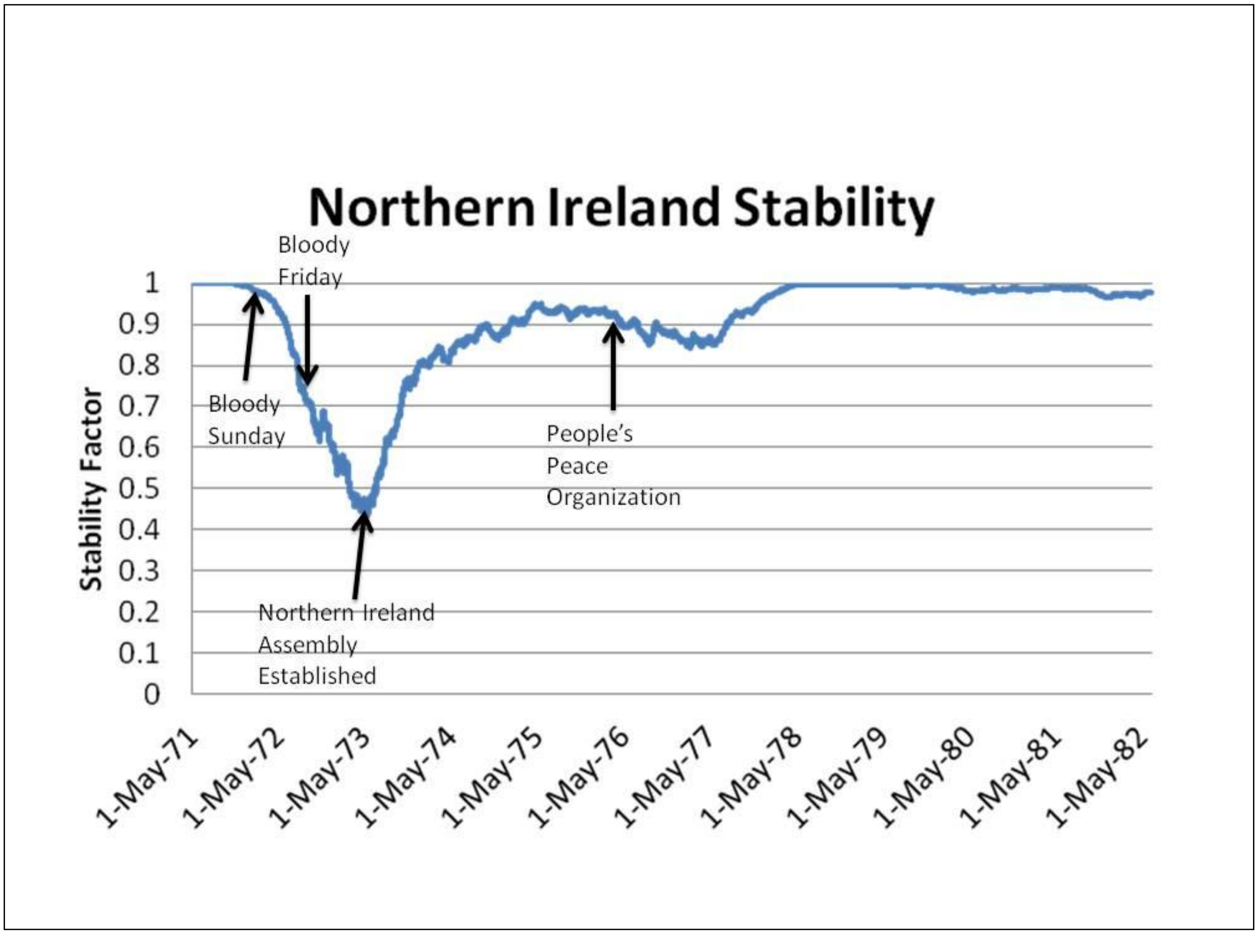

Figure 18. Northern Ireland Results

The "Troubles" in Northern Ireland started around 1969. The period from 1970 through 1972 saw an explosion of political violence in Northern Ireland, peaking in 1972. Nearly 500 people, just over half of them civilians, lost their lives. The trend graph in Figure 18 shows this with the peak instability occurring at the time of the establishment of the Northern Ireland Assembly. After the establishment of the assembly stability begins to improve through the middle 1970s. There was violence in Northern Ireland through the late 1990's, but it appears that it had little overall effect on the stability and was more an act of criminals then an insurgent group.

5.5 Afghanistan Results

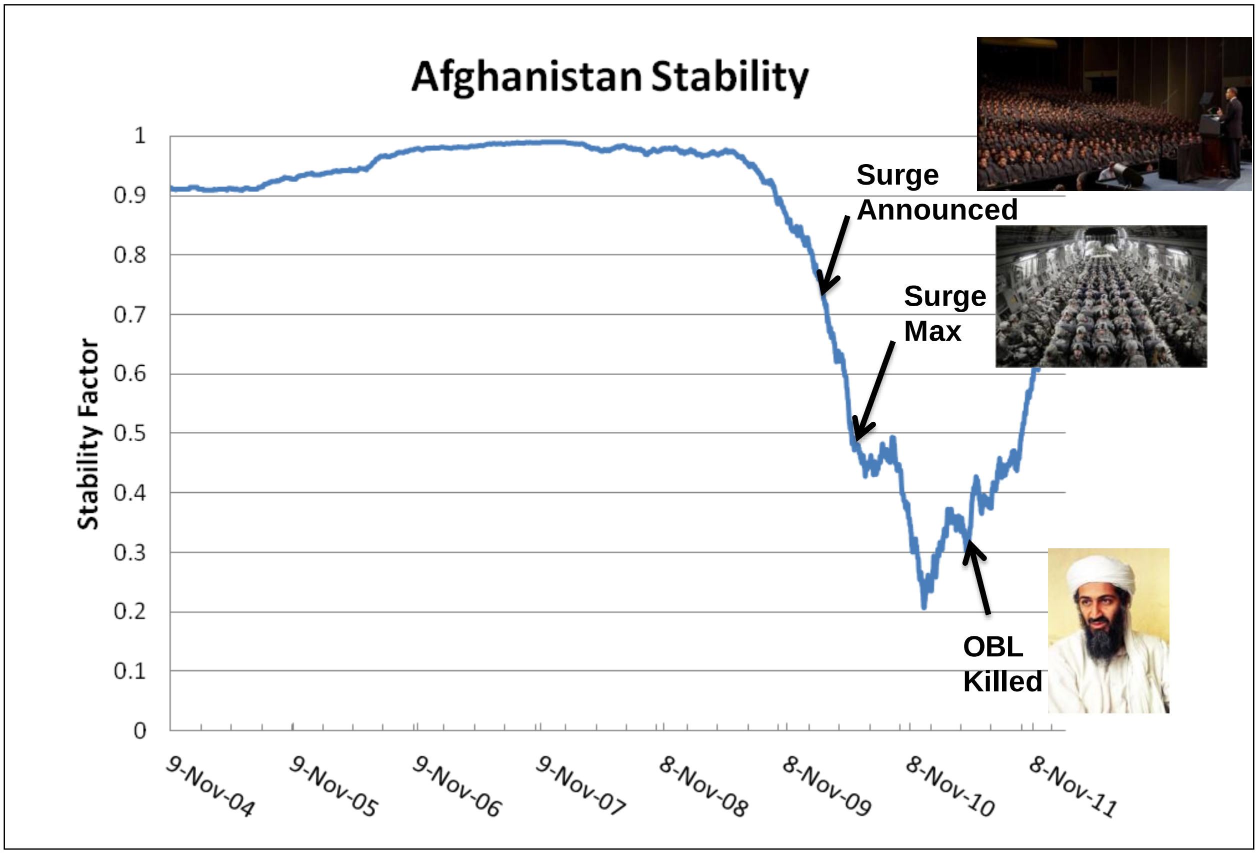

Figure 19. Afghanistan Results

Afghanistan maintained relative stability until early 2009 where it steadily began to decrease. This is clearly highlighted in Figure 19. As stability begins to fall, "the surge" strategy is announced and the troop level reaches its maximum sometime around early 2010. In late 2010, the stability reached a low point and began to rise. Stability has continued to rise ever since which indicates that current strategy within the country seems to be having a positive effect. This is an example of how the metric can be used to inform commanders as to the effectiveness of the current operations in terms of overall "stability" in the area of operations.

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6 FINDINGS

In developing this technique a few issues arose. First, the metric's purpose is only to show a trend in the stability situation within an irregular warfare environment. The metric cannot explain why a metric is moving within a certain direction. However, the analyst can tie strategies to changes in the stability situation as described by the power law metric. Second, the choice of violence metric is up to the analyst. For these examples, KIAs were used because the datasets were available and convenient. However, as long as generalized function is computed and measures the actual distribution using the same violence metric, the procedure is still valid. Finally, the choice of using a 365-day period was for comparison and convenience. It is also possible to use shorter periods of time as long as the values of A and b are recalculated to reflect the new time period, for instance 90 days.

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7 WAY AHEAD

At this time the method can be used in the field as a proxy descriptor for the level of stability in an irregular warfare environment. The next step would be to find a way to integrate it into a wargame. Current irregular warfare wargames only employ violence levels as metrics of "progress". Integrating this procedure into a wargame would add an extra metric. Also, further validation is possible if more reliable datasets can be found. It would be interesting to examine the dataset from some of the other European colonial power as their empires began to crumble.

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APPENDIX A PROJECT CONTRIBUTORS

A-1 PROJECT TEAM

Project Director: LTC David A. Smith

A-1 PRODUCT REVIEWERS

Mr. Russell Pritchard, Quality Assurance

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APPENDIX B REQUEST FOR ALANYTICAL SUPPORT

REQUEST FOR ANALYTICAL SUPPORT

Performing Division: OA	***Account Number:*** 2012112	***FY:*** 2012
Acronym: IWSMod	***Start Date:*** 02-Feb-12	***Est Compl Date:*** 27-Jul-12

Title: Irregular Warfare Stability Model

Category: Analysis of Insurgencies/Counterinsurgencies — ***Method:*** In-house

Sponsor (i.e., DCS-G3) Name: DCS-G-37/CI — ***Office Symbol:*** DCG-G-37/CI

Phone:	***E-Mail:***	***POC:***
Resource Estimates:	***a. Estimated PSM:***	***b. Estimated Funds:*** $0.00

Models to be Used: — ***Product:*** Analytical Tool

Description/Abstract:
The study develops a metric for determining the stability level within the irregular warfare environment. Rare events are often modeled using a power law distribution. If violence within the IW environment is relatively rare, then it is more stable. Therefore the closer the violence distribution is to power law, the more stable the enviroment. To determine how close the actual distribution is to the power law, the method determines the coefficient of determination. The closer the coefficient of determination is to 1, the more stable the environment.

Study Director/POC Signature: — ***Phone:*** 703-806-6637

Study Director/POC: LTC David A Smith

PART 2

Background/Statement of Problem:
In assessments commanders look for metrics to determine how the irregular warfare mission is progressing. One of the metrics used is the level of insurgent violence, where the lower the current level, the better the situation is on the ground. This method can fall prey to Recency Bias, which is the tendency to weigh recent events more than earlier events. To prevent this, a method was needed to evaluate the current violence trend. Was the recent mass casualty attack a timely insurgent strike? Were the last three weeks of quiet days merely a lull as insurgents rearm and regroup? This study produces a trend assessment that can be used by commanders to measure progress.

Scope:
This study uses the casualty data from Korea, Vietnam, Iraq, and Afghanistan. The data ~~was~~ were fine enough to provide individual casualties by day and type. The study uses only security force KIAs.

Issues:

Milestones:

Signature

CAA Division Chief Signature: [signature] — ***Date*** 9 Feb 2012

CAA Division Chief Name: COL Steven A Stoddard

Sponsor Concurrence Signature: — ***Date***

Sponsor Name (COL/DA Div Chief/GO/SES):

Print Date: 03-Feb-12

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