



Summation of QJM/TNDM Validation Efforts



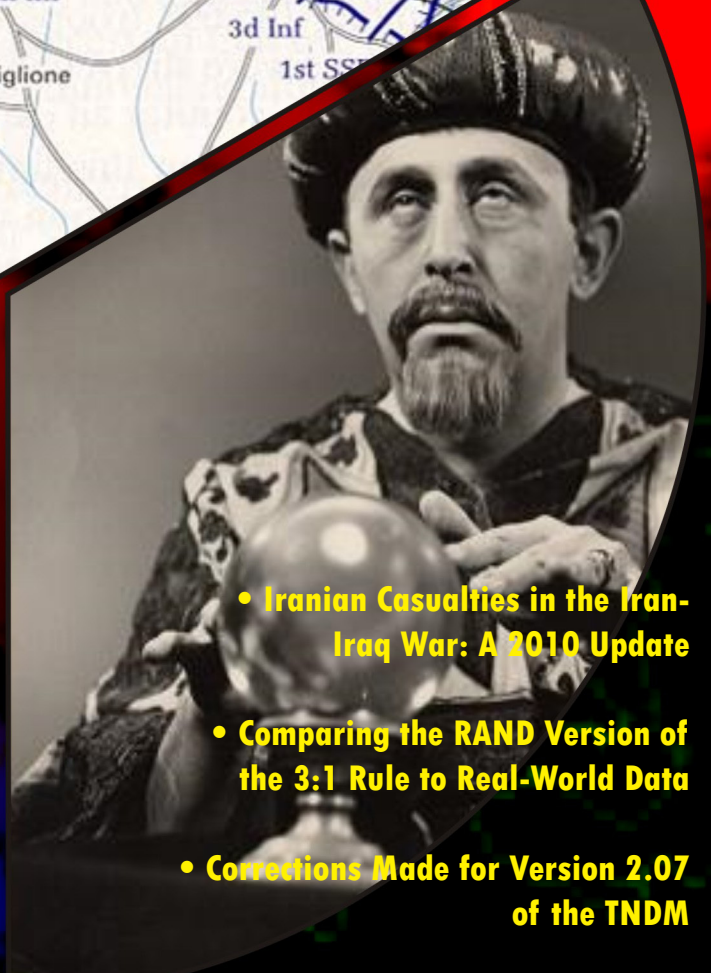
Also in this issue:

- Validation of the TNDM to Corps-Level Combat
- Validation of the TNDM to Division-Level Combat

- Iranian Casualties in the Iran-Iraq War: A 2010 Update

- Comparing the RAND Version of the 3:1 Rule to Real-World Data

- Corrections Made for Version 2.07 of the TNDM



INTRODUCTION

In tribute to what Trevor Dupuy pioneered and in an effort to pursue what he wanted to achieve, TDI continues to amass historical data and strives to refine the combat variables which go into the TNDM. In this issue of our newsletter Christopher Lawrence, Alex Dinsmoor, and Bill Beuttel continue to provide information on these efforts.

As you, our readers, survey the pages of this issue, you may be curious about the total scope of work of TDI. The paragraphs below outline what is missing in applied military history and what TDI is doing to shore up that deficiency. In other words, here is *our core capability*:

1. TDI provides independent, objective, historically-based analyses of modern military campaigns. Operations research, as developed during and right after World War II, was based on recorded, detailed data from battles. It is now nearly extinct. It has been supplanted by weapons and systems effects and performance analyses totally devoid of human factors considerations. As a result the Services, particularly the Army, have only partial answers for the development of operational concepts, battle doctrine, weapons requirements, and organizations. Similarly, because they were not historically validated, the Service models and simulations are skewed. Striving for only measured weapons effects and technical systems capabilities, they miss (or significantly distort) the impact of leadership, training, organization, and psychological factors (such as fear of death) on military units in contact.

2. Over the years, TDI, a successor organization to the Historical Evaluation and Research Organization (HERO), both founded by the late Col. Trevor N. Dupuy, has compiled a large database from modern military campaigns and battles. Using Colonel Dupuy's methodologies and some new techniques, TDI has developed the following capabilities:

a. Comparison of fighting capabilities of opposing forces (systemic strengths and weaknesses) based on:

- (1) Command and organizational arrangements, leadership, force structure, intelligence, and logistics;
- (2) Training, cultural and psychological profiles, and flow of information;
- (3) Doctrinal flexibility or constraints in utilizing new weapons and technologies.

b. Validation of models or simulations and of scenarios for field exercises. Validation is a process, based on historical data and trends, that assists in determining whether a scenario, model, or simulation is an accurate representation of the real world. TDI has the capability to do this independently or to provide primary source historical data for agency in-house validations.

c. Estimating casualties for combat or other operations.

d. Providing lessons learned from studies of cause and effect chains among responsible players at the political, theater, operational, and tactical levels.

e. Analysis of group behavior (impact of various combat activities on units) and other human factors (historically-based aggregate measure of leadership, training, morale, organizational capacity, and cultural characteristics) in modern battles.

f. Studies, based on historic trends and experiential data, of the specific impact on combat caused by new technology and the improvement in weapons. This enables projections of ways in which future wars should be fought and understanding of what elements constitute "force multipliers."

3. The capabilities listed above merge operations research with historical trends, actual combat data, and real world perspectives creating applied military history in its most useful sense.



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IN HONOR OF THE MEMORY OF THE LATE

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This issue of The International TNDM Newsletter is focused primarily on the various validation efforts that have been undertaken for the QJM and the TNDM over the years. This is certainly the most extensively validated model of which we are aware.

The first two articles are on the validation of the TNDM to corps-level and division-level combat. This was done as part of our 2006 effort to analyze the potential effectiveness of a projected combat system as compared to historical data. In this case, we ran a series of corps-level and division-level engagements from the Battle of Kursk (July 1943) using the TNDM. The results of these runs, which effectively serve as an independent and separate corps- and division-level validation of the model, are published here.

Next, we present the final installment in the series of articles by H. W. Beuttel on the Iran-Iraq War. This is Bill Beuttel's revised summation of Iranian casualties in that war. It incorporates the data he has collected since the articles that appeared in this newsletter over a decade ago.

Following that is an article titled, "Comparing the RAND Version of the 3:1 Rule to Real-World Data." This article comes directly from an appendix to our report for the Army Medical Department in 2005 that compared the TNDM to five other casualty-estimation methodologies, reviewed the bases for various casualty estimation methodologies and models, and included a computerized catalog of over 150 combat models and casualty-estimation methodologies.

In creating version 2.07 of the TNDM, we made some minor corrections to the model. These revisions have been distributed to our customers. In this issue we provide a brief description of the changes.

The featured article in this newsletter summarizes the validation efforts applied to the QJM and TNDM over the years. The model has been validated six times, from battalion- to corps-level. The more recent validations have been completely disseminated.

Finally, I profile myself in the "Who is TDI" section. Over the years, we have profiled ten people who were either part of TDI or who contributed to the newsletter. We never got around to profiling me, until now.

This completes the winter issue of The International TNDM Newsletter. We have decided, due to manpower and time limitations, to publish the newsletter semiannually for now.

The next planned revision of the TNDM is to revise the model to better reflect the effects of fighting in urban terrain. This will be based on the work we did in our three urban warfare studies. We will probably address this in the next newsletter.

Anyhow, we trust everyone had a good holiday season and hope you enjoy the newsletter.

Validation of the TNDM to Corps-Level Combat

Christopher A. Lawrence



The Dupuy Institute had a contract in 2006 to test some modern weapons systems using the TNDM. As part of that test, we decided to baseline our model runs to historical data, and used the data from the Battle of Kursk.

The data from the Battle of Kursk came from the DLEDB (Division-Level Engagement Data Base) Kursk engagements. The DLEDB is a data base we have created of 752 division-level engagements from 1904 through 1991. They are mostly a single day in length but can range from a fraction of a day to five days in length, depending on the battle and the records.¹ This powerful database has been used for a range of studies, including the Capture Rates studies, the Situational Awareness study, and our three Urban Warfare studies.² The Kursk engagements in our database came from the updated version of the Kursk Data Base and from the unpublished manuscript Kursk: The Battle of Prokhorovka. Most of the data was derived from the unit records of both sides.

As part of our contracted work, we first base-lined (or validated) the model to two divisions. One was the Leibstandarte SS Adolf Hitler Panzer Grenadier Division. This SS Division was developed from Adolf Hitler's bodyguard and was part of the SS Panzer Corps at Kursk. We recommended to our customer that he do a second, similar, but non-SS division, just to be balanced and avoid criticism. This expanded the test to include the Gross Deutschland Panzer Grenadier Division from the neighboring 48th Panzer Corps at Kursk. We then tested each of these divisions using the TNDM for the 12 days they were on the offensive (4th July through the 15th of July, 1943). In the case of the Gross Deutschland Division, it had two separate engagements on the 6th of July caused by its penetration of the first Soviet defensive lines and its lateral movement before attacking the next Soviet defensive position.

After a review of that work, our customer asked us to go back and repeat the comparison, except using

corps. In this case, we stayed in the same area and time-frame and then did the validation using the 48th Panzer Corps and its neighboring SS Panzer Corps. This was done for each day of the battle for each corps.

In both cases, the opposing Soviet forces were identified as those that primarily opposed them on that day and their data assembled for that day.

This effort effectively generated two separate validations: one of 24 days of combat at corps level and one of 25 cases (23 of them for one day) of combat at the division level.

We believe that all validations should be independent, but we were not able to do that primarily because we were the only ones intimately familiar with the data and the model. Therefore, we separated the work, with me providing the orders of battle for each engagement, including the air support. The actual engagements were set up and run by Richard Anderson. The analysis of the results of the engagements was done by Victoria Plamadeala. This was done in part to make sure that no systematic or personal bias is introduced into the validation.

We assigned the Germans a combat effectiveness value of three for these engagements. This was based in part by our experience in our work for AMEDD (Army Medical Department), in which we used a CEV (Combat Effectiveness Value) of 2.5, based upon Trevor Dupuy's work, for the Soviet Army.³ In this case, we used 3, which seemed to work better. Needless to say, the results would have been very different if we gave both sides equal combat capabilities, but as it is well understood that this was not the case, there was no reason to test it as such.

³ Combat Effectiveness Value (CEV) is a figure used to adjust the relative combat value of one side. It represents the difference in morale, training, experience, and other intangible factors that exist in warfare. In effect, it tries to assign a value to human factors in combat. It is usually a value that you have to assign to one side, based upon an understanding of these factors and their influence. Assigning a value of 1 means that both sides are at equal levels of competence in these areas, which the historical record clearly indicates is not the case.

¹ There are ten engagements from six to eight days in length.

² Not all of these studies have been posted to our website yet.

So, How Did It Do?

Having assembled the data (which was a pretty painstaking process), run the engagements (which was not near as labor intensive as assembling the data), and analyzed the results, how did the TNDM do?

We decided to measure its performance in six areas:

1. Win/Lose
2. Advance rates
3. German casualty rates
4. Soviet casualty rates
5. German armor loss rates
6. Soviet armor loss rates

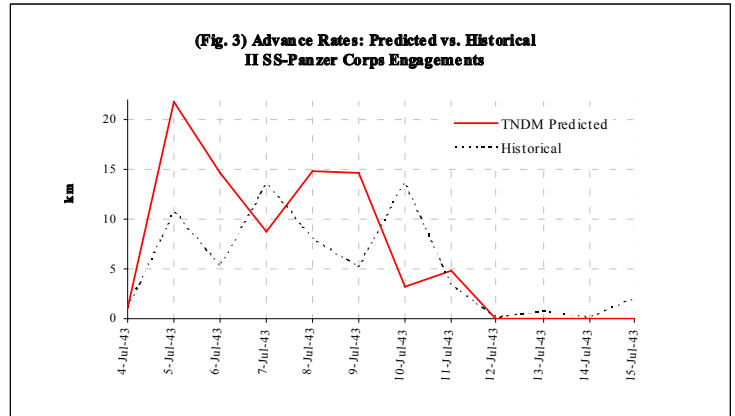
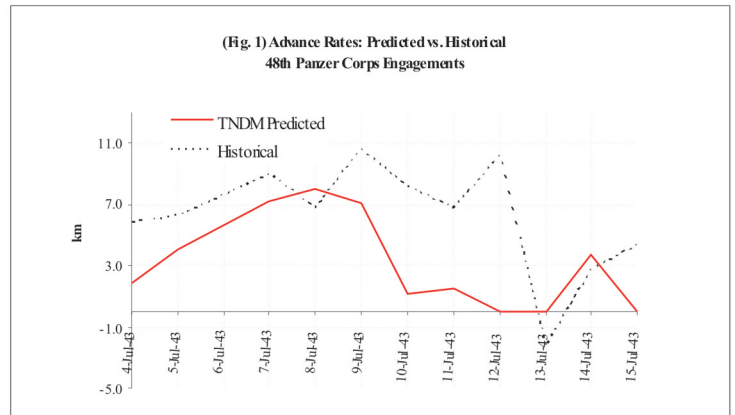
1. Win/Lose

In the case of predicting the winner or the loser, the TNDM predicted the correct outcome in 21 of 24 cases. Now, in the DLEDB, there is a filled-in field that determines the winner of engagement. These were filled in by me before the analysis began, and in many cases (over half the cases in the division-level engagements), it was filled in years before we had this contract. The results could be attacker win, draw, or defender win. The TNDM predicted draws for the SS Panzer Corps for the 13th and 15th when they were in fact marginal wins. The model predicted draws for the 48th Panzer Corps for the 15th when it was a marginal win (the Soviets withdrew during the night). In all reality, considering the nature of the engagements on the 13th and 15th, one could argue whether they were a draw or a German win. The model never completely mis-predicted the outcome (i.e. declared one side won when the other side did). Overall, this is a stellar performance on the part of the TNDM.

2. Advance Rates

In the case of opposed advance rates, we track them for each day in our engagements. Therefore it was a simple matter to compare the historical advance rates with what the combat model generated. This comparison is shown below for each of the German Corps: ⁴

⁴ These charts are from our original report and the figure numbers are in accordance with that report.



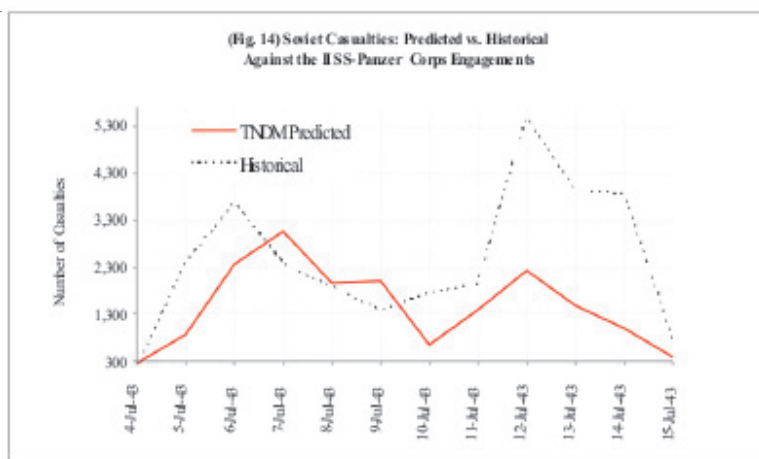
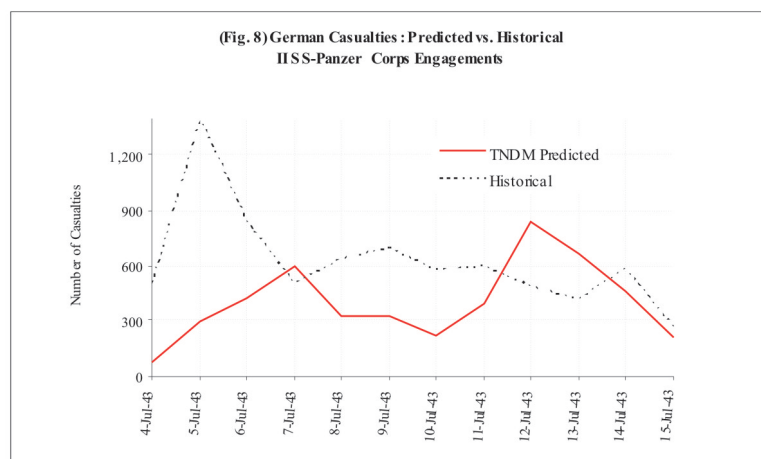
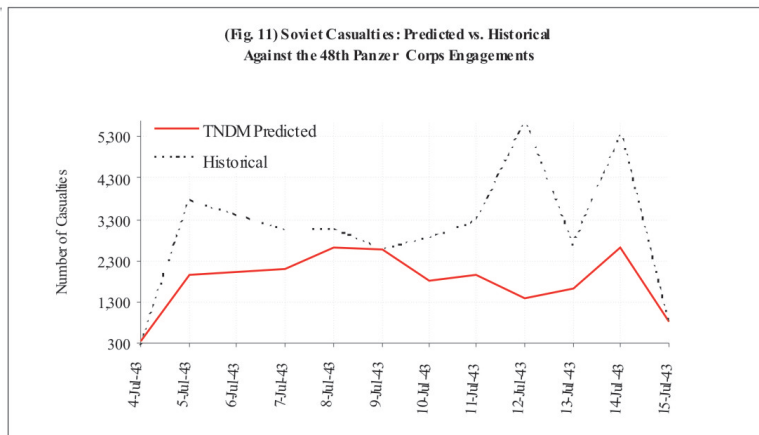
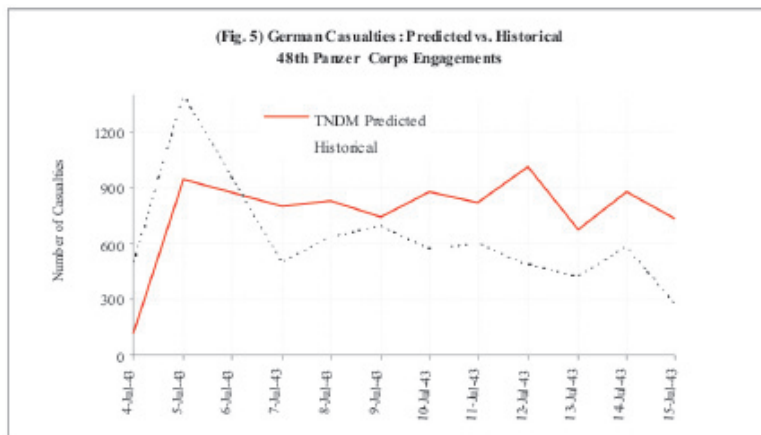
As can be seen, the model sort of did a good job of matching the historical rates. In the case of SS Panzer Corps it was close overall, with several days being under or overestimated by a factor of two. Still, this appears to be a pretty good fit, and we doubt that there are any combat models out there that would do better. The 48th Panzer Corps does well through the 9th and then from the 10th through the 12th, the model simply did much worse than what they historically did.

This was probably caused in part by the 48th Panzer Corps on the afternoon of the 9th turning two of its armored division to the west and exploiting the gaps in the Soviet defenses there. As such, the corps was advancing to the west, perpendicular to its original line of advance. The historical advance rate shows this push to the west, while the push to north historically came to a halt.

3. German Casualty Rates

Again, it was a simple comparison by day for each corps of the number of historical German combat losses (killed, wounded, and missing) compared to the model prediction. For most of the time we had good daily reports of losses by each German division in each

corps. So the daily historical data is pretty accurate in this case.



In this case the 48th Panzer Corps predicted losses couldn't have been much more on target. The SS Panzer Corps historical losses are in many cases much higher than what the model would predict. This is hard to explain without speculating as to the nature of the how the SS fought, or their competency relative to the regular German Army (the Wehrmacht).

4. Soviet Casualty Rates

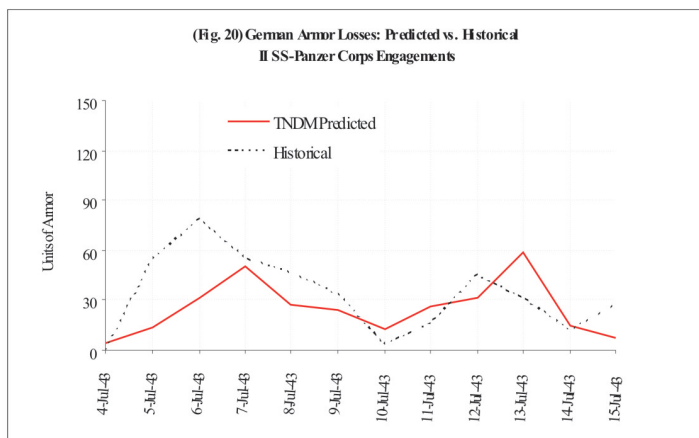
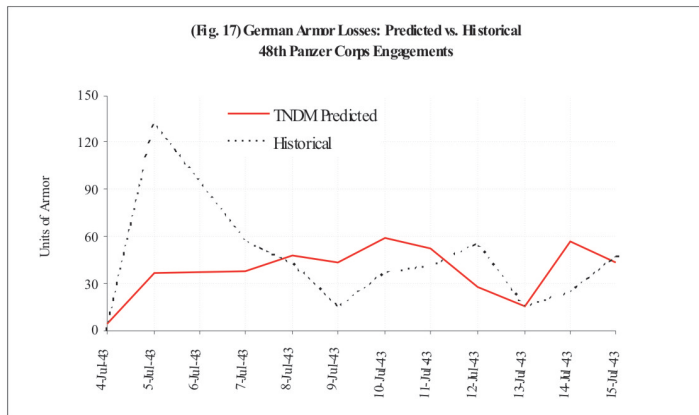
Here again, we did a simple comparison by day for each corps of the number of Soviet combat losses (killed, wounded and missing) historical compared to the model prediction. These are the losses from the Soviet units that faced the German corps in question. In many cases, it consisted of units from several corps or even more than one army. The Soviet losses come from Soviet unit records, but they did not always provided us with a daily loss report. So, in some cases, Soviet losses for that day are derived for some of the units from a periodic report. So not perfect daily historical data but in aggregate it is accurate.

In this case, it is hard for the model to do as bad as the Soviets did historically. We had noted this tendency in previous validations and discussed the problem to some extent in our battalion-level validations. Still, this constantly shows up with the Soviet forces losing more people than the model predicts. In the case of the 12th of July, the date of the famous Battle of Prokhorovka, the Soviets attacked across a broad front with very limited success. This certainly drove up their losses.

5. German Armor Loss Rates

We continue the pattern of doing a simple comparison of the number of tanks lost each day (damaged, destroyed or abandoned, with most being damaged) historically with the number of armored vehicles predicted by the model as being lost. This case is complicated in that our loss figures include tanks that broke down. This is caused by the nature of the historical data, where we usually have daily ready for action reports for each type of tank, but no systematic loss reports. Therefore,

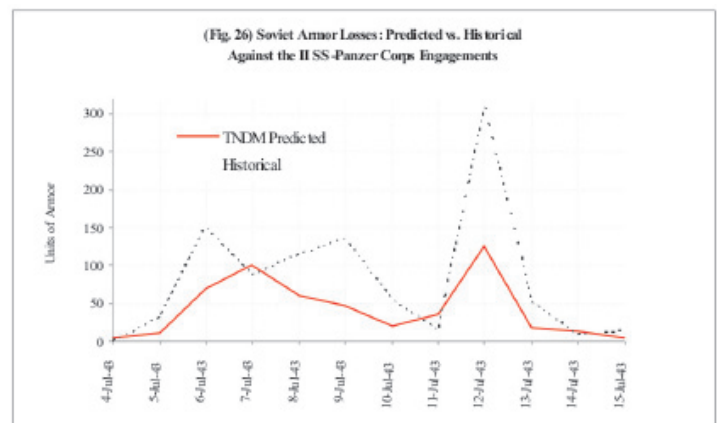
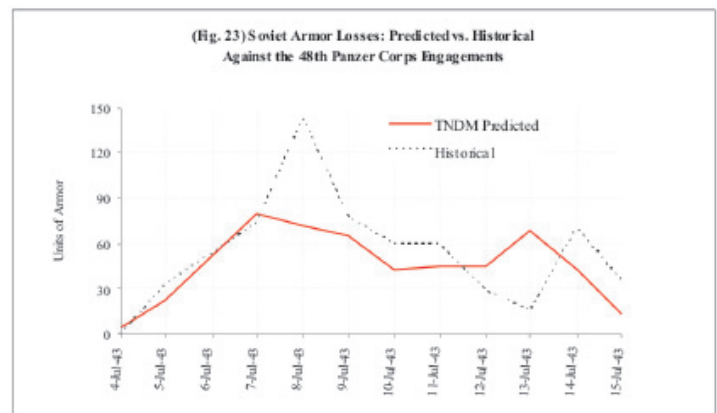
we can only determine how many fewer tanks were not available the following day, and do not know how many of the missing tanks were broken down versus damaged, nor how many repaired tanks showed up with the unit that day. Still, the figures close to accurate and are the best that can be obtained.



In this case, the Germans armored losses were under-predicted for the 5th and 6th but were otherwise accurate. There are two reasons for this. First the Germans were fighting through an extensive minefield and field fortifications. While the model does address these, the nature and extent of the ones used at Kursk were unique. Second, the German historical data includes broken down tanks. In the case of the 48th Panzer Corps, they have a unit of 200 new Panther tanks assigned to them that had not been properly tested before being released for use. As such, they had a considerable number break down in the first couple of days, an estimated 120 tanks! The German historical figures above reflect this. If these are removed, then historical losses are very much in line with the TNDM predicted losses. Overall, the model did a good job here.

6. Soviet Armor Loss Rates

Finally, there is a comparison of the opposing Soviet armor losses. These again, have the same problems of the German armor, in that we do not know how many were damaged versus broken down (the Soviets had a much higher percent of destroyed tanks compared to their total number of tanks lost when compared to the Germans). We do not think that the Soviets repaired as many tanks during the battle as the Germans. We also have a problem, similar to their casualty reports, in that we do not always have the armor losses for each day, but only have it for some units in aggregate reports covering several days. Still, the data we have is a reasonable representation of the real situation and in aggregate is correct.



Still, one will note that Soviet armor losses facing the 48th Panzer Corps is pretty much dead on except for two days. The SS Panzer Corps has a little more of a problem, especially when it comes to the famous Battle of Prokhorovka (12 July), but still the predicted results are only notably off for three days. In general, the predictions on the Soviet armor losses were pretty good and better than for the Soviet casualties.

Summation (Historical Result vs Model Run)

So, overall, I think we are comfortable stating that the TNDM was a good predictor of the outcome, advance rates, German casualty rates, German armor loss rates and Soviet armor loss rates for both corps tested. It tended to under-predict Soviet casualty rates.

In aggregate the statistics are (the historical figure is listed first followed by the predicted result):

1. Win/Lose	
2. Advance Rates (in km)	
Wehrmacht	80.5 vs 37.99 (47%)
SS	63.3 vs 83.3 (132%)
3. German casualty rates	
Wehrmacht	7,491 vs 9,607 (128%)
SS	7,899 vs 4,812 (61%)
4. Soviet casualty rates	
Versus Wehrmacht	35,702 vs 22,504 (63%)
Versus SS	29,311 vs 17,602 (60%)
5. German armor loss rates	
Wehrmacht	470 vs 463 (99%)*
SS	403 vs 305 (76%)
6. Soviet armor loss rates	
Versus Wehrmacht	621 vs 544 (78%)
Versus SS	964 vs 507 (53%)

**24 Corps
Engagements**

21 correct (88%)

* Less the 120 Panthers that broke down



Validation of the TNDM to Division-Level Combat

Christopher A. Lawrence



This article discusses the original validation effort that was done looking at the Gross Deutschland and the Leibstandarte SS Adolf Hitler (LSSAH) Panzer Grenadier divisions at Kursk, from 4 to 15 July 1943. The background to this is discussed in the previous article. These engagements were run in the TNDM for each day, except for the Gross Deutschland Division having two engagements on the 6th of July. This provides for a validation test of 25 division-level engagements.

The two divisions were very similar in structure, with SS Panzer Grenadier divisions having been patterned on the Gross Deutschland Division. There were minor differences in the mix and number of armor vehicles, mix and number of guns, but otherwise, they were parallel organizations of similar structure and size. They were larger than the standard German panzer division. The main difference between these two units was that the Gross Deutschland Division had attached to it the 39th Panzer Regiment, which had around 200 Panthers. These were extremely unreliable and within a few days, it is estimated that about 120 of these had broken down in addition to about 40 being lost in combat. The remaining Panthers were effectively integrated into the Gross Deutschland's Panzer Regiment on the 6th, and thereafter, the division was effectively the same as the SS divisions in structure.

So, How Did It Do?

Again, we assembled the data, ran the engagements, and analyzed the results. We decided to measure performance in six areas:

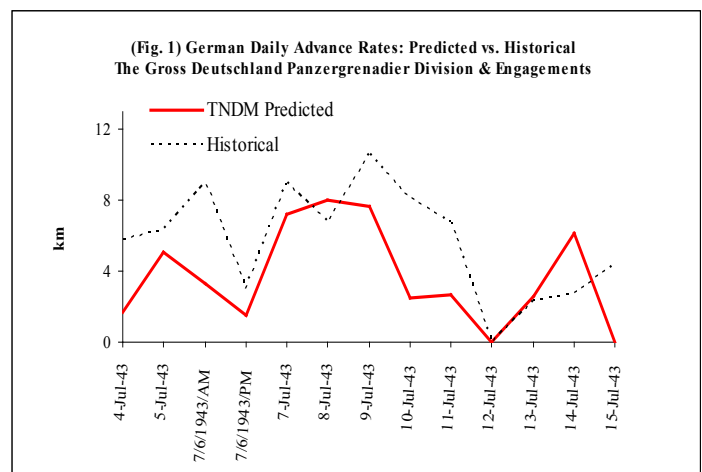
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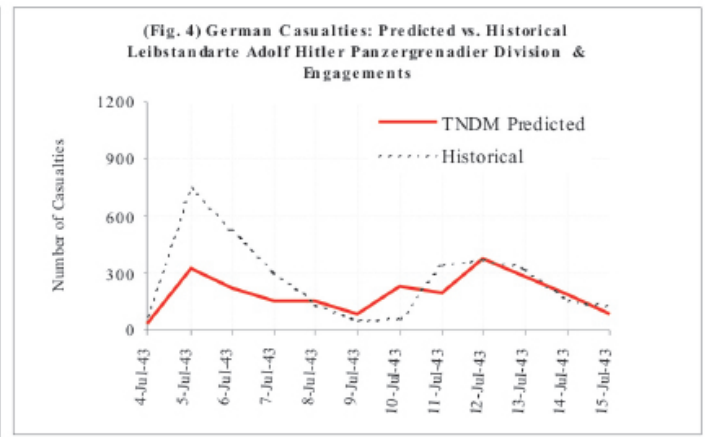
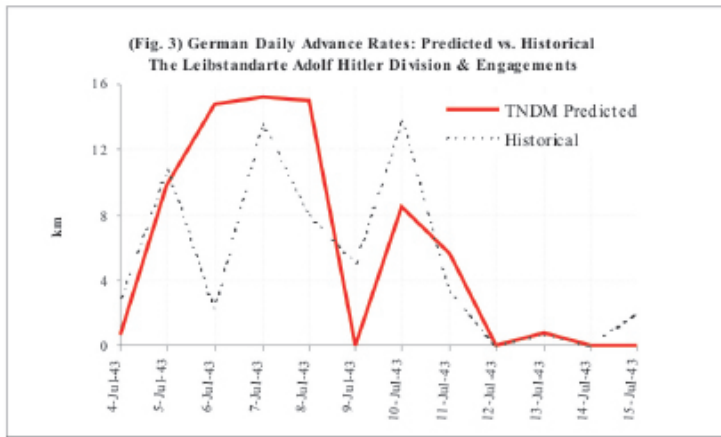
1. Win/Lose

For the division-level engagements, the TNDM correctly predicted outcome in 24 of 25 cases. The model predicted the correct winner in all but one case. That was the Gross Deutschland attack on 15 July, where the attacker won, but the model predicted the defender won. This is an understandable case, and may be easily explained since the main defending unit, the V Guards Tank Corps, had withdrawn from Tolstoye Woods during the night of 14 and 15 July. The Germans were able to then successfully clear the woods in the morning but made no attempt to carry the attack into the V Guards Tank Corps' new position. As a result the Germans were able to successfully attack and advance a substantial distance without significant casualties being incurred by either themselves or the Soviets, a situation that is difficult to model. Overall, we consider this to be a very good performance by the model, being able to correctly predict the winner in 96 percent of the cases. This is in line with what we see with the corps-level engagements but better.

2. Advance Rates

In the case of opposed advance rates, we track them for each day in our engagements. Therefore, it was a simple matter to compare the historical advance rates with what the combat model generated. This comparison is shown below for each of the German divisions:

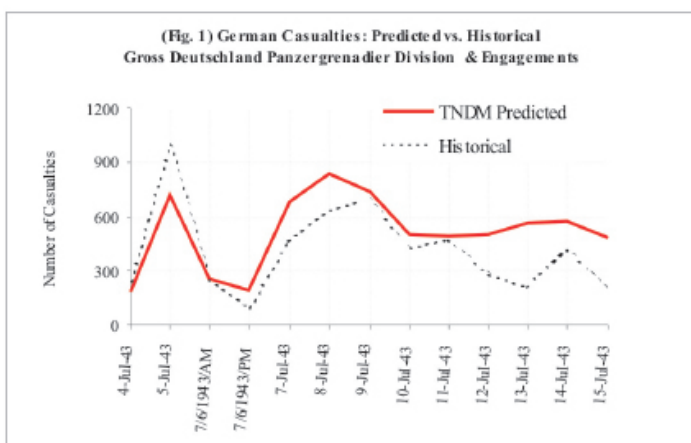




In general, this is a very good performance by the model in both cases. There are about four days across both cases where it is really off, but the TNDM predictions otherwise track closely with the historical data. The three cases that are really off are those for the Gross Deutschland Division for 6 July AM, 10 July and 11 July. In all three of those cases, the Gross Deutschland was making a lateral move across the battlefield against an out of position opponent. The historical advance rates for these divisions were determined years before we ever started this analysis and are part of the Kursk data base.

3. German Casualty Rates

Again, it was a simple comparison by day for the each division of the number of German combat losses (killed, wounded and missing) historical compared to the model prediction. For most of the time we had good daily reports of losses by each German division and in the case of the Gross Deutschland Division, had revised and corrected daily loss figures assembled several months after the battle. So the historical data is very accurate in this case.

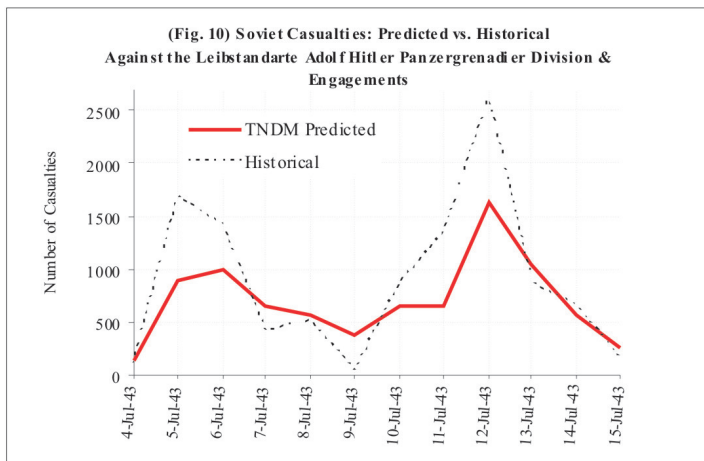
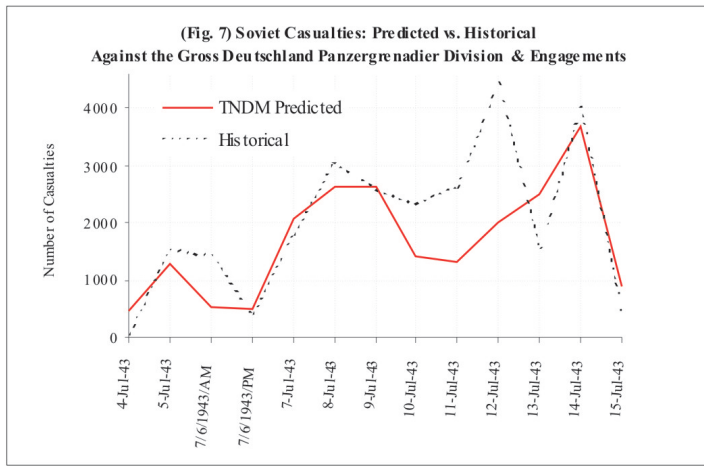


If I ever want to use a single chart to show the power of the TNDM, the Gross Deutschland Division's casualty chart is the one I would use. Casualty prediction doesn't get much better than this. In this case, the daily casualty data that we have from Gross Deutschland we know is accurate, and it is revised data assembled well after the battle.

In the case of the LSSAH Division, we have a couple of days where the predicted casualties are low (the 5th and 6th of July), but otherwise, the TNDM is doing a good job of predicting German division-level losses.

4. Soviet Casualty Rates

Here again, we did a simple comparison by day for each division of the number of Soviet combat losses (killed, wounded, and missing), historical compared to the model prediction. These are the losses from the Soviet units that faced the German divisions in question. In many cases, these consisted of units from several divisions or even more than one corps. The Soviet losses come from Soviet unit records, but these did not always provide us with a daily loss report. So, in some cases, Soviet losses for that day are derived for some of the units from a periodic report. So, not perfect daily historical data, but in aggregate, it is accurate.

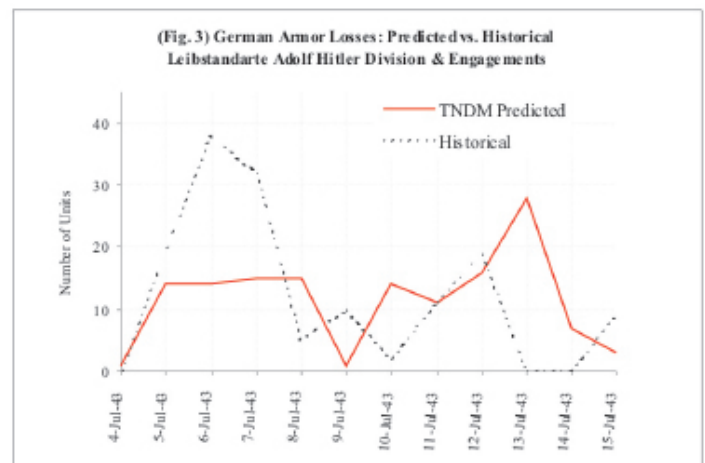
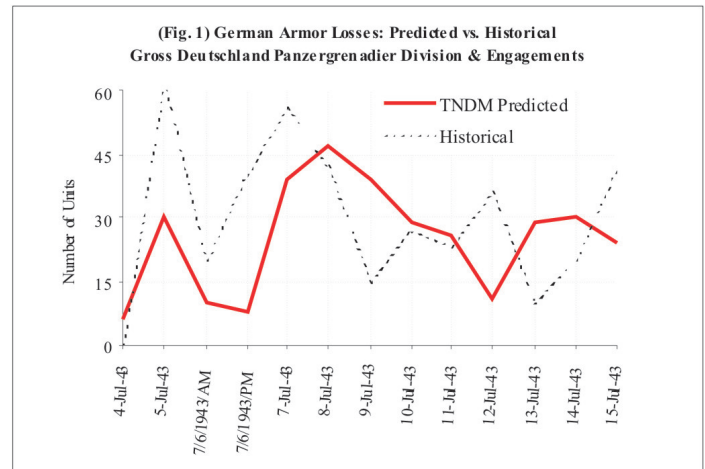


Again, facing the Gross Deutschland, the Soviet losses are very accurate, with them only being noticeably off on one day, the 12th of July, the day of the infamous bloody Soviet counterattack. For the LSSAH Division zone, it is also very good. Overall, for these two divisions, the TNDM did a much better job of predicting the Soviet casualty rates compared to what was done for the two corps.

5. German Armor Loss Rates

We continue the pattern of doing a simple comparison of the number of tanks lost each day (damaged, destroyed or abandoned, with most being damaged) historically with the number of armored vehicles predicted by the model as being lost. This case is complicated in that our loss figures include tanks that break down. This is caused by the nature of the historical data, where we usually have daily ready for action reports for each type of tank, but no systematic loss reports. Therefore, we can only determine how many fewer tanks were not available the following day, and do not know how many of the missing tanks were broken down versus damaged, nor how many

repaired tanks showed up with the unit that day. Still, the figures are close to accurate and are the best that can be obtained.

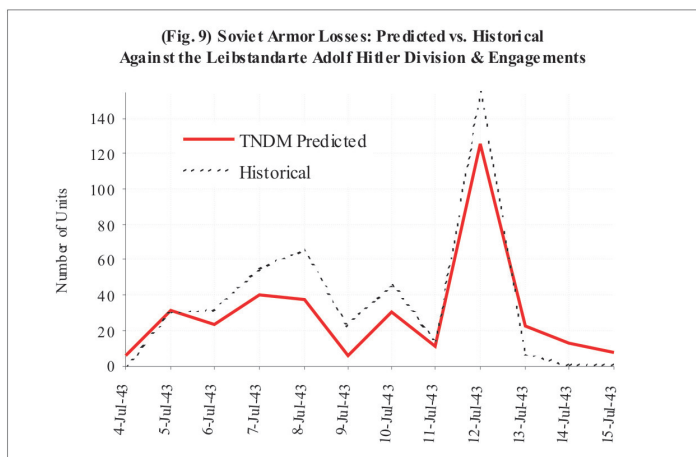
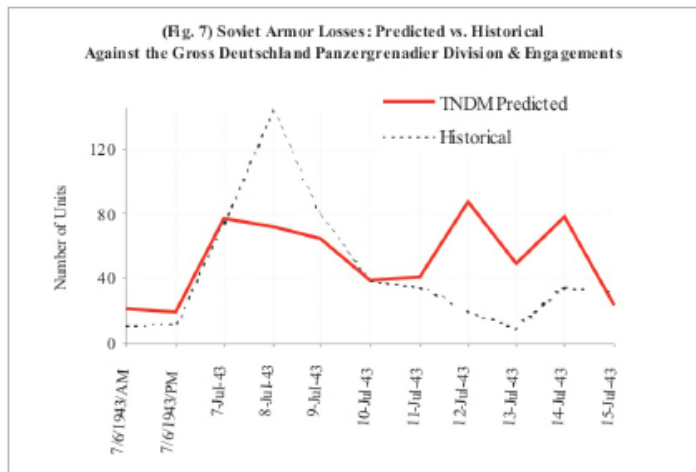


Of course, the Gross Deutschland figures are heavily influenced by the large number of Panthers which broke down during the first couple of day of the offensive (probably around 120). After that, the predicted line does a fairly good job of following historical armor losses except for the 12th and the 13th. The TNDM predictions for the LSSAH Division losses are clearly astray for the 6th and 7th of July, and we have no real explanation for this. On the 13th, the division did not really attack, so the high predicted losses there may be indicative of the way we chose to run that engagement.

6. Soviet Armor Loss Rates

Finally, there is a comparison of the opposing Soviet armor losses. These again, have the same problems of the German armor, in that we do not know how many were damaged versus broken down (the Soviet had a much higher percent of destroyed tanks compared to

their total number of tanks lost when compared to the Germans). We do not think that the Soviets repaired as many tanks during the battle as did the Germans. We also have a problem, similar to their casualty reports, in that we do not always have the armor losses for each day, but only have it for some units in aggregate reports covering several days. Still, the data we have is a reasonable representation of the real situation and in aggregate is correct.



The Soviet armor losses against the Gross Deutschland Division are not always well predicted here. There were no Soviet armor losses recorded against this division for the 4th or the 5th (there was little armor in the area). The model under-predicted for the 8th and over-predicted for the 12th through the 14th. Considering how complex the fighting was on those days, this is not all that surprising (the division was restoring a position that had been penetrated by Soviet armor).

On the other hand, if I wanted a single chart to show the power of the TNDM, the LSSAH Division's Soviet armor loss chart certainly does the trick. It is hard to expect a model to perform better than this.

Summation (Historical Result vs. Model Run)

Overall, I think we are comfortable stating that the TNDM was a good predictor of the outcome, advance rates, German casualty rates, Soviet casualty rates, German armor loss rates and Soviet armor loss rates for both divisions tested.

In aggregate the statistics for the corps (reprinted) and division-level validation are (the historical figure is listed first followed by the predicted result):

	24 Corps Engagements	25 Division Engagements
1. Win/Lose	21 correct (88%)	24 correct (96%)
2. Advance Rates (in km)		
Wehrmacht	80.5 vs 37.99 (47%)	74.9 km vs 48.3 (64%)
SS	63.3 vs 83.3 (132%)	62.4 km vs 70.4 (113%)
3. German casualty rates		
Wehrmacht	7,491 vs 9,607 (128%)	5,386 vs 6,718 (125%)
SS	7,899 vs 4,812 (61%)	3,204 vs 2,318 (72%)
4. Soviet casualty rates		
versus Wehrmacht	35,702 vs 22,504 (63%)	26,348 vs 21,890 (83%)
versus SS	29,311 vs 17,602 (60%)	10,705 vs 8,365 (78%)
5. German armor loss rates		
Wehrmacht	470 vs 463 (99%)*	390 vs 328 (84%)*
SS	403 vs 305 (76%)	146 vs 139 (95%)
6. Soviet armor loss rates		
versus Wehrmacht	621 vs 544 (78%)	488 vs 571 (117%)
versus SS	964 vs 507 (53%)	430 vs 357 (83%)

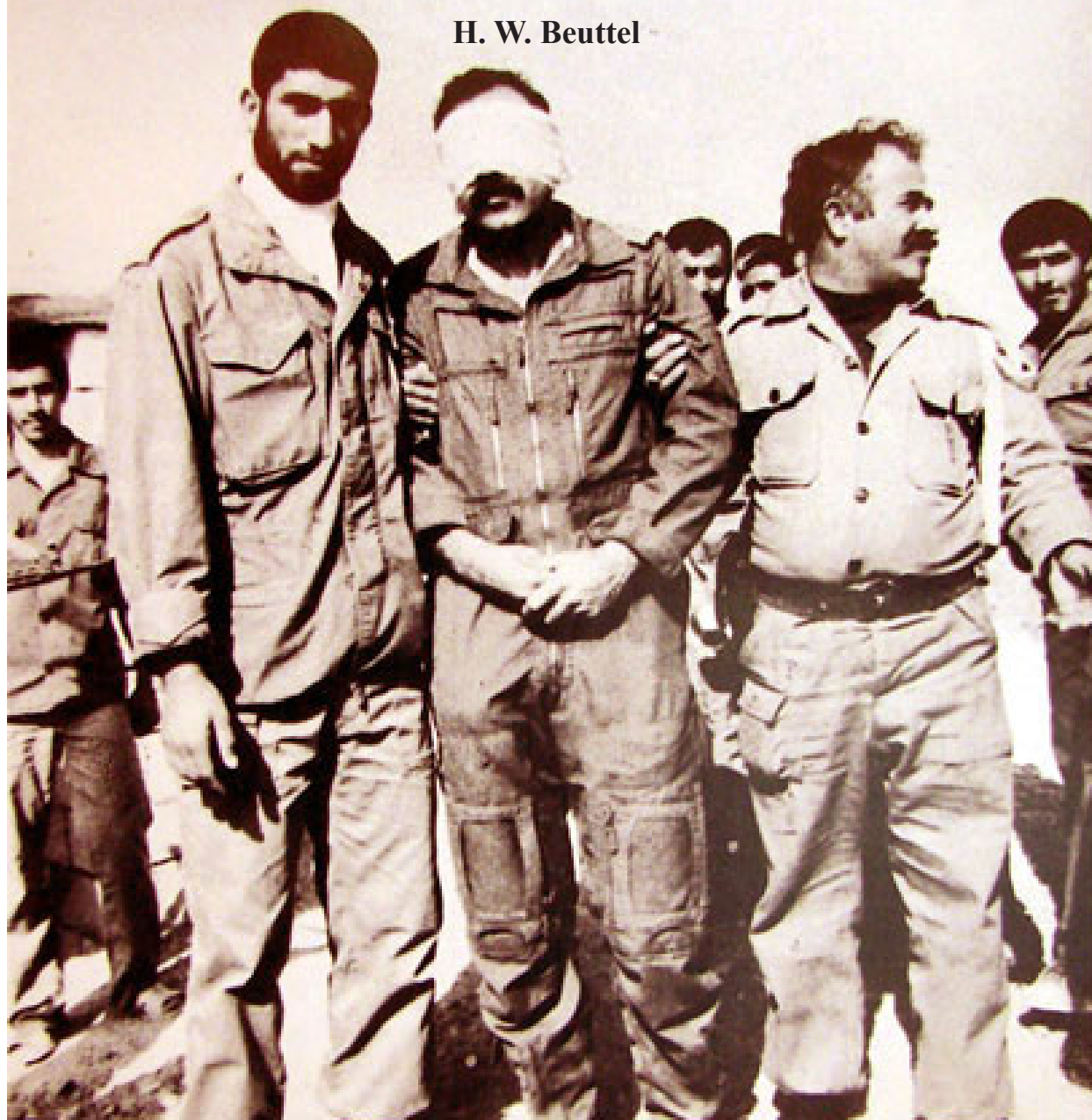
* Less the 120 Panthers that broke down

Overall, I believe these two validations clearly establish that the model is a good predictor of corps- and division-level combat. Furthermore, as the use of the CEV was essential in getting the results that we did, it clearly showed the importance of considering human factors when analyzing warfare between different armed forces.



Iranian Casualties in the Iran-Iraq War: A 2010 Update

H. W. Beuttel



Over the last thirteen years since the publication of my "Iranian Casualties in the Iran-Iraq War: A Reappraisal" by The Dupuy Institute in the December 1997 issue of The International TNDM Newsletter, the Iranian government has released new data which not only generally confirms, but also corrects and expands on this subject. Generally, these tend to confirm my earlier calculations and provide poignant additional detail.

On 14 March 1998, the Iranian Foundation for the Martyrs released their official figures for war dead. A total of 213,000 "martyrs" died during the Islamic Revolution, the War of Sacred Defense or fell victim to

political assassinations. Of these, 85% (181,050) died in the war (which I take to be active combatants killed in action).¹ While this is in line with my general thesis, I was surprised it was in the lower bounds of my estimate. If anything I expected it to be somewhat higher. Equally interesting is that 31,950 "martyrs" died in the Islamic Revolution -- a figure that is counted from 15 Khordad 1342 (5 June 1963). This figure does not count those of the Shah's faction or other opposition (not "martyrs") who also perished. The much publicized wrap figure of 50,000 dead in the Revolution may be correct. In 2008 the total war dead was revised to about 199,000, almost

¹ "Iran Counts 213,000 'Martyrs'," *Iran News*, 14 March 1998.

20,000 more.²

Among the other poignant statistics released are the following:³

- 75% of the dead were between 14 and 24 years of age

- Their average age was 23.
- Some 44% were between 16 and 20 years old;
- 30% were 21 to 25;
- 8% were 26 to 30 and the remainder older.
- Some 36,000 were under eighteen.⁴
- 7,000 (4%) were *under 14*.

- Fifty-five of every 1,000 clerics were killed in action; 14 times more than lay persons

- Twenty four of every 1,000 clerics lost a son in the war; 6.5 times more than the average family.

- Over 93,000 *Baseej* fighters were killed in action.⁵ Of these, 3,500 "University" *Baseej* fighters were killed in action.⁶ Not all *Baseej* were illiterate peasants. A substantial number were recruited for temporary service from Iran's best and brightest at university.

- Female *Baseej* martyrs numbered 4,470.⁷

- Of Iran's 320,000 permanently disabled from the War of Sacred Defense, 45,000 (14%) are combat stress casualties. Of these 12,000 (27%) are in "critical condition."⁸

Killed in Action

In an address to the Imam Ali Officers' College in Tehran on 14 April 1998, regular ground forces commander Brigadier General Pourshab cited figures of 50,000 regular army personnel killed in action and 120,000 disabled in the War of Sacred Defense.⁹

² "Iranians Count Cost of War, Two Decades On," *Payvand*, 9 June 2008.

³ "Iran Counts 213,000 'Martyrs'," *Iran News*, 14 March 1998; "Safavi: Weak Revolutionary, Legal Institutions Make US Happy," *IRNA*, 28 May 1998.

⁴ "Iranians Count Cost of War, Two Decades On," *Payvand*, 9 June 2008.

⁵ "Baseej Instrumental in Both War and Peace Times," *IRNA*, 7 February 1999.

⁶ "Safavi Condemns Physical Face-Off at Universities," *IRNA*, 5 January 1998.

⁷ "Women In The Iranian Armed Forces," *RFE/RL Iran Report*, 12 February 2001.

⁸ "Safavi: Iran Shoulders Great Responsibility Toward War Disabled," *Tehran Times*, 6 May 1999.

⁹ "Iran Army, One of the Strongest in World," *Tehran Times*, 14 April 1998.

During the Ettehad ("Unity") naval maneuver of 12-21 April 1998, spokesman Capt. Abdollah Manavi cited 48,000 regular forces servicemen including 3,000 navy personnel as killed in action during the imposed war with Iraq.¹⁰

Readers of my original article may recall that outgoing *Pasdaran* commander Maj. Gen. Moshen Rezai claimed 150,000 *Pasdaran* (and *Baseej*) KIA ("martyrs") in the War of Sacred Defense. I will reproduce for the benefit of those who may not have access to the original article, my comments on this statement at the time:

The Moshen Rezai Excursion

In September of 1997, outgoing commander of the *Pasdaran*, Maj. Gen. Moshen Rezai, cited some compelling statistics on Iranian casualties in the War of Sacred Defense. Speaking of the IRGC, he claimed some 2,000,000 *Pasdaran* served in combat over the course of the war. Of these, 150,000 were martyred, 200,000 permanently disabled.¹¹ Taken at face value, these figures suggest KIA totals far higher than released in 1988. The *Pasdaran* are cited as taking some 90% more KIA than disclosed at war's end. If the proportion is the same for the regular army, then it must have suffered some 66,000 KIA, and paramilitary deaths were on the order of 16,000. The total KIA would stand at 232,000. Another question is whether Rezai counted the MIAs, and if so, how many were *Pasdaran* (and *Baseej*)? If he did, and the proportion is constant (69%), then some 23,000 of 33,000 cases recovered or settled were *Pasdaran* (or *Baseej*). This in turn boosts the count by at least 11,000 (counting regular army and paramilitary recovered MIAs) to about 243,000. As there are at least 39,000 still missing (and presumed dead), the final tally would be on the order of 282,000 military and paramilitary dead.

On the other hand Major General Rezai may have been speaking somewhat loosely to exaggerate his component's contribution. He has been known to exaggerate before. The number of 150,000 KIA matches the sum of the announced dead (123,220) at war's end, plus officially announced recovered MIA *bodies*—27,000 as of June 1997 (remember: 6,000 MIAs have been simply *declared* dead at family request). $123,220 + 27,000 = 150,220$. The remaining estimated 39,000 residual MIAs would bring the total count of military combat dead to 189,000 - in line with above estimates.¹²

¹⁰ "Iranian Naval Forces Ready to Defend Country, Its Territory," *IRNA*, 16 April 1998.

¹¹ "Rezai Speaks Out About His New Appointment, IRGC," *Iran News*, 13 September 1997.

¹² H.W. Beuttel, "Iranian Casualties in the Iran-Iraq War: A Reappraisal," *The International TNDM Newsletter*, December 1997, 10-11.

It now appears that my argument was superfluous, although an interesting coincidence. The *Pasdaran* (and *Baseej*) contrasted to regular forces may have indeed suffered not 90% more killed (extrapolated from 1988 Iranian data), but 300% more combat deaths. They often had less training and tactical competency than regular forces and were famous (or infamous) for their so-called “human wave” assaults. Baseej commander Brig. Gen. Mohammed Hejazi revealed in February 1999 that over 93,000 Baseej were killed in action.¹³ This represents some 62% of overall Pasdaran killed and as much as 47% of overall combat dead.

In any event, combining the Pasdaran figures of General Rezai and the statements of General Pourshab, total KIA still stand at no more than 200,000. This is in perfect accord with the figure of 199,000 released in June 2008.

And why does the Foundation for the Martyrs list only 181,050 KIA? If we take the average of the two sums (200,000 and 181,050), we arrive at 190,525 KIA. This is still in line with my original calculation. Figures of the Foundation and the services may vary without being actually contradictory. The Foundation’s “martyrdom” is an official status that entitles surviving relatives to certain benefits. Those of the services are based upon unit returns.

But what of the MIAs? Are they included in this count? It seems reasonable at this point to conclude that they are. Total KIA and MIA counts originally were 123,220 (1988) and 72,753 (1995), which equals 195,973 or very close to the service figures of 200,000. As of April 1998, 39,320 Iranian MIA bodies had been recovered.¹⁴ This would leave an MIA residual of 33,433. By 2002, this stood at 48,000, with another 10,000 still listed as missing.¹⁵ Combining 48,000 with 93,000 and 58,000, we arrive at exactly 199,000 dead. This number seems fairly firm now, as the much publicized release of 322 Iranian “PoWs” in April 1998 by Iraq yielded only 3 that were of war vintage—all the others being civilian internees since the 1991 Desert Storm War.¹⁶ In July 1998, Iran claimed

to have information that “hundreds” (no longer thousands) of Iranian PoWs from the war were still being held in Abu Ghraib prison outside Baghdad. Before the 1990 invasion of Kuwait, Iraq had hundreds of Iranian PoWs transferred to secret locations.¹⁷ As this information comes from the Iraqi opposition, its veracity may be suspect.¹⁸ Many, if not all, of these were probably Iranian nationals arrested for criminal offenses. There are probably no more true Iranian PoWs from the War of Sacred Defense still held in Iraq at this time.

This may explain Iranian PoW Commission chief Brig. Gen. Abdollah Najafi’s somewhat veiled remark in July 1998 in which he stated that the names of those listed as PoWs by both Iran and Iraq had become “clear.” He also mentioned that total releases up to that time numbered 39,364 Iranian and 54,776 Iraqi PoWs.¹⁹ He stated that Iraq had clarified the fate of 10% of Iranian PoWs still in Iraq, that some had died and others were unwilling to return home. The number of unresolved cases numbered 3,738.²⁰ This number corresponds more or less to the sum of the 3,000 deserters/defectors during the imposed war and 400 Iranian ex-PoWs unwilling to return home. This leaves a residual of 378, which in fairness could be described as “hundreds” still in captivity as in the resistance report. Whether they are truly “PoWs” of the war era or other types of prisoners and internees remains to be seen.

As there may have been as many as 3,000 defectors in this MIA total, and the Iraqi one-time claim that 400 Iranian PoWs refused repatriation, the residents, *Tehran Times*, 5 April 1998;”²³ More Iranian PoWs Exchanged for 500 Iraqi PoWs,” *IRNA*, 6 April 1998; “Head of Commission on PoWs: PoWs Issue to Be solved This Year,” *IRNA*, 13 April 1998; “Iran-Iraq PoW Committee to Meet in Baghdad,” *Iran News*, 13 April 1998; “Leader Receives Former PoWs,” *IRNA*, 8 April 1998; “Iran Releases 5,584 Iraqi POWs Including Army Generals,” *Associated Press*, 7 April 1998; “Iraq Releases Iranian Pilot,” *Associated Press*, 7 April 1998; “268 Iranian PoWs to Be Swapped for 3,791 Iraqi War Prisoners,” *Tehran Times*, 5 April 1998; “23 More Iranian PoWs Exchanged for 500 Iraqi PoWs,” *IRNA*, 6 April 1998; “Iran Says All Prisoners to be Swapped with Iraq,” *Associated Press*, 6 April 1998; “3rd Batch of PoWs Swapped, 1 Iraqi Dies of Heart Attack,” *IRNA*, 5 April 1998.

¹⁷ “Iranian PoWs Still Kept in Iraq, Iraqi Opposition Says,” *IRNA*, 29 July 1998.

¹⁸ “Hundreds of Iranian PoWs Still in Iraq, Says Opposition Radio,” *IRNA*, 6 July 1998.

¹⁹ “Iran’s PoW Commission Head: Talks with Iraqis Positive,” *IRNA*, 17 July 1998.

²⁰ “Fate of 3,738 Iranian PoWs Still Unknown,” *IRNA*, 21 July 1998.

¹³ “Baseej Instrumental in Both War and Peace Times,” *IRNA*, 7 February 1999.

¹⁴ “Search for War Martyrs Causes Almost 50 More Deaths on Iran-Iraq Border,” *Iran News*, 23 April 1998.

¹⁵ “Funeral for 225 Martyrs of Iraqi Imposed War to Be Held Wednesday,” *IRNA*, 5 January 2002.

¹⁶ “268 Iranian PoWs to Be Swapped for 3,791 Iraqi War Pris-

ual may be closer to 30,000.²¹ If we deduct these from the 1988 and 1995 KIA and MIA numbers, it equals 192,573. Reconciling the figures of Pourshab (50,000) and Manavi (48,000) for regular forces KIA, it seems reasonable that the former rounded up and the latter is closer to the true figure. We can forgive General Pourshab for inflating the count by 4%. If we theorize that perhaps General Rezai also rounded up by no more than 4%, then his real figure would be about 144,000 (150,000 * .96). This now yields a total of 192,000 (48,000 + 144,000). This is within 2% of my original calculation. It also indicates that the difference between the figures of the services and the Foundation for the Martyrs is only about 11,000 or about 6%. It suggests that Iran has realized its MIAs are, in fact, dead. The only question is formal "martyr" status.

I conclude that Iranian KIA in the War of Sacred Defense was at least 192,000, or some 2% higher than I calculated in the original version of this article written in 1997. If the 199,000 is accepted, then about 5% higher.

Disabled and Severely Wounded

The numbers of disabled or severely wounded must also be revised. I took the 200,000 cited by General Rezai to be a combined figure for both Pasdaran/Baseej and regular forces. Brig. Gen. Mohammed Hejazi, commander of *Baseej*, stated in February 1999 that the *Baseej* suffered 42,000 disabled in the war.²² *Baseej* fighters represent 21% of overall *Pasdaran* disabled. However, General Pourshab's figures for regular forces alone indicate 120,000 disabled.²³ Together, these equal 320,000 severely wounded. Even accounting for a 4% round up, the number is still 307,000. It is likely no rounding has occurred as in the case of killed and missing. Figures from the Foundation for the Disabled are probably quite accurate. This would indicate the distri-

bution of killed to severely wounded to other wounded was 17%, 28%, 55%. The proportion of severely wounded is now almost double that of T.N. Dupuy's historically-derived distribution of 20% killed, 15% severely wounded and 65% other wounded.²⁴

On an aside, Iranian categorization of degree of disability is very different from that of the West. Iranian reports often cite a range of 50-70% "disabled." These reports usually refer to individuals who were blinded, lost one or more limbs, confined to wheelchairs or even quadriplegic. I seem to remember an instance of 90% disability, but I cannot recall what this poor soul must have been enduring. My own father, a WWII combat infantry officer, was grievously wounded in the European Theater in 1944. Despite spending several years in and out of military hospitals and being categorized as "100% disabled," he still had his sight, use of all his limbs (aside from a fused left wrist) and generally good health until his death in 2003. It would seem that in the Iranian scale "100% disabled" equals "dead."

Casualty Patterns in Iranian Forces

The patterns of disabled to killed (using the larger numbers) overall are 1.60:1. Among regulars, it was 2.4:1, and among Pasdaran overall it was 1.33:1. If we decompose *Pasdaran* into *Pasdaran* and *Baseej*, the ratios of disabled to killed is: *Pasdaran* 1.46:1; *Baseej* 0.45:1.

The differing ratios between components may be accounted for by the probability of many more direct, frontal attacks by *Pasdaran* in which more severe wounds were encountered from mines and small arms. Another contributing factor may be the overall Iranian tendency not to shut down an operation until having suffered 30% casualties. Finally, the excellent medical support Iranian forces enjoyed (perhaps more so by regulars) saved the lives of those gravely injured who would have otherwise died of wounds.²⁵ This is particularly noticeable in the *Baseej* disabled to killed ratio. The *Baseej* were the least trained, least supported component. Those who were not killed outright more frequently died of wounds than other components. Hence

²⁴ T.N. Dupuy, *Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War* (Fairfax, Va.: HERO Books, 1990), 165-167.

²⁵ H.W. Beuttel, "Iranian Casualties in the Iran-Iraq War: A Reappraisal," *The International TNDM Newsletter*, December 1997, 12.

²¹ "Iranians Against the Ayatollah," *Special Forces*, April 1988, p.2.; "War in the Gulf: Chronology of Events," *FYEO*, No. 267, 10 June 1991, p. 267-2; "War in the Gulf: Chronology of Events," *FYEO*, No. 277, 28 October 1991, p. 277-4. Iran may have experience as many as 25,000 known deserters during the war. Of these only about 3,000 joined armed opposition groups in Iraq. Between September 1984 and March 1985 Iran executed 168 soldiers for "spying or counter-revolutionary activities." See Edgar O'Ballance, *The Gulf War* (London: Brassey's, 1988), 169.

²² "Baseej Instrumental in Both War and Peace Times," *IRNA*, 7 February 1999.

²³ "Iran Army, One of Strongest in World," *Tehran Times*, 14 April 1998.

their surviving disabled, representing the living fraction of severely wounded, was three to five times less.

The percentage of killed and disabled by total service combatants is:

Pasdaran ~

Killed: 3%

Disabled: 8%

Baseej ~

Killed ~ 5%

Disabled ~ 2%

Regulars ~

Killed: 5%

Disabled: 12%

Pasdaran to *Baseej* to Regular KIA:

1.0 : 1.78 : 0.93

Pasdaran to *Baseej* to Regular Disabled:

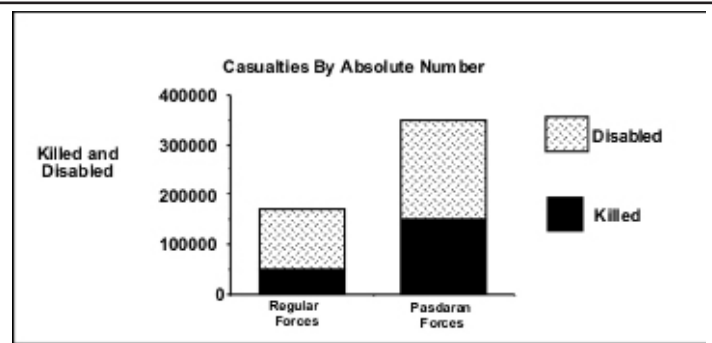
1.0 : 0.27 : 0.78

Pasdaran to *Baseej* to Regular Killed + Disabled:

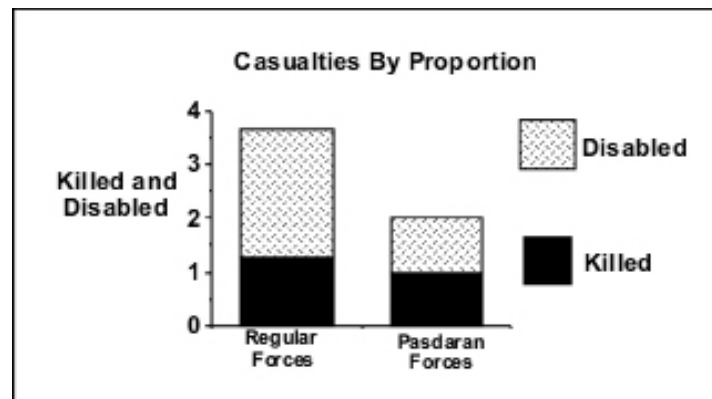
1.0 : 0.65 : 0.80

Thus the *Pasdaran* (counting *Baseej*), a force four times as large as the regular army, suffered 300% more killed and 67% more disabled. Overall, it suffered 206% more lethal or disabling casualties. However, the regular army suffered 25% more killed proportional to its size than the *Pasdaran*, and 240% more disabled. Proportionate to its size, regular forces' overall lethal and disabling casualties were 189% larger than the *Pasdaran*. This suggests regular troops fought even more and harder than *Pasdaran* formations. The *Baseej*, proportionate to their size, suffered 182% more dead than the *Pasdaran*, but only 27% of disabling wounds. Contrasted to the regular Army their killed were equivalent, but they suffered six times fewer disabling wounds proportionately.

An interesting note on casualty distribution by rank was revealed in a speech by Maj. Gen. Rahim Safavi, CinC *Pasdaran*, to a gathering of IRGC officers and NCOs during *Pasdaran* Week in November 1999. In the speech he remarked that nearly 30,000 IRGC personnel were martyred in the course of the War of Sacred Defense.²⁶ This low number can be explained, given his audience, as probably the number of IRGC



**Casualty Pattern:
Regular Forces Vs Pasdaran**



**Casualty Pattern:
Regular Forces Vs Pasdaran**

officers and NCOs killed in action. If so, then officers and NCOs accounted for 20% of all IRGC personnel killed.

Total Casualties

Some 1997 articles related to the Iran-Iraq War have cited “official statistics”—without identifying the source—that the war claimed 300,000 Iranian lives, and 500,000 were wounded.²⁷ I do not take these references as definitive or precise as regards military battle casualties. They appear to be more general numbers for the revolution and the war, counting all military and civilian dead, both combat and non-combat deaths. If we add the 32,000 martyrs of the revolution to the 273,000 deaths due to the imposed war with Iraq that I calculated in my previous article, the sum is 305,000.

These articles also cite 500,000 wounded in the war. This would give a wounded to killed ratio of 1.67:1. This is suspect compared to historical casualty trends. At best 500,000 might represent “other wounded,” as distinct from 320,000 disabled or severely wounded, yielding a total military wounded of 820,000. If actual

²⁶ “IRGC Safavi,” *IRNA*, 12 November 1999.

²⁷ “Leader Attends Funeral for 1,500 Martyrs,” *Iran News*, 2 Mar 1998; “Tehran’s Vast Monument to a Deadly Conflict,” *Agence France Presse*, 15 December 1997.

combat deaths were 199,000, then the wounded to killed ratio in this case is 4.12:1, a much more believable figure.

Our revised casualty figures and percentages for Iranian forces are now:

Total Battle Casualties: 1,137,000
Total Killed in Action: 192-199,000 (17-18%)
Total Severely Wounded: 320,000 (28%)
Total Other Wounded: 638,000 (55%)

Of 5,000,000 estimated Iranian combatants:

4% were killed in action
6% were severely wounded/disabled (up 2 percentiles)
13% were wounded

Naval Casualties

Captain Manavi indicated that of the 48-50,000 regulars killed in action, 3,000 were naval personnel.²⁸ This is roughly 6% of regular KIA. It is a large number for a war in which there were only a few naval engagements and those primarily against US forces in April 1988. Most of these sailors probably died supporting the great amphibious and littoral operations such as *Kheiber* and *Wal Fajir-8*.

Casualties Due to Air and Missile Strikes

In my original article I calculated that Iraqi air strikes may have killed as many as 24,000 Iranian soldiers and wounded another 86,000. I indicated this was probably inflated. It was. According to official statistics released in 2000, some 171,235 troops actually fell at the front, while 16,780 died in Iraqi air and missile strikes.²⁹ These latter are technically described as in “residential areas” and may not include troops killed by air at the front. Nevertheless, the number indicates how ineffective Iraqi air power actually was. Consequently, we may conclude that 16,780 were killed by air, and thus about 59,493 may have been wounded by air power. This results in air accounting for about 8% of all killed and only 6% of all wounded.

Combat Stress Casualties

It comes as no surprise that in fighting the longest war of the 20th Century, Iranian forces suffered combat stress casualties, and these psychological casualties have been acknowledged. At one Tehran center in 1998, 76 veterans were permanently hospitalized for “nervous and psychological disorders.” Thirty six were listed with over 50% disability.³⁰ Of Iran’s 320,000 permanently disabled from the War of Sacred Defense, 45,000 (14%) were combat stress casualties according to Pasdaran Commander in Chief, Maj. Gen. Rahim Safavi speaking in 1999. Of these, 12,000 (27%) required immediate hospital care.³¹ This indicates an instance of one serious combat stress casualty per twenty five other battle casualties or a rate of 9 per 1,000 combat veterans (given 5,000,000 saw combat) and 2.4 severe cases per 1,000 veterans.

In the 23 years of the Napoleonic Wars a soldier might expect to fight in sixty battles and see some 400 other lesser actions. A total of some 644 major combat actions also occurred during the period.³² Combat stress casualties were almost unknown.³³ Combat stress was first formally diagnosed in the US Civil War, and it was called “Soldier’s Heart.” The intensity and frequency of the fighting—some 10,455 combat actions in just four years, fifteen times that of the Napoleonic Wars—caused this casualty-producing effect of battle to become noticeable. Battles themselves had lengthened from an average of 1.6 days in the Napoleonic Wars to 2.6 days fifty years later.³⁴ There were no less than 2,261 recognized major actions, 3.5 times that of the sum of major actions in the Napoleonic Wars.³⁵ It was diagnosed as “nostalgia” in the first year of the war with a recorded 5,213 cases. The rate then was about 2.34 - 3.3 per 1,000 soldiers annually.³⁶

³⁰ “President Visits Rehabilitation Center for War Disabled,” *Iran News*, 3 January 1998.

³¹ “Safavi: Iran Shoulders Great Responsibility Toward War Disabled,” *Tehran Times*, 6 May 1999.

³² Gunther E. Rothenburg, *The Art of War in the Age of Napoleon* (Bloomington: Indiana University Press, 1980), 228, 246.

³³ Rory Muir, *Tactics and the Experience of Battle in the Age of Napoleon* (New Haven, Conn.: Yale University Press, 1991), 194-195.

³⁴ Paddy Griffith, *Battle Tactics of the Civil War* (New Haven, Conn.: Yale University Press, 1989), 197.

³⁵ Frederick Phisterer, *Statistical Record: A Treasury of Information About the US Civil War* (Carlisle, Pa.: John Kallmann Publishers, reprint of 1883 ed.), 83ff.

³⁶ Anthony Babington, *Shell Shock: A History of the Changing Attitudes to War Neurosis* (London: Leo Cooper, 1997), 13-20.

²⁸ “Iranian Naval Forces Ready to Defend Country, Its Territory,” *IRNA*, 16 April 1998.

²⁹ “Iran Lost 188,015 Forces During 8 Year War,” *IRNA*, 23 September 2000.

In WWI the British Army listed 28,533 shell shock wounded cases by December 1917. The British, however, distinguished between shell shock “wounded” (about 40%) and shell shock “sick” (about 60%), so actual numbers were higher. By 1921, 65,000 UK veterans were drawing pensions for neuropsychiatric disorders, with 14,771 (23%) of them confined to hospital. This was only about 3% of Britain’s 2,090,212 military wounded. By 1922 that number of pensioners had fallen to 50,000, but there were now 16,771 (34%) hospitalized. Also in WWI, a total of 69,394 US soldiers of the AEF suffered from neuropsychiatric disorders. This was about 34% of total AEF ground combat forces wounded of 203,183 (193,663 Army, 9,520 USMC), but it is not clear if all these were counted in casualty statistics, as most men recovered. Of these, only 4,039 cases (6%) had to be evacuated to the US, and 7,804 (11%) had to be confined to hospital after the war. This represented 27% of overall disabled wounded being so treated in 1921. It also represents about 4% of total wounded—in line with UK experience.³⁷

In WWII the US had three combat stress casualties for every two wounded and 125 for every 100 killed. The German army had only 13 for every 100 wounded.³⁸ In the North African campaign prior to Kasserine, psychiatric casualties were responsible for 20% of all battlefield evacuations and sometimes ran as high as 34%. During 1943 almost 40% of the Southwest Pacific Area’s evacuations to Hawaii or the US were loosely classed as mental. In Normandy 11,000 were treated for combat exhaustion with 75% returned to duty.³⁹ Overall, the annual rate for the US Army in WWII was between 28 and 101 per 1,000 engaged troops. In Korea during 1950-52, 37 of every 1,000 US servicemen were treated for psychiatric wounds each year. Only 6% of these were severe and required evacuation.⁴⁰

If Iranian serious combat stress casualties (45,000) accounted for, say, 4% of all wounded then we arrive at a figure of about 1,125,000 total combat wounded. This is closer to the total battle casualty figure of 1,137,000 cited above. It would suggest to some

that Iranian forces had far less of a problem with combat stress casualties than other 20th Century armies fighting sustained general wars. This may be due not only to a culturally superior psychological fortitude of the Iranian soldier or even the probable strengthening effect of a deep belief in Islam, but also to the simple fact there were only about 400 days of heavy combat in the eight years of the war. Additionally, the frequency of all combat actions was about that of the US Civil War, but the Iranian combat stress rate per thousand per year was three times higher.

Conclusion

Despite the fact that these figures debunk the western myth that hundreds of thousands or millions died in the War of Sacred Defense, we must not forget the tragedy that these lethal and disabling casualties represent. The war caused not only the casualties themselves, but also the heartbreak of their loved ones and friends and imposed an obligatory burden on the nation. “Every single one of the 34 tiny alleyways around my home is named after a martyr. In some alleyways there were three or four martyrs,” said Tehran resident Mohammed Ibrahim, a veteran of the 1985 battles. The mother of 17-year-old Pasdaran martyr Ali Reza Mirzai literally lived at her son’s grave at the Behest e Zahra for 13 years after his 1985 death in action, until ill health forced her to come only once a week. She cooked simple meals at his graveside to feed veterans visiting the cemetery as a way to honor her son’s memory.⁴¹

In 1989, 2.7 million persons—the wives, parents, and children—of men killed and disabled in the war were receiving government benefits. By 1996 this figure had risen 170% to 4.6 million as disabled veterans struggled to attain and maintain a normal life with families.⁴²

Excursion: PoW/MIA Update

In November 1997, Iran approved the release of another 496 Iraqi PoWs.⁴³ This brought the total to 49,196 since the end of the imposed war; 10,000 were

³⁷ *Ibid.* 107, 121-122.

³⁸ James F. Dunnigan, *How to Make War*, 3d ed. (New York: William Morrow and Co., 1993), 480.

³⁹ Albert E. Cowdrey, *Fighting For Life: US Military Medicine in World War II* (New York: The Free Press, 1994), 135-152, 256-257.

⁴⁰ Babington, *op. cit.*, 164.

⁴¹ “Tehran’s Vast Monument to a Deadly Conflict,” *Agence France Presse*, 15 December 1997.

⁴² “President Rafsanjani’s Grand Achievements in Two Terms,” *Iran Exports*, 47 (May-June 1997).

⁴³ “Iran to Unilaterally Release 500 Iraqi PoWs,” *IRNA*, 26 November 1997; “Leader Approves Release of Iraqi PoWs,” *IRNA*, 26 November 1997.

unilateral Iranian actions.⁴⁴ In response Iraq released two Iranian civilians arrested for border crossing in 1991.⁴⁵ In December 1997, Iran released two Jordanian PoWs captured during the *Fatah ol Mobin* offensive in 1982.⁴⁶ In January 1998, two Sudanese PoWs captured during the war were likewise released.⁴⁷ Later in May 1998, Iran released four Palestinian PoWs who had fought for Iraq.⁴⁸



In April 1998, a sudden change occurred in the POW situation. Iraq agreed to release 380 Iranian PoWs in exchange for the release of 5,592 Iraqi prisoners. On 3 April, 61 or 62 Iranians were exchanged for 800 Iraqis at the Khosravi border post.⁴⁹ Still, hope for a full accounting of Iranian PoWs is unlikely. In October 1991, Iraq stated it had 400 Iranians who re-

fused repatriation.⁵⁰ During the 1991-92 time frame, another 64 Iranian soldiers became POWs during fighting with the NLA and Kurdish groups supported by Iraq.⁵¹ These individuals probably were the ones being released or compelled to return. The exchange began on 2 April when 112 Iranians and 1,801 Iraqi PoWs were released. A further 89 Iranians and 1,500 Iraqis were exchanged on 5 April. On 6 April, 23 Iranians and 500 Iraqis went home, bringing the total to 4,058 (258 Iranian and 3,800 Iraqi). The final exchange took place on 7 April, when 50 Iranians were freed, and the total Iraqi repatriates numbered 5,584 of the original 5,592 promised (one Iraqi PoW who died of a heart attack during the swap; seven other Iraqi PoWs in the group elected to stay in Iran). This brought the grand total for the aftermath of the Iran-Iraq War to 29,157 Iranian and 50,993 Iraqi PoWs released in 94 bilateral exchanges, plus 28 unilateral releases by Iran according to Brig. Gen. Abdollah Najafi, head of the Iranian PoW Commission speaking on 5 April. This was contradicted by commission statistics released the next day, which listed 39,269 Iranian and 52,993 Iraqi PoWs swapped since 1981.⁵² In July 1998, these figures were revised again by General Najafi to 39,364 Iranian and 54,778 Iraqi PoWs exchanged.⁵³

Of the 319 (322?) Iranians actually released in April 1998, 316 were civilian internees seized during the unrest in southern Iraq following the end of the Desert Storm War. Among the few actual PoWs of the War of Sacred Defense was Hussein Raza Lashgari, the Iranian pilot shot down in 1981, coming home after 18 years. Also released were pilot Mohammed Amini and Arsalan Sharifii. Ayatollah Khomeini personally greeted these three returnees, promoting the first two to the rank of brigadier general and the third to major.⁵⁴

⁴⁴ "Iran Unilaterally Releases 500 Iraqi PoWs," *Tehran Times*, 29 November 1997.

⁴⁵ "Iraq Releases Two Iranians Jailed Since 1991," *Reuters*, 5 December 1997; the ICRC lists these two as Iranian servicemen captured in 1991. See "Iran/Iraq: New Hopes for Repatriations," *ICRC News* 97/49, 11 December 1997.

⁴⁶ "Iran Releases Two Jordanian PoWs," *IRNA*, 11 December 1997.

⁴⁷ "Iran Frees Two Sudanese Held since War with Iraq," *Iran News*, 21 January 1998.

⁴⁸ "Four Palestinian PoWs Freed at Request of Hamas Leader," *IRNA*, 4 May 1998.

⁴⁹ "Iran, Iraq Begin Exchange of PoWs," *IRNA*, 3 April 1998; "Iran-Iraq Release PoWs," *BBC News*, 3 April 1998; "Iran - PoW Exchange, 5,600 Iraqis to Be Released," *USNI Daily Defense News Capsules*, 3 April 1998.

⁵⁰ "War in the Gulf: Chronology of Events," *FYEO*, No. 267, 10 June 1991, p. 267-2; "War in the Gulf: Chronology of Events," *FYEO*, No. 277, 28 October 1991, p. 277-4.

⁵¹ "Iran and Iraq," *ICRC Annual Report* 1996, 1 June 1997.

⁵² "268 Iranian PoWs to Be Swapped for 3,791 Iraqi War Prisoners," *Tehran Times*, 5 April 1998; "23 More Iranian PoWs Exchanged for 500 Iraqi PoWs," *IRNA*, 6 April 1998; "Head of Commission on PoWs: PoWs Issue to Be solved This Year," *IRNA*, 13 April 1998; "Iran-Iraq PoW Committee to Meet in Baghdad," *Iran News*, 13 April 1998.

⁵³ "Iran's PoW Commission Head: Talks with Iraqis Positive," *IRNA*, 17 July 1998.

⁵⁴ "Leader Receives Former PoWs," *IRNA*, 8 April 1998; "Iran releases 5,584 Iraqi POWs Including Army Generals," *Associated Press*, 7 April 1998; "Iraq Releases Iranian Pilot," *Associated Press*, 7 April 1998; "268 Iranian PoWs to Be Swapped for 3,791 Iraqi War Prisoners," *Tehran Times*, 5 April 1998; "23 More Ira-

Generals Lashgari and Amini led the Army Day Parade on 18 April 1998 in Tehran's Azadi Square, where they were personally greeted by President Khatami.⁵⁵

In July 1998 Iran claimed it had information that "hundreds" of Iranian PoWs were still being held in Abu Ghraib prison outside Baghdad.⁵⁶ Before the 1990 invasion of Kuwait, Iraq had hundreds of Iranian PoWs transferred to secret locations.⁵⁷ However, General Najafi stated that the names of those listed as PoWs by both Iran and Iraq had become "clear."⁵⁸ He stated that Iraq had clarified the fate of 10% of Iranian PoWs still in Iraq, that some had died and others were unwilling to come home. The number of unresolved cases numbered 3,738.⁵⁹

In December 1998, another release of Iraqi PoWs was announced. On 17 December, 375 Iraqi PoWs were handed over at Khosrawi border point. This raised the overall numbers of Iraqis released to 55,150 according to Seyyed Ahmad Safavi, an official in charge of the provincial foreign nationals department.⁶⁰ A further release of 376 Iraqi PoWs was announced in January 1999.⁶¹ On 16 March 1999, Iran released another 449 Iraqi PoWs in return for fifty three Iranian civilians jailed in Iraq. This raised the Iranian PoW and other returnee count to 39,417 and that of Iraq to 55,438. Iran still holds 8,718 Iraqis registered with the Red Cross, but the actual residual was closer to 18,000.⁶² In April 1999, Brig. Gen. Mohammed Balar, spokesman of Iran's PoW Commission, said that there were no actual Iraqi PoWs left in Iran. All of the residuals had chosen

to stay in Iran and did not wish repatriation.⁶³ In August 1998, Iran arranged a meeting of the ICRC with 3,479 Iraqi PoWs. In March 1999, only 6 of 108 interviewed indicated they desired repatriation.⁶⁴ In all, 3,587 Iraqi PoWs have told the ICRC they did not wish to return to Iraq. Iran also examined the official Iraqi list of 9,162 names and found many of them repetitive, already released, under refugee status or completely unknown. In all, Iran clarified the status of some 18,995 alleged Iraqi PoWs in 1998. At the same time Iran called on Iraq to provide more information on the fate of 2,806 Iranian PoWs.⁶⁵

In August 1999, the PoW issue became active again. Ten days of talks in Baghdad beginning 24 July eventually broke down. The Iraqis presented a list of 2,952 (or 2,525) Iraqis still held by Iran. Iran countered by providing a list of 2,923 Iranian PoWs. Iraq claimed it held only 64 Iranian criminals captured during the Shiite rebellion of 1991 in the aftermath of the Desert Storm War. According to Iranian figures, Iran had released 55,438 Iraqi PoWs on 103 occasions since 1981, while Iraq had released 39,417 Iranian PoWs on 70 occasions.⁶⁶ Eventually, about 400 Iraqi PoWs were released in exchange for 50 Iranian detainees.⁶⁷ On 29 September 1999, Iran unilaterally released 276 Iraqi PoWs in conjunction with the 100th birth anniversary of Imam Khomeini. It reiterated that 2,806 Iranian PoWs were still being held by Iraq.⁶⁸ Brig. Gen. Mohammed Balar, public affairs chief of the Iranian POW Commission, noted that 6,018 Iraqi PoWs had been unilaterally released by Iran to Iraq's zero.⁶⁹

In April 2000, Iran announced it would unilaterally release 2,000 Iraqi PoWs.⁷⁰ The first group of 500 was released on 9 April 2000.⁷¹ Three more releases in

nian PoWs Exchanged for 500 Iraqi PoWs," IRNA, 6 April 1998; "Iran Says All Prisoners to be Swapped with Iraq," Associated Press, 6 April 1998; "3rd Batch of PoWs Swapped, 1 Iraqi Dies of Heart Attack," IRNA, 5 April 1998;

⁵⁵ "Iran Displays Its Armed Forces Might, Potentials," IRNA, 18 April 1998.

⁵⁶ "Hundreds of Iranian PoWs Still in Iraq," IRNA, 6 July 1998.

⁵⁷ "Iranian PoWs Still Kept in Iraq, Iraqi Opposition Says," IRNA, 29 July 1998.

⁵⁸ "Iran's PoW Commission Head: Talks with Iraqis Positive," IRNA, 17 July 1998.

⁵⁹ "Fate of 3,738 Iranian PoWs Still Unknown," IRNA, 21 July 1998.

⁶⁰ "Some More Iraq PoWs to Be Released," IRNA, 15 December 1998; "Iran Releases 375 More Iraqi PoWs," IRNA, 17 December 1998.

⁶¹ "Iran to Release Iraqi PoWs," BBC News, 3 January 1999.

⁶² "Iran and Iraq Exchange Prisoners," CNN, 16 March 1999; "Iraq, Iran Exchange PoWs," IRNA, 17 March 1999; "Iran Releases 450 Iraqi PoWs," IRNA, 18 March 1999.

⁶³ "Iran Has No More Iraqi PoWs," Iran News, 24 April 1999.

⁶⁴ "Head of Iranian PoWs Commission On Outcome of Talks with Iraqis," IRNA, 24 May 1999.

⁶⁵ "Iran Requests Iraq to Clarify 2,806 Iranian PoWs," IRNA, 25 April 1999.

⁶⁶ "55,438 Iraqi PoWs Released By Iran since 1981," Tehran Times, 11 August 1999; "Iran Blames Iraq for PoW Talks Breakdown as War of Words," Agence France Presse, 10 August 1999.

⁶⁷ "Iran, Iraq Exchange Bodies," BBC News, 2 September 1999.

⁶⁸ "Iran Frees 276 Iraqi PoWs," IRNA, 29 September 1999; "Iran Releases 276 Iraqi PoWs Unilaterally," IRNA, 29 September 1999.

⁶⁹ "Iraq PoWs to be Released Unilaterally by Iran," IRNA, 28 September 1999.

⁷⁰ "Iran to Unilaterally Release 2,000 Iraqi PoWs Next Week," IRNA, 6 April 2000.

⁷¹ "Iraqi PoWs Freed 12 Years after War with Iran," Reuters, 9

the next few days brought the total to 1,999.⁷² On 23 April 2000, Iran claimed their latest figures indicated Iraq held 3,206 Iranian PoWs; Iran had freed 57,712 Iraqi PoWs since the war, while 39,417 Iranian PoWs had been released by Iraq. Some 9,000 Iraqi PoWs had sought asylum in Iran, and 4,600 of these had been formally interviewed by the ICRC and their requests officially submitted.⁷³ On 6 May 2000, Brig. Gen. Mohammed Balar, head of the POW Commission, announced Iran had unilaterally released another 480 Iraqi PoWs at the Iraqi Munthiriya border post. Other sources indicated Iran would release yet another 2,000 in the next few weeks.⁷⁴ The next release was announced for 23 May 2000, when 460 Iraqi PoWs would be set free. Some 6,743 Iraqi PoWs had been interviewed at this time by the ICRC and indicated they did not want to return home. Since 1995 Iran claimed to have clarified the fate of some 17,275 Iraqi captives and freed 10,514 of them, bringing the total to 50,019 released in 106 transfers since the war. In return Iraq had released 39,417 Iranian PoWs in 70 transfers.⁷⁵ Another 460 were released on 25 May 2000. Since April 1998 Iran had released 9,451 PoWs, while Iraq had released just 3 POWs and some 369 civilian internees.⁷⁶ On 29 June 2000, another 450 Iraqi PoWs were released, bringing the total to 3,389 in 2000.⁷⁷ On 10 and 11 August 2000, 728 Iraqi PoWs, the only remaining POWs held against their will, were released to Iraq. Some 7,307 Iraqi former POWs have elected to remain in Iran with formal petitions to the ICRC, while over 8,000 total have chosen to do so. Since 1995, 12,145 Iraqi PoWs have been repatriated according to Brig. Gen. Abdullah Najafi, Chief of the Iranian PoW Commission. In all, Iran had released 59,830 Iraqi PoWs to Iraq's 39,417 Iranians.⁷⁸

April 2000.

⁷² "Iran Sets Free More Iraqi PoWs," *Reuters*, 10 April 2000; "Najafi: ICRC to Decide Fate of Iranian PoWs within a Month," *IRNA*, 14 April 2000.

⁷³ "Official: Iraq Still Holds 3,206 Iranian PoWs," *IRNA*, 23 April 2000.

⁷⁴ "Iran to Free 480 Iraqi PoWs," *IRNA*, 28 April 2000; "Iran Frees 480 Iraqi PoWs," *IRNA*, 6 May 2000; "480 Iraqi PoWs Home 12 Years After Iran War," *Reuters*, 4 May 2000.

⁷⁵ "Iran Will Unilaterally Free 460 Iraqi PoWs on 23 May," *IRNA*, 17 May 2000.

⁷⁶ "Iran Frees 460 Iraqi PoW," *The News International Pakistan*, 25 May 2000.

⁷⁷ "450 Iraqi PoWs Freed by Iran," *IRNA*, 29 June 2000; "Iraqi PoWs Return Home, Praise Iran's Hospitality," *IRNA*, 29 June 2000.

⁷⁸ "Najafi: Iranian PoWs Fate to be Clarified Soon," *IRNA*, 6 August 2000; "Iran To Hand Over 721 Iraqi PoWs to ICRC," *IRNA*, 6 August 2000; "Iran to Release All Remaining Iraqi PoWs

The Iranian number claimed seems to include Iraqi PoWs choosing to remain in Iran. In December 2000, Iran still claimed Iraq held 3,206 POWs, while Iraq insisted Iran held 29,000 of theirs.⁷⁹ Reports in early 2002 indicate that Iraq, if not holding actual POWs, was holding up to 2,000 Iranian civilian internees at its Ramadiyah camp.⁸⁰ Similarly, Iran released another 682 Iraqi PoWs in January 2002.⁸¹ Of these, 507 were PoWs from the War of Sacred Defense, and the other 188 were PoWs captured after the First Gulf War fleeing coalition forces. In return, the Iraqis released 46 Iranian prisoners it claimed were not PoWs but rather were illegal border crossers. This amounted to the release of a total of 99,766 PoWs of both nations since the end of the war.⁸² Iran continued to insist Iraq still held 2,806 Iranian PoWs. By April 2002, this claim fell to 900.⁸³ In November Iran freed 20 more Iraqi PoWs, but Iraq had no more Iranians to set free.⁸⁴

In the run up to the US 2003 invasion of Iraq, more prisoner exchanges were arranged. On 18-19 March, Iran and Iraq exchanged 1,239 POWs—888 Iraqi and 351 Iranians. The Iranians were not POWs but civilian detainees.⁸⁵ In May the ICRC brokered the release of 59 Iraqi PoWs from Iran which it stated were

Soon," *IRNA*, 5 August 2000; "Iran Releases 728 Remaining Iraqi PoWs," *IRNA*, 9 August 2000; "Remaining Iraqi PoWs Released By Iran Unilaterally," *IRNA*, 9 August 2000; "Iran Holds No More Iraqi PoWs-Official," *IRNA*, 13 August 2000; "Iran-Iraq-PoWs," *IRNA*, 10 September 2000; "Iran-PoWs-ICRC," *IRNA*, 12 September 2000; "Iraq Has Given No Explanation on 3,000 PoWs," *IRNA*, 27 September 2001.

⁷⁹ "Iran-Iraq-Prisoners," *IRNA*, 16 December 2000.

⁸⁰ "The War's Not Over," *RFE/RL Iran Report*, 22 January 2001.

⁸¹ "In Brief – Iran Releases 682 Iraqi PoWs," *JDW*, 6 February 2002.

⁸² "Iraq Hopes Iran Ends Human File," *Iraqi News Agency*, 24 January 2002; "Iran to Free 697 Iraqi PoWs within 72 Hours: Ministry," *AFP*, 20 January 2002; "Iran Frees Hundreds of Iraqi Prisoners of War," *Reuters*, 23 January 2002; "Iran Releases Iraqi PoWs," *BBC News*, 21 January 2002; "Red Cross Oversees POW Handover," *AP*, 23 January 2002; "Iran Releases 682 Iraqi PoWs," *IRNA*, 23 January 2002.

⁸³ "Iran and Iraq Have Exchanged 98% of PoWs: Press," *IRNA*, 10 April 2002; "900 Iranian PoWs Remain in Captivity of Iraqi Regime," *IRNA*, 21 July 2002.

⁸⁴ "Iran Frees 20 Iraqi Prisoners of War," *AFP*, 20 November 2002.

⁸⁵ "351 Iranian Prisoners Released By Iraq," *IRNA*, 18 March 2003; "Release of Iranian Prisoners by Iraq Not Entire Demands of Iran," *IRNA*, 19 March 2003; "Iran and Iraq Exchange 1,200 Prisoners," *AFP*, 19 March 2003; "FM Spokesman: Remaining PoWs to be Exchanged Next Week," *IRNA*, 13 March 2003; "Exchange of Iranian Prisoners, Iraqi PoWs Ends," *IRNA*, 19 March 2003.

the last held in Iran involuntarily.⁸⁶ In August, Brig. Gen. Abdollah Najasfi, head of the Iranian POW Commission, stated 7,228 Iraqi PoWs had chosen to stay in Iran and that Iran had released 61,482 Iraqi PoWs in total. Further 38,993 Iranian PoWs had been returned by Iraq, and 570 had died in Iraqi custody.⁸⁷

Like their US counterparts, many Iranian *azadegan* (ex-PoWs) suffer from post-traumatic stress disorders and chronic physical ailments associated with their captivity. The conditions of their confinement by the Iraqis were horrendous, involving starvation rations, beatings, sexual abuse, disease and indifferent medical attention, claustrophobic mass internment living accommodations, and often ten years or more captivity. Azizollah Farokhi is typical. Captured in 1983 when just 20 years old, he spent eight years in captivity until released in the buildup to the Desert Storm War. Wounded when captured, he suffers 60% disability. Like their US counterparts in Vietnam, despite threats and abuse, he and other Iranian PoWs refused to collaborate with the enemy, maintaining complete loyalty to their nation and faith. Such was the strength of their moral resistance that one Iraqi guard told them: “We are your prisoners.”⁸⁸

The quality and amount of aid ex-PoWs and other wounded veterans have received from the Iranian government has been widely criticized.⁸⁹ “For people who gave so much, the government does not do enough. The Americans who fought in Vietnam are treated better than us” is the bitter opinion of Gholam Ali, a typical Iranian war veteran.⁹⁰ This was the subject of an award-winning Iranian film—“The Glass Agency”—in the 1997 Fajr Film Festival. The movie centers on a war veteran who takes hostages at a travel agency to obtain a free plane ticket and money to take his friend, a war disabled *Baseej*, to London for surgery. The film won eight prizes for best picture, actor, actress, supporting actor, director, script, editing and soundtrack.⁹¹

⁸⁶ “Iraqis Said To Be Last PoWs Return from Iran,” *Reuters*, 5 May 2003.

⁸⁷ “Head of PoW Committee: No More Iraqi PoWs in Iran,” *IRNA*, 17 August 2003.

⁸⁸ “Iranian PoWs in Iraq Witness Iraqi’s Weakness,” *Tehran Times*, 18 August 1998.

⁸⁹ “Our Boy; Their Prisoner of War,” *The Iranian*, December 1995.

⁹⁰ “Tehran’s Vast Monument to a Deadly Conflict,” *Agence France Presse*, 15 December 1997.

⁹¹ “War Movie Given Top Honors at Iran Festival,” *AFP*, 11 February 1998.

On the other hand, there are veterans who have continued their military careers and are not bitter about the war. One such is Ali Zakani, now a senior *Baseej* official at Tehran University. “We did not enter the battlefield to become martyrs, only to defend Islam and the revolution. But we knew if we died, we were going to be martyrs, and that was important to us ... so we would have victory either way.” Zakani enlisted in the *Baseej* at age 15, fought in 15 major campaigns and as wounded an incredible 10 times. He recalled how during the *Wal Fajir-8* operation Iranian frogmen di-



rected his unit's assault boats to an Iraqi position on the Majnoon islands. After hours of deadly close combat, 20 Iraqi soldiers surrendered to his unit. The Iranian troops tended to the Iraqi wounded and shared their rations of "good bread" made from milk and wheat with their malnourished prisoners. One of the Iraqis was so overwhelmed by Iranian kindness and honor in the midst of such carnage that he blurted out: "Now I know what is Islam." He was then allowed to go back into the marshes and retrieve other surrendering Iraqi soldiers and bring them to safety.⁹²



In December 1991, a forensic team with Human Rights Watch and Physicians for Human Rights uncovered the graves of 19 Iranian soldiers on the grounds of the Sardaw military base near Sulaimaniyya. After examining the remains, the forensic experts found several skulls with evidence of single gunshot wounds. In spring 1985, two years before the base was built, a group of Kurdish secondary students found the bodies exposed on the slopes of Saywan Hill. Some of them were still in uniform. The students notified local residents, who called the municipality, which, in turn, dispatched a local gravedigger, Sadiq 'Issa, to dispose of the bodies. 'Issa told the forensic team that many of the bodies had intravenous needles in their forearms. He speculated that they were captured Iranian soldiers who had been hospitalized by the Iraqis and then later executed in retaliation for an Iranian attack, which was a common practice during the Iraq-Iranian War. "I could see some of them had been shot in the head," he said. "And on some of them I found identification papers and even photographs of their families. I placed these things in glass jars and, as I buried them, I placed the jars between their legs." The International Committee of the Red Cross turned over the remains of the Iranian soldiers to the Iranian authorities in 1992.⁹³

"Martyr" is not an exclusively Muslim status. In conjunction with Christmas 1998 the Foundation for the Martyrs commemorated the Iranian Christian "martyrs" who "were active in safeguarding divine values."⁹⁴

In 2008, Mohammed Taghi Khademi, a senior official with Iran's Foundation for Preservation of the Relics and Values of Sacred Defense, said 50,000 MIA bodies had been recovered and of these 10% had not been identified.⁹⁵ The standard practice seems to be determination of the operation in which they were martyred and the provincial origins of units in that engagement. Of the 1,500 buried in May 1998, 99% were identified by their dog tags.⁹⁶ In search operations along the Iran-Iraq border between 1990 and 1998, 50 were

⁹³ See Eric Stover, "Unquiet Graves: The Search for the Disappeared in Iraqi Kurdistan," *Middle East Watch*, a division of Human Rights Watch, and Physicians for Human Rights, March 1992.

⁹⁴ "Martyrs Foundation Congratulates Birth Anniversary of Christ," *IRNA*, 23 December 1998.

⁹⁵ "7,000 Iranian MIAs from War," *PressTV*, 14 November 2008.

⁹⁶ "Iran Holds Funeral for Victims of War with Iraq," *Reuters*, 2 May 1998.

killed and 80 wounded by mines.⁹⁷ Among these victims was noted Iranian war documentary director Morteza Avini. He was killed by a mine on 8 April 1993, while making a documentary about Iranian MIAs.⁹⁸ In July 1999, the new Iranian-designed mine clearance vehicle *Taftian-1* was put into trials with an MIA recovery team working in minefields.⁹⁹

In May 1998, 1,500 martyrs were buried, including 315 or 319 from Tehran Province.¹⁰⁰ On 4 September 1998, ceremonies were held in Tehran for another 700 MIAs.¹⁰¹ These had been recovered in the preceding four months in the Salamech region along with those of 300 Iraqi soldiers, according to Brig. Gen. Mir Faisal Baqerzadeh, head of the MIA commission.¹⁰² In May 2001, a funeral was held for 1,000 martyrs from 20 different provinces in Azadi Square in Tehran.¹⁰³ Some 225 were eulogized in 45 cities in January 2002, all of them unknowns.¹⁰⁴ In July, the remains of 570 deceased PoW-MIAs were interred, 120 of them unknown.¹⁰⁵ Another 300 MIAs were buried in Tehran in November.

⁹⁷ "Search for War Martyrs Causes Almost 50 More Deaths on Iran-Iraq Border," *Iran News*, 23 April 1998.

⁹⁸ "Iranian and French Scholars to Review War Films in Tehran," *Tehran Times*, 7 April 2008.

⁹⁹ "Iran's Defense Industrial Complex Produces Mine Mopper," *IRNA*, 29 July 1999.

¹⁰⁰ "Leader Leads Funeral Procession in Tehran," *IRNA*, 21 July 1995; "Rowhani Pays Tribute to Martyrs of Sacred Defense," *IRNA*, 27 July 1995; "Funeral Procession War Martyrs," *IRNA*, 7 July 1997; "The Remains of 750 Iranian Soldiers..." *Al Akhbar Muslim World News*, 15 October 1996; "Funeral Service to be Held Nationwide for 1,233 War Martyrs," *IRNA*, 1 October 1997; "Funeral Service for War Martyrs," *Iran Daily*, 7 October 1997; "Martyr Funeral Procession in Presence of Leader," *IRNA*, 1 May 1998; "Leader Attends Funeral for 1,500 Martyrs," *Iran News*, 2 May 1998; "Iran Holds Funeral for Victims of War with Iraq," *Reuters*, 2 May 1998; "900 Iranian PoWs Remain in Captivity in Iraq," *IRNA*, 21 July 2002.

¹⁰¹ "Iran - Funeral Ceremony," *IRNA*, 4 September 1998.

¹⁰² "Thousands Attend Mass Funeral for Iranian Soldiers Killed in Iraq War," *Iran News*, 5 September 1998.

¹⁰³ "Funeral Service for 1,000 War Martyrs to be Held," *IRNA*, 24 April 2001; "People Invited to Participate in Funeral for War Martyrs," *IRNA*, 8 May 2001.

¹⁰⁴ "Funeral for 225 Martyrs of Iraqi Imposed War to be Held Wednesday," *IRNA*, 5 January 2002; "Iran Buries Unknown Martyrs of Iraqi Imposed War," *IRNA*, 9 January 2002; "Funeral Services Held for 10 Unknown Martyrs," *IRNA*, 9 January 2002; "Supreme Leader Visits Graves of Unknown Martyrs," *IRNA*, 12 January 2002; "National Heroes Seen Off to Paradise," *Tehran Times*, 10 January 2002; "Martyrs to be Buried in 40 Cities Next Week," *Tehran Times*, 2 January 2002.

¹⁰⁵ "Funeral Procession Held for Bodies of PoWs," *IRNA*, 24 July 2002; "Bodies of Five Unidentified Soldiers Laid to Rest," *IRNA*, 25 July 2002.



ber.¹⁰⁶ In April 2003, a funeral was held for 90 martyrs throughout Iran. All unknowns, 8 were buried in Mashad, 6 in Meshkan, 6 at the University of Khorassan, 5 at Azad University, 5 in Taftan Park in Khash, 5 at Basij base east of Tehran and 20 in Isfahan.¹⁰⁷ In July, 300 martyrs were laid to rest in the Behest e Zahra cemetery and elsewhere.¹⁰⁸ In early August, 25 more were buried in Tehran, 5 at the Qamar e Bani Hashem Mosque and 5 at the Malek Ashtar Barracks of the *Bas-e-ej*.¹⁰⁹ Later that month, another 225 were buried at 40 locations throughout Iran. MIA Committee chief Mir Feizal Bagherzadeh said there were still 8,700 Iranian soldiers buried in Iraq.¹¹⁰ In June 2008, the remains of seven unknowns were buried on the grounds of the Majlis in Tehran.¹¹¹ Unrecovered Iranian MIAs are carried as active soldiers on their unit personnel rolls with their current status listed simply as "still at the front."

In June 1997, the remains of 20, and in August those of 15 more Iranian MIAs were returned by Iraq.¹¹² In September 1997, another 15 Iranian MIAs came home, exchanged for 16 Iraqi dead. During the

¹⁰⁶ "Iran to Hold Funeral for 300 Martyrs," *IRNA*, 21 November 2002.

¹⁰⁷ "Remains of Unknown Martyrs of War with Iraq Buried Throughout Iran," *IRNA*, 24 April 2003; "Iran to Hold Funerals for 90 Martyrs of War with Iraq," *IRNA*, 19 April 2003.

¹⁰⁸ "Mass Funeral Services Held for 300 War Martyrs," *IRNA*, 13 July 2003.

¹⁰⁹ "Burial Ceremony Held for 25 Unknown Martyrs in Tehran Province," *IRNA*, 2 August 2003.

¹¹⁰ "State Funerals for 225 Martyrs in Iran-Iraq War," *AFP*, 2 August 2003.

¹¹¹ "President Participates in Mass Funeral for 7 Unknown War Martyrs," *IRNA*, 27 June 2008.

¹¹² "Remains of Twenty Martyrs of Imposed War Handed Over to Iran," *IRNA*, 1 June 1997; "Iran, Iraq Swap Bodies of Soldiers," *Tehran Times*, 6 August 1997.

exchange ceremony at Shalamcheh border point General Baqerzadeh, head of Iranian MIA retrieval operations, approached his Iraqi counterpart with a proposal to swap Iraqi PoWs for Iranian MIA corpses.¹¹³ As of September 1997, the total number of MIA bodies recovered stood at over 37,000 according to General Baqerzadeh.¹¹⁴ In December 1997, Iraq exchanged the bodies of 7 Iranian MIAs for those of 37 of their own.¹¹⁵ By April 1998, a total of 39,230 Iranian MIAs had been recovered, 1,500 since October 1997.¹¹⁶ In May 1998, Iran and Iraq reached an accord for joint search operations. According to General Baqerzadeh, the first effort would be to recover MIAs of the *Karbala-5* offensive by a ten-man Iranian team in the Shalamcheh region of Iraq. At the same time an Iraqi team would search for their MIAs on Iranian territory.¹¹⁷ The team entered Iraq on 11 May 1998, and by September had recovered 111 MIAs, 77 of whom could be identified. These men had been lost in the *Karbala-5* and *Beit ol Moqqadas-7* operations. The Iraqi team in Iran located 117 of their own MIAs. The remains were exchanged on 29 September at Salamcheh. After a funeral service in Susanagerd, the bodies were transferred to Tehran.¹¹⁸ On 9 June 1998, the remains of 53 other Iranian MIAs were returned at Salamcheh crossing point, while those of 134 Iraqi MIAs were likewise handed over in return.¹¹⁹ On 28 July 1998, the remains of another 100 Iranian and 83 Iraqi MIAs were exchanged at Salamchech.¹²⁰ According to General Baqerzadeh, the next search area would be in the Sumar and Mandali areas.¹²¹

On 8 December 1998, Iran received the remains of 121 of its MIAs killed in the Basra, Al Fao and Al Amara areas in exchange for 213 Iraqi bodies. Discus-

sions were held on a boat in the Arvandrud River by General Baqerzadeh on means to search for the MIAs of the *Karbala-4* and *Wal Fajir-8* offensives.¹²²

The US attacks on Iraq in December 1998 caused suspension of MIA retrieval operations and evacuation of Iranian search teams in Iraq. They were scheduled to resume as soon as possible.¹²³ A funeral service for 440 MIAs was held in Tehran on 8 January 1998. The remains of 219 MIAs found in the Shalamcheh region have not yet been identified. All told, the remains of 43,512 martyrs had been recovered by then. General Baqerzadeh said the remains of another 10,000-12,000 MIAs still lay in Iraq.¹²⁴ Similar funeral ceremonies for 34 MIAs in Khuzistan, 12 in Kohkiluyeh-Boyerahmad and 2 in Kashan were held on 15 January 1999.¹²⁵

In April 1999, Iraq and Iran held talks on release of further Iraqi PoWs and the continued search for MIAs. A swap of 221 Iraqi and 166 Iranian MIAs was scheduled for 17 April at the al-Mundhiriya border post.¹²⁶ The swap occurred on schedule, but only 164 Iranian bodies were actually delivered.¹²⁷ Of these, 161 were as yet unidentified.¹²⁸ On 7 June 1999, a funeral ceremony was held for some 600 MIAs recovered in the previous 6 months. This raised the recovered MIA total to 43,672, according to General Baqerzadeh.¹²⁹ At the same time, another body exchange was being arranged with Iraq.¹³⁰ This occurred on 8 June 1999, when the remains of 47 Iranian MIAs were traded for those of 59 Iraqis.¹³¹ On 30 July 1999, a funeral procession was held for 72 MIAs killed during operations

¹²² "Iran Receives More Bodies of War Martyrs," IRNA, 8 December 1998; Iran, Iraq to Expand Cooperation on Fate of MIAs," IRNA, 8 December 1998.

¹²³ "Joint Search Operations to Find Bodies of War Martyrs Halt," IRNA, 22 December 1998.

¹²⁴ "Funeral Service To Be Held for 440 War Martyrs," IRNA, 4 January 1998.

¹²⁵ "Funeral Processions for War Martyrs on Last Friday of Ramadan," IRNA, 15 January 1999.

¹²⁶ "Iranian Visits Baghdad to Discuss PoWs Issue," Reuters, 15 April 1999; "Iran and Iraq to Swap War Dead," AFP, 15 April 1999.

¹²⁷ Bodies of 164 Martyrs of Sacred Defense Returned to Country," IRNA, 17 April 1999.

¹²⁸ "Funeral Procession Held for 161 Martyrs in Abadan," IRNA, 19 April 1999.

¹²⁹ "Funeral Procession to be Held for 600 Martyrs of Imposed War," IRNA, 6 June 1999.

¹³⁰ "Iran, Iraq to Exchange Remains of War Veterans," Tehran Times, 6 June 1999.

¹³¹ "Bodies of Iranian and Iraqis Exchanged Tuesday," IRNA, 8 June 1999.

¹¹³ "Bodies of 15 Iranian Martyrs Exchanged with Corpses of Iraqis," IRNA, 15 September 1997.

¹¹⁴ "Funeral Service to be Held Nationwide for 1,233 War Martyrs," IRNA, 1 October 1997.

¹¹⁵ "Remains of Seven Iranian Martyrs Exchanged with Those of Iraq," IRNA, 22 December 1997.

¹¹⁶ "Search for War Martyrs Causes Almost 50 More Deaths on Iran-Iraq Border," Iran News, 23 April 1998.

¹¹⁷ "Search Operation to Locate MIAs Starts," IRNA, 11 May 1998.

¹¹⁸ "Funeral Procession to be Held for 111 War Martyrs," IRNA, 29 September 1998; "Remains of 111 Martyrs of Sacred Defense Returned Home," Iran News, 30 September 1998.

¹¹⁹ "Iraq Hands Over Bodies of 53 Martyrs to Iran," IRNA, 9 June 1998.

¹²⁰ "Iran-Iraq Exchange Remains of Soldiers," IRNA, 28 July 1998.

¹²¹ "Iran Offers Joint Cooperation with Iraq to Find Remains of Dead," IRNA, 9 June 1998.

Ramadan, Kheiber, Wal Fajir-3, Karbala-4, Beit ol Moqqadas-7 and the Iraqi attack on Shalamcheh. This ceremony brought the number of Iranian MIAs recovered to 43,744 and the number of Iraqi MIAs returned to 6,000.¹³² Another exchange occurred on 2 September with Iran receiving 164 sets of remains and returning those of 221 Iraqi soldiers.¹³³

On 20 January 2000, Iran held memorial services for the remains of 342 MIAs at Qom. This brought the total remains recovered to 44,086. Iraq still held another 64 not yet handed over, according to General Baqerzadeh.¹³⁴ Eventually, four funeral caravans—dubbed “Faith,” “Jihad,” “Martyrdom,” and “Allegiance”—each of 114 bodies, were arranged. The remains proceeded from Abadan to Tehran and thence to Mashad. All the MIAs were reported identified.¹³⁵ Thus Iran continues its sad duty of burying recovered soldiers from a war fought not only in another century but also another millennium.

In April 2000, Brigadier General Abdullah Najafi, chief of the Iranian MIA commission, stated that Iran still had some 30,000 MIAs unrecovered. He added that Iraq claimed 60,000.¹³⁶ Three hundred more Iranian MIAs were buried in the *Behest e Zahra* on 26 May 2000.¹³⁷ This brought the total to 44,386. Yet another 300 were honored in Tehran on 12 August 2000.¹³⁸ The next return of MIA remains did not occur until 10 January 2001, when only 38 Iranian bodies were returned in exchange for those of 332 Iraqi soldiers. In a surprising development, the Iraqis agreed to exhume the bodies of Iranian PoWs who had died in captivity and return them.¹³⁹ In August 2001, Iraq returned another 122 Iranian MIAs in exchange for 122 of their own found in the

Shalamcheh and Zeid war zones. In September, a new agreement was established between the two countries for continued MIA retrieval operations.¹⁴⁰ In November 2001, an exchange of 78 Iranian bodies for those of 64 Iraqis took place at Dehloran.¹⁴¹ In January 2002, the Iraqi Foreign Ministry said the remains of 574 Iranians would be exchanged for the remains of 1,183 Iraqis in the near future.¹⁴² In June 2002, the nations exchanged the remains of 80 Iranian MIAs for 91 Iraqis.¹⁴³ At this time Iran had returned remains of 5,323 Iraqi soldiers for 3,998 Iranian.¹⁴⁴ In July, the remains of 570 Iranian PoWs who had died in captivity were exchanged for those of 1,166 Iraqi PoWs who had suffered the same fate.¹⁴⁵ This was the forty-eighth exchange of remains since 1991, according to MIA Recovery Committee representative Colonel Alireza Gholami.¹⁴⁶ In September, 88 Iranian and 32 Iraqi remains were exchanged and in October those of 84 Iranians and 64 Iraqis. Some 59 had been lost in the Fath ol Mobin-1 operation and the others in operation *Badr*.¹⁴⁷ In November, 18 sets of Iraqi remains were exchanged for 78 Iranian and in December 74 Iraqi for 77 Iranian.¹⁴⁸ By January 2002, some 48,000 MIAs had been recovered and search was still underway to recover another 10,000 according to General Baqerzadeh.¹⁴⁹

In January 2003, the bodies of 47 Iran MIAs were returned in exchange for the remains of 131 Iraqi bodies. Thirty-nine of the Iranian MIAs were discovered by searchers from the 25th *Pasdaran* “Karbala” Division. Eight of the bodies were those of POWs who

¹⁴⁰ “Iran, Iraq Exchange 122 Bodies of MIAs,” *IRNA*, 16 August 2001; “Iran, Iraq Agree to Resume Search Operations for Missing Soldiers,” *IRNA*, 11 September 2001.

¹⁴¹ “Bodies of 78 Iranian Martyrs Exchanged for Those of 64 Iraqi Soldiers,” *IRNA*, 14 November 2001.

¹⁴² “In Brief – Iran Releases 682 Iraqi PoWs,” *JDW*, 6 February 2002.

¹⁴³ “Iran Receives Remains of 80 Martyrs of the War,” *IRNA*, 18 June 2002.

¹⁴⁴ “Iran-Iraq Talks Scheduled,” *AP*, 16 June 2002.

¹⁴⁵ “Iran Receives Bodies of PoWs,” *IRNA*, 21 July 2002; “Iraq, Iran Exchange Remains of Dead PoWs,” *AP*, 22 July 2002.

¹⁴⁶ “Iran to Hand over Remains of 1,200 Iraqi Soldiers Soon,” *IRNA*, 16 July 2002.

¹⁴⁷ “Iran, Iraq Swap Bodies of 120 Soldiers Killed in The War,” *AFP*, 17 September 2002; “Iran, Iraq Exchange Remains of 150 Soldiers,” *AFP*, 29 October 2002; “Iran, Iraq Exchange Remains of Soldiers Killed in 1980-1988 War,” *IRNA*, 18 September 2002.

¹⁴⁸ “Iran, Iraq Trade Remains of Soldiers,” *Reuters*, 28 December 2002.

¹⁴⁹ “Funeral for 225 Martyrs of Iraqi Imposed War to be Held Wednesday,” *IRNA*, 5 January 2002.

¹³² “Funeral Procession for 72 Martyrs to Be Held Friday,” *IRNA*, 26 July 1999.

¹³³ “Iran, Iraq Bodies Exchange,” *BBC News*, 2 September 1999.

¹³⁴ “Funeral Procession To Be Held for 342 Martyrs in Mashad,” *IRNA*, 3 January 2000.

¹³⁵ “Funeral Procession of 456 Martyrs Start,” *IRNA*, 12 January 2000; “456 Martyrs to be Laid to Rest in Mashad,” *Iran News*, 10 January 2000; “Convoy of Martyrs to Arrive at Mausoleum of Late Imam, Funeral will be Held on Sunday,” *IRNA*, 13 January 2000.

¹³⁶ “Najafi: ICRC to Decide Fate of Iranian PoWs within a Month,” *IRNA*, 14 April 2000.

¹³⁷ “Funeral Procession to be Held for 300 Martyrs on Friday,” *IRNA*, 23 May 2000.

¹³⁸ “Funeral Procession to be Held for 300 Martyrs in Tehran,” *IRNA*, 12 August 2000.

¹³⁹ “Bodies of 38 Iranian Martyrs Exchanged with Those of 332 Iraqi,” *IRNA*, 10 January 2001.

had died in Iraqi detention camps. Five of the Iraqi bodies were also those of soldiers who had died in Iranian custody. This was the 48th body exchange carried out.¹⁵⁰ In March, all MIA recovery operations were suspended, and Iranian searchers returned home in the looming hostilities between the US and Iraq that became Operation Iraqi Freedom (OIF). In May, Iran received the remains of 45 missing Iranian soldiers from Iraq which had been scheduled to be delivered prior to OIF.¹⁵¹

Iran refused, however, the handover of Iranian MIAs discovered by coalition forces in the aftermath of Saddam Hussein's deposition. UK forces had discovered 200 sets of possible Iranian MIA remains in plastic bags in a warehouse in Basra. Many showed signs of torture and execution. US forces had discovered a mass grave outside Mosul with the remains of possibly 300 Iranian PoWs. At the end of forensic investigation at the sites, about 100 were definitely identified as Iranian PoWs.¹⁵² As of 2004, about 7,000 Iranian troops were still listed as MIA.¹⁵³ This number was confirmed again in 2008.¹⁵⁴ In November 2007, the apparent fate of a few was revealed when a mass grave was discovered at Al Zubair near Basra containing the remains of 30 individuals, some of whom were definitely Iranian soldiers identified by their dog tags.¹⁵⁵ Documents that came to light in August 2007, indicated at least 700 Iranian PoWs had been executed by direct order of either Saddam Hussein or Lt. Gen. Saber Abduilaziz al-Dorwri, the head of the Iraqi secret service. Some 157 of these Iranian PoWs were unregistered with the International Red Cross at the time of their executions.¹⁵⁶

On 1 December 2008, the bodies of 200 Iraqi MIAs were exchanged for those of 41 Iranian missing. Only 24 of the Iranian soldiers were identified although another report reduced this to 10 as "positively identified."¹⁵⁷

Interestingly, the burial of MIAs in prominent places has been met with some resistance. Burials on university campuses became an issue in 2006. In March, three MIAs were buried on the grounds of Tehran's Sharif University and three other unknowns were interred at Shahid Rajaii University. Several hundred students protested these ceremonies, claiming it was inappropriate and would be used in future as a pretext by the government to stifle dissent by claiming war martyrs were being disrespected.¹⁵⁸

In June 2008, in anticipation of an eventual US invasion of Iran, 320,000 graves were ordered dug in border regions, 15,000-20,000 in each border province. General Baqerzadeh was in charge of this operation. He noted the effort was to "reduce the suffering of the families of the fallen in any attack on our country... and to prevent the repetition of the long and bitter experience of the Vietnam War."¹⁵⁹

Thus Iran continues its sad duty of burying recovered soldiers from a war fought not only in another century but also another millennium and preparing its graves registration effort for another war that might take even more lives.

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¹⁵⁰ "Bodies of 47 War Martyrs Returned Home," Tehran Times, 28 January 2003.

¹⁵¹ "Iranian Inspectors Searching for MIAs in Iraq Left for Home," IRNA, 6 March 2003; "Iraq Put Exchanging Remains of Soldiers with Iran on Hold," IRNA, 26 March 2003; "Iran Suspends Hunt for 1980-1988 War Dead in Iraq," AFP, 2 March 2003.

¹⁵² "Iran to Receive Remains of 45 Soldiers of Iraqi War on Sunday," IRNA, 14 May 2003; "British Find 200 Bodies, Grisly Photos Near Basra," Reuters, 5 April 2003; "Bodies Found may be from Iran-Iraq War," AP, 6 April 2003; "Mass Grave Discovered Near Mosul Could Contain Hundreds of Bodies," VOA News, 18 July 2003.

¹⁵³ "All Iranian, Iraqi PoWs Released," Payvand, 28 February 2004.

¹⁵⁴ "7,000 Iranian MIAs from War," PressTV, 14 November 2008.

¹⁵⁵ "Victims of Iran War with Iraq Found in Mass Grave," Iran Mania, 26 November 2007.

¹⁵⁶ "Iraqi General-MKO Executed Iranian POWs," Iran Didban, 16 August 2007.

¹⁵⁷ "Iran, Iraq Exchange Remains of Soldiers," PressTV, 1 December 2009; "Iran, Iraq Swap Soldiers' Bodies from 1980s War," Fars News Agency, 1 December 2009.

¹⁵⁸ "Iran: Students Protest Burials of War Dead on Tehran Campuses," Payvand, 15 March 2006.

¹⁵⁹ "Iran to Ready Thousands of Graves for Enemy Soldiers," Breitbart.com, 29 June 2008.

Comparing the RAND Version of the 3:1 Rule to Real-World Data



Christopher A. Lawrence

For this test, The Dupuy Institute took advantage of two of its existing databases for the DuWar suite of databases. The first is the Battles Database (BaDB), which covers 243 battles from 1600 to 1900. The second is the Division-level Engagement Database, which covers 675 division-level engagements from 1904 to 1991.

The first was chosen to provide a historical context for the 3:1 rule of thumb. The second was chosen so as to examine how this rule applies to modern combat data.

We decided that this should be tested to the RAND version of the 3:1 rule as documented by RAND in 1992 and used in JICM (with SFS) and other models. This rule, as presented by RAND, states: "...the famous '3:1 rule,' according to which the attacker and defender suffer equal fractional loss rates at a 3:1 force ratio if the battle is in mixed terrain and the defender enjoys 'prepared' defenses..."

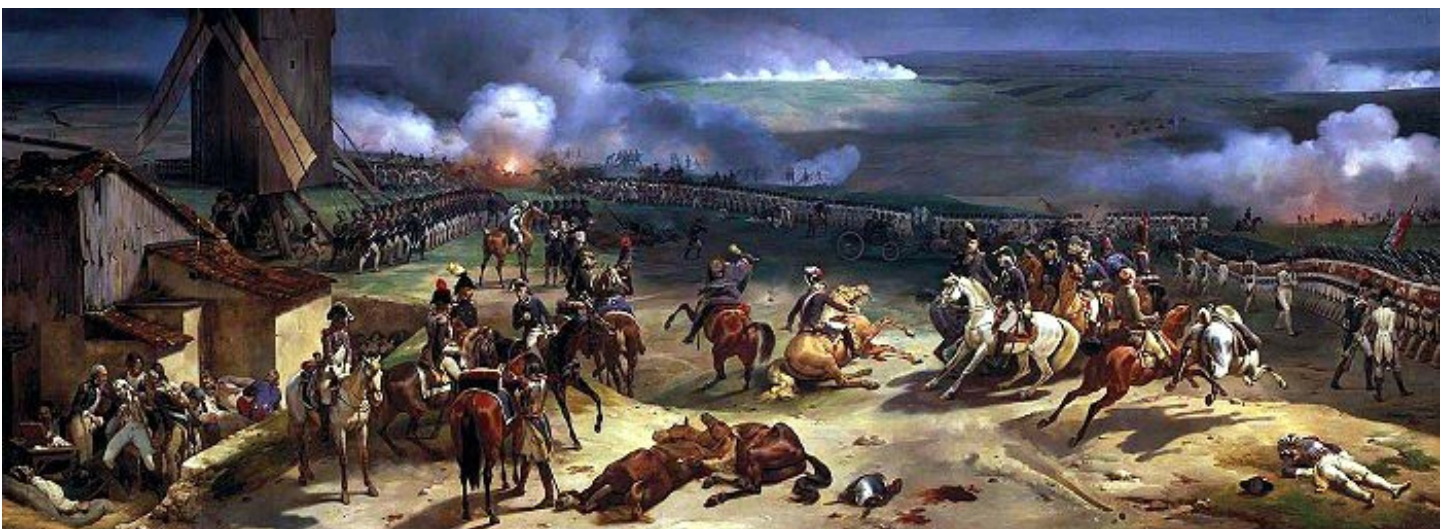
Therefore, we selected out all those engagements from these two databases that ranges from force ratios of 2.5 to 1 to 3.5 to 1 (inclusive). It was then a simple matter to map those to a chart that looked at attackers losses compared to defender losses. In the case of the pre-1904 cases, even with a large database (243 cases), there were only 12 cases of combat in that range, hardly statistically significant. That was because

most of the combat was at odds ratios in the range of .50-to-1 to 2.00-to-one.

The count of number of engagements by odds in the pre-1904 cases:

Ratio	Number of Cases	Percent
Less than .20	0	0
0.20 - 0.28	2	1
0.29 - 0.40	2	1
0.40 - 0.50	9	4
0.50 - 0.66	17	7
0.67 - 1.00	64	26
1.00 - 1.50	71	29
1.50 - 2.00	38	16
2.00 - 2.50	16	7
2.50 - 3.50	12	5
3.50 - 5.00	4	2
5.00 - 10.00	5	2
10.00 - 20.00	3	1
20.00 or greater	0	0

As the database is one of battles, then usually these are only joined at reasonably favorable odds, as shown by the fact that 88 percent of the battles occur between 0.40 and 2.50 to 1 odds. The twelve pre-1904 cases in the range of 2.50 to 3.50 are shown in Table 1.



Battle Name	Year	Force Ratio	Attacker % Loss	Defender % Loss	Loss Ratio	% per Day Loss Ratio
Hochkirch	1758	2.58	9.48	29.35	0.83	0.32
Maxen	1759	2.81	2.63	7.41	1.00	0.36
Jemappes	1792	3.08	7.50	19.23	1.20	0.39
Hondschoote	1793	3.23	7.14	23.08	1.00	0.31
La Rothiere	1814	2.75	5.45	15.00	1.00	0.36
Arcis-sur-Aube	1814	2.67	1.88	8.33	0.60	0.23
Buena Vista	1847	2.94	7.14	7.84	2.68	0.91
Inkerman	1854	2.63	36.16	25.66	3.70	1.41
Five Forks	1865	3.00	2.11	60.00	0.11	0.04
Coulmiers	1870	3.00	3.00	9.00	1.00	0.33
Belfort	1871	2.75	2.42	1.67	4.00	1.45
Majuba Hill	1871	3.43	0.50	81.14	0.02	0.01
Average		2.91	7.12	23.98	1.43	0.51

Table 1

If the RAND version of the 3:1 rule was valid, one would expect that the “Percent per Day Loss Ratio” (the last column) would hover around 1.00, as this is the ratio of attacker percent loss rate to the defender percent loss rate. As it is, 9 of the 12 data points are noticeably below 1 (below 0.40 or a 1 to 2.50 exchange rate). This leaves only three cases (25%) with an exchange rate that would support such a “rule.”

If we look at the simple ratio of actual losses (vice percent losses), then the numbers comes much closer to parity, but this is not the RAND interpretation of the 3:1 rule. Six of the twelve numbers “hover” around an even exchange ratio, with six other sets of data being widely off that central point. “Hover” for the rest of this discussion means that the exchange ratio ranges from 0.50-to-1 to 2.00-to-1.

Still, this is early modern linear combat, and is not always representative of modern war. Instead, we will examine 634 cases in the Division-level Database (which consists of 675 cases) where we have worked out the force ratios. While this database covers from 1904 to 1991, most of the cases are from WWII (1939-1945). Just to compare:

Years	Number of Cases
1904-1905	3
1912	1
1914-1918	19
1938	1
1940	2
1941	7
1942	1
1943	285*
1944	197**
1945	93
1956	2
1967	16
1968	1
1973	32
1991	15

* 37 of these do not have force ratios.

** 4 of these do not have force ratios.

As such, 87% of the cases are from WWII data and 10% of the cases are from post-WWII data. The engagements without force ratios are those that we are still working on as The Dupuy Institute is always expanding the DLEDB as a matter of routine. The specific

cases, where the force ratios are between 2.50 and 3.50 to 1 (inclusive) are shown in Table 2:

Battle Name	Year	Force Ratio	Attacker % Loss	Defender % Loss	Loss Ratio	% per Day Loss Ratio
The Yalu	1904	3.11	0.98	6.94	0.44	0.14
Prelip	1912	2.50	3.00	15.00	0.50	0.20
First Dardanelles Landing	1915	3.20	16.88	39.00	1.38	0.43
Somme: Bazentin Ridge	1916	3.00	20.00	26.67	2.25	0.75
Megiddo	1918	2.80	3.30	19.18	0.48	0.17
<i>Changkufen/Hill 52</i>	<i>1938</i>	<i>2.50</i>	<i>4.00</i>	<i>2.75</i>	<i>3.64</i>	<i>1.45</i>
Sele-Calore Corridor	1943	2.96	2.02	1.45	4.11	1.39
Capua	1943	3.36	0.52	0.20	8.70	2.59
Stalemate at Capua	1943	3.38	0.04	0.00	N/A	N/A
Monte Grande (Volturno)	1943	3.37	0.20	0.08	8.38	2.49
Roccamonfina	1943	3.18	0.23	0.59	1.22	0.38
Closing up...Garigliano	1943	3.28	0.17	0.03	19.00	5.79
Calabritto I	1943	3.49	0.06	0.19	1.11	0.32
Calabritto II	1943	3.47	0.45	0.29	5.43	1.56
Calabritto III	1943	3.40	0.15	0.62	0.83	0.25
Calabritto IV	1943	3.47	1.53	0.73	6.40	1.85
Calabritto V	1943	3.50	0.07	1.50	0.15	0.04
Calabritto VIII	1943	2.77	0.11	0.17	1.80	0.65
Monte Camino X	1943	3.46	0.12	2.02	0.20	0.06
Advance...Merefa River I	1943	2.65	0.48	0.32	4.00	1.51
Advance through Dergachi	1943	2.67	0.48	39.70	0.03	0.01
Losovo I	1943	3.19	0.50	7.16	0.22	0.07
<i>Kochetovka I</i>	<i>1943</i>	<i>2.54</i>	<i>3.22</i>	<i>1.22</i>	<i>6.19</i>	<i>2.44</i>
<i>Kochetovka II</i>	<i>1943</i>	<i>2.89</i>	<i>2.62</i>	<i>1.39</i>	<i>5.44</i>	<i>1.89</i>
<i>Kochetovka III</i>	<i>1943</i>	<i>2.87</i>	<i>3.16</i>	<i>1.08</i>	<i>8.39</i>	<i>2.92</i>
<i>Kochetovka IV</i>	<i>1943</i>	<i>2.68</i>	<i>0.72</i>	<i>0.43</i>	<i>4.54</i>	<i>1.69</i>
LSSAH Clears Outpost...	1943	2.98	0.25	1.22	0.62	0.21
Totenkopf Prepares to...	1943	2.57	0.05	0.00	N/A	N/A
LSSAH Attacks	1943	3.00	2.69	18.20	0.44	0.15
Totenkopf Attacks	1943	2.57	0.77	3.24	0.61	0.24
The 106th ID Advances	1943	3.24	1.33	4.22	1.02	0.31
The 19th PzD Continues...	1943	2.94	2.01	6.94	0.85	0.29
The 7th PzD Turns	1943	3.45	1.75	12.21	0.49	0.14
19th PzD Breaks Through	1943	2.75	2.15	6.93	0.86	0.31
The 6th PzD Pushes...	1943	3.19	0.82	1.63	1.60	0.50
The Adolf Hitler SS...	1943	3.42	0.23	0.60	1.30	0.38
Bowling Alley II	1944	3.12	1.95	8.13	0.75	0.24
Bowling Alley I	1944	3.24	1.93	2.16	2.91	0.90

Battle Name	Year	Force Ratio	Attacker % Loss	Defender % Loss	Loss Ratio	% per Day Loss Ratio
Formia	1944	3.04	0.47	3.15	0.45	0.15
Monte Grande (Rome)	1944	2.87	0.32	2.43	0.38	0.13
Itri-Fondi	1944	2.69	0.32	1.43	0.60	0.22
Terracina	1944	2.71	0.53	1.90	0.76	0.28
Sezze	1944	2.58	0.31	1.33	0.60	0.23
Lanuvio	1944	2.83	1.28	2.86	1.27	0.45
Valmontone	1944	2.63	1.33	2.81	1.25	0.48
Seine River	1944	2.71	0.19	2.01	0.26	0.10
Melun	1944	2.87	0.19	2.01	0.27	0.10
Boulogne I	1944	2.84	0.53	4.92	0.31	0.11
Calais I	1944	3.39	0.09	3.50	0.09	0.03
Brest, Suburbs I	1944	2.98	0.49	5.92	0.25	0.08
Brest, Suburbs II	1944	3.24	0.38	10.17	0.12	0.04
Boulogne II	1944	2.99	0.46	24.88	0.06	0.02
Morhange	1944	3.43	1.30	0.87	5.11	1.49
Sarre-Union	1944	3.27	0.59	1.07	1.81	0.55
Singling-Bining	1944	3.02	1.02	2.40	1.28	0.42
Our River North	1944	2.79	2.41	1.71	3.93	1.41
Schnee Eifel North II	1944	3.08	0.39	21.30	0.06	0.02
Schnee Eifel South	1944	2.56	1.82	6.98	0.67	0.26
Bastogne Corridor III	1944	2.64	0.54	1.16	1.23	0.46
Aachen 1st ID Attack I	1944	3.03	0.78	5.68	0.42	0.14
Aachen 1st ID Attack II	1944	3.23	0.54	2.30	0.76	0.23
Aachen 1st ID Attack III	1944	2.73	0.36	4.48	0.22	0.08
Aachen 1st ID Attack IV	1944	2.95	0.34	2.03	0.50	0.17
Aachen 1st ID Attack V	1944	3.02	0.38	5.37	0.21	0.07
Aachen 1st ID Attack VII	1944	3.32	0.37	5.45	0.22	0.07
Aachen 1st ID Attack XII	1944	2.52	0.59	3.06	0.49	0.19
Aachen 1st ID Attack XIII	1944	2.60	0.48	12.50	0.10	0.04
Aachen 1st ID Attack XIV	1944	2.93	0.18	22.47	0.02	0.01
Aachen 30th ID Attack III	1944	2.64	1.19	5.85	0.54	0.20
<i>Nikopol Bridgehead</i>	<i>1944</i>	<i>3.05</i>	<i>0.41</i>	<i>0.97</i>	<i>1.27</i>	<i>0.42</i>
<i>Brody, Phase II</i>	<i>1944</i>	<i>2.98</i>	<i>4.55</i>	<i>3.80</i>	<i>3.57</i>	<i>1.20</i>
<i>Vistula River, Op. II</i>	<i>1944</i>	<i>2.74</i>	<i>2.89</i>	<i>2.04</i>	<i>3.87</i>	<i>1.41</i>
<i>Ciechanow, Phase I</i>	<i>1945</i>	<i>3.48</i>	<i>6.34</i>	<i>4.68</i>	<i>4.72</i>	<i>1.36</i>
<i>Ciechanow, Phase II</i>	<i>1945</i>	<i>3.11</i>	<i>7.02</i>	<i>5.90</i>	<i>3.70</i>	<i>1.19</i>
Kochi Ridge - Onaga I	1945	2.92	0.61	8.83	0.20	0.07
Kochi Ridge IV	1945	2.94	0.38	14.24	0.08	0.03
Manila, 37th ID 1	1945	3.41	0.48	2.40	0.69	0.20
Manila, 37th ID 2	1945	3.43	0.00	2.48	N/A	N/A
Manila, 37th ID 22	1945	2.54	0.78	12.01	0.17	0.07

Battle Name	Year	Force Ratio	Attacker % Loss	Defender % Loss	Loss Ratio	% per Day Loss Ratio
Manila, 37th ID 23	1945	2.89	0.84	11.15	0.22	0.08
Manila, 37th ID 24	1945	3.23	0.55	15.49	0.11	0.04
1st CavD at Manila 1	1945	2.73	0.12	2.80	0.11	0.04
1st CavD at Manila 2	1945	2.81	0.00	7.68	N/A	N/A
1st CavD at Manila 3	1945	3.04	0.44	1.71	0.78	0.26
1st CavD at Manila 4	1945	3.07	0.06	5.64	0.03	0.01
1st CavD at Manila 5	1945	3.25	0.23	1.36	0.54	0.17
1st CavD at Manila 6	1945	3.30	0.75	19.80	0.13	0.04
Bir Hassna - Bir Thamada	1967	2.90	0.69	18.33	0.11	0.04
<i>Mitla Pass</i>	<i>1967</i>	<i>3.03</i>	<i>1.25</i>	<i>0.62</i>	<i>6.11</i>	<i>2.01</i>
<i>Third Army Offensive</i>	<i>1973</i>	<i>3.50</i>	<i>4.77</i>	<i>1.08</i>	<i>15.42</i>	<i>4.41</i>
<i>Yehudia-El Al</i>	<i>1973</i>	<i>3.49</i>	<i>1.14</i>	<i>1.19</i>	<i>3.33</i>	<i>0.96</i>
<i>Khafji</i>	<i>1991</i>	<i>3.00</i>	<i>0.96</i>	<i>0.43</i>	<i>6.76</i>	<i>2.25</i>
Between the Wire	1991	2.86	0.01	2.81	0.01	0.00
PL NEW JERSEY...	1991	2.53	0.10	15.33	0.02	0.01
Big Night-1 ID (M)...	1991	2.77	0.12	2.50	0.14	0.05
Medina Ridge	1991	3.26	0.18	15.83	0.04	0.01
Objective ORANGE...	1991	2.80	0.07	4.00	0.05	0.02
AO BRAGG	1991	2.50	0.02	2.04	0.02	0.01
Average		3.00	1.39	6.08	1.86	0.61
Less pre-1943			0.96	5.28	1.89	0.61
Also less Soviet-doctrine attacks*			0.63	5.83	1.27	0.41

* Engagements in italics are attacks by “Soviet doctrine” trained armies, including 10 by the Soviet Army in 1938 and WWII, three by the Egyptians and Syrians in 1967 and 1973 and one by the Iraqis in 1991.

Table 2

This is a total of 98 engagements at force ratios of 2.50 to 3.50 to 1. It is 15 percent of the 634 engagements for which we had force ratios. With this fairly significant representation of the overall population, we are still getting no indication that the 3:1 rule, as RAND postulates it applies to casualties, does indeed fit the data at all. Of the 98 engagements, only 19 of them demonstrate a percent per day loss ratio (casualty exchange ratio) between 0.50-to-1 and 2-to-1. This is only 19 percent of the engagements at roughly 3:1 force ratio. There were 72 percent (71 cases) of those engagements at lower figures (below 0.50-to-1) and only 8 percent (cases) are at a higher exchange ratio. The data clearly was not clustered around the area from 0.50-to-1 to 2-to-1 range, but was well to the left (lower) of it.

Looking just at straight exchange ratios, we do get a better fit, with 31 percent (30 cases) of the figure ranging between 0.50 to 1 and 2 to 1. Still, this fig-

ure exchange might not be the norm with 45 percent (44 cases) lower and 24 percent (24 cases) higher. By definition, this fit is 1/3rd the losses for the attacker as postulated in the RAND version of the 3:1 rule. This is effectively an order of magnitude difference, and it clearly does not represent the norm or the center case.

The percent per day loss exchange ratio ranges from 0.00 to 5.71. The data tends to be clustered at the lower values, so the high values are very much outliers. The highest percent exchange ratio is 5.71, the second highest is 4.41, the third highest is 2.92. At the other end of the spectrum, there are four cases where no losses were suffered by one side and seven where the exchange ratio was .01 or less. Ignoring the “N/A” (no losses suffered by one side) and the two high “outliers (5.71 and 4.41), leaves a range of values from 0.00 to 2.92 across 92 cases. With an even distribution across that range, one would expect that 51

percent of them would be in the range of 0.50-to-1 and 2.00-to-1. With only 19 percent of the cases being in that range, one is left to conclude that there is no clear correlation here. In fact, it clearly is the opposite effect, which is that there is a negative relationship. **Not only is the RAND construct unsupported, it is clearly and soundly contradicted with this data.** Furthermore, the RAND construct is theoretically a worse predictor of casualty rates than if one randomly selected a value for the percentile exchange rates between the range of 0 and 2.92. We do believe this data is appropriate and accurate for such a test.

As there are only 19 cases of 3:1 attacks falling in the even percentile exchange rate range, then we should probably look at these cases for a moment:

Battle	Year	Force Ratio	Attacker % Loss	Defender % Loss	Loss Ratio	% per Day Loss Ratio
Somme: Bazentin Ridge	1916	3.00	20.00	26.67	2.25	0.75
Changkufen/Hill 52	1938	2.50	4.00	2.75	3.64	1.45
Sele-Calore Corridor	1943	2.96	2.02	1.45	4.11	1.39
Calabritto II	1943	3.47	0.45	0.29	5.43	1.56
Calabritto IV	1943	3.47	1.35	0.73	6.40	1.85
Calabritto VIII	1943	2.77	0.11	0.17	1.80	0.65
Advance...Merefa River I	1943	2.65	0.48	0.32	4.00	1.51
Kochetovka II	1943	2.89	2.62	1.39	5.44	1.89
Kochetovka IV	1943	2.68	0.72	0.43	4.54	1.69
The 6th PzD Pushes...	1943	3.19	0.82	1.63	1.60	0.50
Bowling Alley I	1944	3.24	1.93	2.16	2.91	0.90
Morhange	1944	3.43	1.30	0.87	5.11	1.49
Sarre-Union	1944	3.27	0.59	1.07	1.81	0.55
Our River North	1944	2.79	2.41	1.71	3.93	1.41
Brody, Phase II	1944	2.98	4.55	3.80	3.57	1.20
Vistula River Op. II	1944	2.74	2.89	2.04	3.87	1.41
Ciechanow, Phase I	1945	3.48	6.34	4.68	4.72	1.36
Ciechanow, Phase II	1945	3.11	7.02	5.90	3.70	1.19
Yehudia-Ei Al	1973	3.49	1.14	1.19	3.33	0.96
Average		3.06	3.20	3.12	3.80	1.25

One will note, in these 19 cases, that the average attacker casualties are way out of line with the average for the entire data set (3.20 versus 1.39 or 3.20 versus 0.63 with pre-1943 and Soviet-doctrine attackers removed). The reverse is the case for the defenders (3.12 versus 6.08 or 3.12 versus 5.83 with pre-1943 and Soviet-doctrine attackers removed). Of course, of the 19 cases, 2 are pre-1943 cases and 7 are cases of Soviet-doctrine attackers (in fact, 8 of the 14 cases of the Soviet-doctrine attackers are in this selection of 19 cases). This leaves 10 other cases from the Mediterranean and

ETO (Northwest Europe 1944). These are clearly the unusual cases, outliers, etc. While the RAND 3:1 rule may be applicable for the Soviet-doctrine offensives (as it applies to 8 of the 14 such cases we have), it does not appear to be applicable to anything else. By the same token, it also does not appear to apply to virtually any cases of post-WWII combat. This all strongly argues that not only is the RAND construct not proven, but it is indeed clearly not correct.

The fact that this construct also appears in Soviet literature, but nowhere else in US literature, indicates that this is indeed where the rule was drawn from. One must consider the original scenarios run for the RSAC wargame were “Fulda Gap” and Korean War scenarios. As such, they were regularly conducting bat-

tles with Soviet attackers versus Allied defenders. It would appear that the 3:1 rule that they used more closely reflected the experiences of the Soviet attackers in WWII than anything else. Therefore, it may have been a fine representation for those scenarios as long as there was no US counterattacking or US offensives (and assuming that the Soviet Army of the 1980s performed at the same level as in did in the 1940s).

There was a clear relative performance difference between the Soviet Army and the German Army in World War II (see our Capture Rate Study Phase I & II and Measuring Human Factors in Combat for a detailed analysis of this).¹ It was roughly in the order of a 3-to-1-casualty exchange ratio. Therefore, it is not surprising that Soviet writers would create analytical tables based upon an equal percentage exchange of losses when attacking at 3:1.

What is surprising, is that such a table would be used in the US to represent US forces now. This is clearly not a correct application.

Therefore, RAND’s SFS, as currently constructed, is calibrated to, and should only be used to represent, a Soviet-doctrine attack on first world forces

¹ *Capture Rate Study Phases I and II Final Report* (The Dupuy Institute, March 6, 2000) (2 Vols.) and *Measuring Human Factors in Combat—Part of the Enemy Prisoner of War Capture Rate Study* (The Dupuy Institute, August 31, 2000). Both of these reports are available through our web site.

where the Soviet-style attacker is clearly not properly trained and where the degree of performance difference is similar to that between the Germans and Soviets in 1942-44. It should not be used for US counterattacks, US attacks, or for any forces of roughly comparable ability (regardless of whether Soviet-style doctrine or not). Furthermore, it should not be used for US attacks against forces of inferior training, motivation and cohesiveness. If it is, then any such tables should be expected to produce incorrect results, with attacker losses

being far too high relative to the defender. In effect, the tables unrealistically penalize the attacker.

As JICM with SFS is now being used for a wide variety of scenarios, then it should not be used at all until this fundamental error is corrected, even if that use is only for training. With combat tables keyed to a result that is clearly off by an order of magnitude, then the danger of negative training is high.



Corrections Made for Version 2.07 of the TNDM



Alexander Dinsmoor

The Dupuy Institute has released a minor revision of the Tactical Numerical Deterministic Model (TNDM). The two changes in version 2.07 are:

1. The duplicate 'anti-tank missile' entry has been removed from the Weapons Type menu and no longer appears when you are creating an OLI. Previously, both entries functioned and selecting either did not impair the operation of the TNDM. However, this correction removed the duplicate entry.

2. We have tweaked the magazine load capacity function when creating a Mobile Fighting Machine (MFM). Previously, the TNDM was having trouble when you created new MFM components and then tried

to use those components to create a new MFM in the same TNDM session. The TNDM was not processing the magazine capacity correctly, and this was impairing the TNDM's ability to correctly establish Operational Lethality Indices (OLIs). The revision allows you to create MFM components and then load them onto a MFM in the same TNDM session. Note, the rate of fire for a MFM is based on the ammunition load for the primary weapon of an MFM.

Hopefully, these changes will resolve some recurring user interface issues and allow for easier use and operation of the TNDM. We will be distributing this revised version to holders of our support contract.

C:\TNDM205\tndm.exe

Record # 248 of 254 File: OLI Last Update: 04/07/1910

[I=Quit] Press <ESC> or <Enter> to Exit

CATEGORY	SUBCAT	COMPONENT	WEAPON	OLI
1	0	N	12cm GrW 42 and 378(r) <120mm Mortar>	204.000▲
1	0	N	5cm 1e GrW 36 <50mm Mortar>	27.000
1	0	N	8cm GrW 34 <81mm Mortar>	72.000
1	0	N	Flammenwerfer 41/42	0.541
1	0	N	Karabiner 98k Rifle <Kar 98k>	0.175
1	0	N	MG34 Machinegun, 7.92mm	0.585
1	0	N	8mm Breda M37 MG	0.206
1	0	N	50mm Mortar Type 89 "Knee Mortar"	28.000≈
1	0	N	81mm Mortar Type 97	87.000
1	0	N	.303-inch Bren Mk IV Light Machinegun	0.165
1	0	N	3-inch Mortar Mk I	76.000
1	0	N	.30cal MG M1917A1	0.214
1	0	N	.30cal MG M1919	0.214
1	0	N	.50cal MG M2	0.507
1	0	N	4.2-inch Chemical Mortar M30	166.000▼

PRIMARY WEAPON'S RANGE FINDER-Stadiametric

Next Prev Top Bottom Go Search Find Limit Edit Add Del View Report Clean Quit
Browse file in table format

Sample weapons catalog listing

A Summation of QJM/TNDM Validation Efforts



Christopher A. Lawrence

There have been six or seven different validation tests conducted of the QJM (Quantified Judgment Model) and the TNDM (Tactical Numerical Deterministic Model). As the changes to these two models are evolutionary in nature but do not fundamentally change the nature of the models, the whole series of validation tests across both models is worth noting. To date, this is the only model we are aware of that has been through multiple validations. We are not aware of any DOD combat model that has undergone more than one validation effort. Most of the DOD combat models in use have not undergone any validation.

The Two Original Validations of the QJM

After its initial development using a 60-engagement WWII database, the QJM was tested in 1973 by application of its relationships and factors to a validation database of 21 World War II engagements in Northwest Europe in 1944 and 1945. The original model proved to be 95% accurate in explaining the outcomes of these additional engagements. Overall accuracy in predicting the results of the 81 engagements in the developmental and validation databases was 93%.¹

During the same period the QJM was converted from a static model that only predicted success or failure to one capable of also predicting attrition and movement. This was accomplished by adding variables and modifying factor values. The original QJM structure was not changed in this process. The addition of movement and attrition as outputs allowed the model to be used dynamically in successive "snapshot" iterations of the same engagement.

From 1973 to 1979 the QJM's formulae, procedures, and variable factor values were tested against the results

of all of the 52 significant engagements of the 1967 and 1973 Arab-Israeli Wars (19 from the former, 33 from the latter). The TNDM was able to replicate all of those engagements with an accuracy of more than 90%.²

In 1979 the improved QJM was revalidated by application to 66 engagements. These included 35 from the original 81 engagements (the "development database"), and 31 new engagements. The new engagements included five from World War II and 26 from the 1973 Middle East War. This new validation test considered four outputs: success/failure, movement rates, personnel casualties, and tank losses. The TNDM predicted success/failure correctly for about 85% of the engagements. It predicted movement rates with an error of 15% and personnel attrition with an error of 40% or less. While the error rate for tank losses was about 80%, it was discovered that the model consistently underestimated tank losses because input data included all kinds of armored vehicles, but output data losses included only numbers of tanks.³

This completed the original validations efforts of the QJM. The data used for the validations, and parts of the results of the validation, were published, but no formal validation report was issued. The validation was conducted in-house by Colonel Dupuy's organization, HERO. The data used were mostly from division-level engagements, although they included some corps- and brigade-level actions. We count these as two separate validation efforts.

The Development of the TNDM and Desert Storm

In 1990 Col. Dupuy, with the collaborative assistance of Dr. James G. Taylor (author of *Lanchester Models of Warfare* in two volumes, published by the Operations Research Society of America, Arlington, Virginia, in 1983) introduced a significant modification: the representation of the passage of time in the

² The original QJM validation data was first published in the *Combat Data Subscription Service* Supplement, vol. 1, no. 3 (Dunn Loring VA: HERO, Summer 1975). (HERO Report #50.) That effort used data from 1943 through 1973.

³ HERO published its QJM validation database in *The QJM Data Base* (3 volumes) Fairfax VA: HERO, 1985 (HERO Report #100).

¹ It is unclear what these percentages, quoted from Dupuy in the TNDM General Theoretical Description, specify. We suspect it is a measurement of the model's ability to predict winner and loser. No validation report based on this effort was ever published. Also, the validation figures seem to reflect the results after any corrections made to the model based upon these tests. It does appear that the division-level validation was "incremental." We do not know if the earlier validation tests were tested back to the earlier data, but we have reason to suspect not.

model. Instead of resorting to successive “snapshots,” the introduction of Taylor’s differential equation technique permitted the representation of time as a continuous flow. While this new approach required substantial changes to the software, the relationship of the model to historical experience was unchanged.⁴ This revision of the model also included the substitution of formulae for some of its tables so that there was a continuous flow of values across the individual points in the tables. It also included some adjustment to the values and tables in the QJM. Finally, it incorporated a revised OLI calculation methodology for modern armor (mobile fighting machines) to take into account all the factors that influence modern tank warfare.⁵ The model was reprogrammed in Turbo PASCAL (the original had been written in BASIC). The new model was called the TNDM (Tactical Numerical Deterministic Model).

Building on its foundation of historical validation and proven attrition methodology, in December 1990, HERO used the TNDM to predict the outcome of, and losses from, the impending Operation Desert Storm.⁶ It was the most accurate (lowest) public estimate of US war casualties provided before the war. It differed from most other public estimates by an order of magnitude.

Also, in 1990, Trevor Dupuy published an abbreviated form of the TNDM in the book *Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War*. A brief validation exercise using 12 battles from 1805 to 1973 was published in this book.⁷ This version was used for creation of M-COAT⁸ and was also sepa-

⁴ The Dupuy Institute, *The Tactical Numerical Deterministic Model (TNDM): A General and Theoretical Description*, McLean VA: The Dupuy Institute, October 1994.

⁵ This had the unfortunate effect of undervaluing WWII-era armor by about 75% relative to other WWII weapons when modeling WWII engagements. This left The Dupuy Institute with the compromise methodology of using the old OLI method for calculating armor (Mobile Fighting Machines) when doing WWII engagements and using the new OLI method for calculating armor when doing modern engagements

⁶ “Testimony of Col. T. N. Dupuy, USA, Ret., Before the House Armed Services Committee, 13 Dec 1990.” The Dupuy Institute File I-30, “Iraqi Invasion of Kuwait.”

⁷ Trevor N. Dupuy, *Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War* (HERO Books, Fairfax, VA, 1990), 123-4.

⁸ M-COAT is the Medical Course of Action Tool created by Major Bruce Shahbaz. It is a spreadsheet model based upon the elements of the TNDM provided in Dupuy’s *Attrition* (op. cit.). It used a scoring system derived from elsewhere in the US Army. As such, it is a simplified form of the TNDM with a different weapon scoring system.

rately tested by a student (Lieutenant Gozel) at the Naval Postgraduate School in 2000.⁹ This version did not have the firepower scoring system, and as such neither M-COAT, Lieutenant Gozel’s test, nor Colonel Dupuy’s 12-battle validation included the OLI methodology that is in the primary version of the TNDM.

For counting purposes, I consider the Gulf War the third validation of the model. In the end, for any model, the proof is in the pudding. Can the model be used as a predictive tool or not? If not, then there is probably a fundamental flaw or two in the model. Still the validation of the TNDM was somewhat second hand, in the sense that the closely-related previous model, the QJM, was validated in the 1970s to 200 World War II and 1967 and 1973 Arab-Israeli War battles, but the TNDM had not been. Clearly, something further needed to be done.

The Battalion-Level Validation of the TNDM

Under the guidance of Christopher A. Lawrence, The Dupuy Institute undertook a battalion-level validation of the TNDM in late 1996. This effort tested the model against 76 engagements from World War I, World War II, and the post-1945 world including Vietnam, the Arab-Israeli Wars, the Falklands War, Angola, Nicaragua, etc. This effort was thoroughly documented in the *TNDM Newsletter*.¹⁰ This effort was probably one of the more independent and better-documented validations of a casualty estimation methodology that has ever been conducted to date, in that:

- The data was independently assembled (assembled for other purposes before the validation) by a number of different historians.

⁹ See Gözel, Ramazan. *Fitting Firepower Score Models to the Battle of Kursk Data*. NPGS Thesis. Monterey CA: Naval Postgraduate School. <http://diana.or.nps.navy.mil/~twlucas/Student%20theses/GozelThesis.pdf>, September 2000.

¹⁰ Lawrence, Christopher A. “Validation of the TNDM at Battalion Level.” *The International TNDM Newsletter*, vol. 1, no. 2 (October 1996); Bongard, Dave “The 76 Battalion-Level Engagements.” *The International TNDM Newsletter*, vol. 1, no. 4 (February 1997); Lawrence, Christopher A. “The First Test of the TNDM Battalion-Level Validations: Predicting the Winner” & “The Second Test of the TNDM Battalion-Level Validations: Predicting Casualties.” *The International TNDM Newsletter*, vol. 1 no. 5 (April 1997); and Lawrence, Christopher A. “Use of Armor in the 76 Battalion-Level Engagements.” & “The Second Test of the Battalion-Level Validation: Predicting Casualties Final Scorecard.” *The International TNDM Newsletter*, vol. 1, no. 6 (June 1997).

- There were no calibration runs or adjustments made to the model before the test.
- The data included a wide range of material from different conflicts and times (from 1918 to 1983).
- The validation runs were conducted independently (Susan Rich conducted the validation runs, while Christopher A. Lawrence evaluated them).
- The results of the validation were fully published.
- The people conducting the validation were independent, in the sense that
 - a) there was no contract, management, or agency requesting the validation;
 - b) none of the validators had previously been involved in designing the model, and had only very limited experience in using it; and
 - c) the original model designer was not able to oversee or influence the validation.¹¹

The validation was not truly independent, as the model tested was a commercial product of The Dupuy Institute, and the person conducting the test was an employee of the Institute. On the other hand, this was an independent effort in the sense that the effort was employee-initiated and not requested or reviewed by the management of the Institute. Furthermore, the results were published.

The TNDM was also given a limited validation test back to its original WWII data around 1997 by Niklas Zetterling of the Swedish War College, who retested the model to about 15 or so Italian campaign engagements. This effort included a complete review of the historical data used for the validation back to their primary sources, and details were published in *The International TNDM Newsletter*.¹²

There has been one other effort to correlate outputs from QJM/TNDM-inspired formulae to historical data using the Ardennes and Kursk campaign-level (i.e.,

¹¹ Trevor N. Dupuy passed away in July 1995, and the validation was conducted in 1996 and 1997.

¹² Zetterling, Niklas. "CEV Calculations in Italy, 1943." *The International TNDM Newsletter*; vol. 1, no. 6. McLean VA: The Dupuy Institute. June 1997. See also *Research Plan, The Dupuy Institute Report E-3*, McLean VA: The Dupuy Institute, 7 Oct 1998.



division-level) databases.¹³ This effort did not use the complete model, but only selective pieces of it, and achieved various degrees of "goodness of fit." While the model is hypothetically designed for use from squad level to army group level, to date no validation has been attempted below battalion level, or above division level. At this time, the TNDM also needs to be revalidated back to its original WWII and Arab-Israeli War data, as it has evolved since the original validation effort.

The Corps- and Division-level Validations of the TNDM

Having now having done one extensive battalion-level validation of the model and published the results in our newsletters, volume I, issues 5 and 6, we were then presented an opportunity in 2006 to conduct two more validations of the model. These are discussed in depth in two articles of this issue of the newsletter.

These validations were again conducted using historical data, 24 days of corps-level combat and 25 cases of division-level combat drawn from the Battle of Kursk during 4-15 July 1943. It was conducted using an independently-researched data collection (although the research was conducted by The Dupuy Institute), using a different person to conduct the model runs (although that person was an employee of the Institute) and using another person to compile the results (also an employee of the Institute). To summarize the results of this validation (the historical figure is listed first followed by the predicted result):

¹³ See Gözel, Ramazan. *Fitting Firepower Score Models to the Battle of Kursk Data*. NPGS Thesis. Monterey CA: Naval Postgraduate School. <http://diana.or.nps.navy.mil/~twlucas/Student%20theses/GozelThesis.pdf>, September 2000.

	24 Corps Engagements	25 Division Engagements
1. Win/Lose	21 correct (88%)	24 correct (96%)
2. Advance Rates (in km) Wehrmacht SS	80.5 vs 37.99 (47%) 63.3 vs 83.3 (132%)	74.9 km vs 48.3 (64%) 62.4 km vs 70.4 (113%)
3. German casualty rates Wehrmacht SS	7,491 vs 9,607 (128%) 7,899 vs 4,812 (61%)	5,386 vs 6,718 (125%) 3,204 vs 2,318 (72%)
4. Soviet casualty rates versus Wehrmacht versus SS	35,702 vs 22,504 (63%) 29,311 vs 17,602 (60%)	26,348 vs 21,890 (83%) 10,705 vs 8,365 (78%)
5. German armor loss rates Wehrmacht SS	470 vs 463 (99%)* 403 vs 305 (76%)	390 vs 328 (84%)* 146 vs 139 (95%)
6. Soviet armor loss rates versus Wehrmacht versus SS	621 vs 544 (78%) 964 vs 507 (53%)	488 vs 571 (117%) 430 vs 357 (83%)

* Less the 120 Panthers that broke down

There was one other effort that was done as part of work we did for the Army Medical Department (AMEDD). This is fully explained in our report *Casualty Estimation Methodologies Study: The Interim Report* dated 25 July 2005. In this case, we tested six different casualty estimation methodologies to 22 cases. These consisted of 12 division-level cases from the Italian Campaign (4 where the attack failed, 4 where the attacker advanced, and 4 where the defender was penetrated) and 10 cases from the Battle of Kursk (2 cases where the attack failed, 4 where the attacker advanced and 4 where the defender was penetrated). These 22 cases were randomly selected from our earlier 628 case version of the DLEDB (Division-level Engagement Database; it now has 752 cases). Again, the TNDM performed as well as or better than any of the other casualty estimation methodologies tested. As this validation effort was using the Italian engagements previously used for validation (although some had been revised due to additional research) and three of the Kursk engagements that were later used for our division-level validation, then it is debatable whether one would want to call this a seventh validation effort. Still, it was done as above with one person assembling the historical data

and another person conducting the model runs. This effort was conducted a year before the corps and division-level validation conducted above and influenced it to the extent that we chose a higher CEV (Combat Effectiveness Value) for the later validation. A CEV of 2.5 was used for the Soviets for this test, vice the CEV of 3.0 that was used for the later tests.

Summation

The QJM has been validated at least twice. The TNDM has been tested or validated at least four times, once to an upcoming, imminent war, once to battalion-level data from 1918 to 1989, once to division-level data from 1943 and once to corps-level data from 1943. These last four validation efforts have been published and described in depth. The model continues, regardless of which validation is examined, to accurately predict outcomes and make reasonable predictions of advance rates, loss rates and armor loss rates. This is regardless of level of combat (battalion, division or corps), historic period (WWI, WWII or modern), the situation of the combats, or the nationalities involved (American, German, Soviet, Israeli, various Arab armies, etc.). As the QJM, the model was effectively validated to around 200 World War II and 1967 and 1973 Arab-Israeli War battles. As the TNDM, the model was validated to 125 corps-, division-, and battalion-level engagements from 1918 to 1989 and used as a predictive model for the 1991 Gulf War. This is the most extensive and systematic validation effort yet done for any combat model. The model has been tested and re-tested. It has been tested across multiple levels of combat and in a wide range of environments. It has been tested where human factors are lopsided, and where human factors are roughly equal. It has been independently spot-checked several times by others outside of the Institute. It is hard to say what more can be done to establish its validity and accuracy.

TDI Profile

Christopher A. Lawrence



Over the years, we have presented bios of ten people employed by or associated with The Dupuy Institute. In order of appearance, these were: Dave Bongard, Jose Perez, Richard Anderson, Joseph A. Bulger, Jay Karamales, Trevor N. Dupuy, James G. Taylor, George Daoust, Nicholas Krawciw, and Alexander Dinsmoor. Even though I have been the editor of the Newsletter and chief operating officer at the Institute for that time, I have always found an excuse to feature someone else. This is in part because my credentials are very limited, as I have only a bachelor's degree, and it is not in history or in operations research.

I am a historian by trade. For better or worse, I have learned how to conduct research, write history, and run research projects by following the examples of Trevor Dupuy and Curt Johnson. I am an analyst by trade, having never taken an operations research course in my life. My analytical skills have been developed by following the example of Trevor Dupuy, in addition to a limited knowledge of econometrics and considerable self-study. As such, I am on paper qualified to be neither a historian nor an analyst. Still, I've been paid to do both for over two decades and have done this in a competitive commercial environment. This proof by performance harkens back to a much earlier day in the work of the studies and analysis community, and there are few in the business now who do not have advanced degrees. Anyhow, to present a brief bio:

Christopher A. Lawrence has been the executive director of The Dupuy Institute for over a decade and is the Institute's president. He has been involved in a varied career, including almost 30 years' work for the departments of Defense, the Army, the Navy, and the Air Force. He has worked both with practical applications and analytical studies. His experience includes work in support of the Naval Sea Systems Command program office for submarine sonar systems and then with General Dynamics as part of the Joint Cruise Missile Program. He has 25 years of experience as a program manager. He has managed more than 40 studies on military topics including urban warfare, enemy prisoner-of-war capture rates, U.S. Army record-keeping, the military consequences of landmine restrictions, comparative

mortality rates of different services in Vietnam, casualty estimates for U.S. operations in Bosnia, casualty estimates for U.S. Operations in Iraq, and a range of insurgency studies. He is primarily responsible for the development and maintenance of the Ardennes Campaign Simulation Database, the Kursk Database, the TDI suite of conventional combat, insurgency, and contingency operations databases, and the Modern Insurgency Spread Sheets (MISS). These include the three largest databases on conventional combat and the largest database assembled on insurgencies. He is author of *A History of the Department of Defense Federally Funded Research and Development Centers* and is currently working on completing two books: *Understanding Insurgencies* and *Prokhorovka: The Battle of Kursk*. Mr. Lawrence graduated with a Bachelor of Arts in International Relations from The American University (1978) and has conducted post-graduate work at a number of universities.

Chris lives in Vienna, Virginia with his wife Tatiana and son Sasha. He continues to pursue a range of interests outside of history from hosting jams to managing Little League baseball teams.

