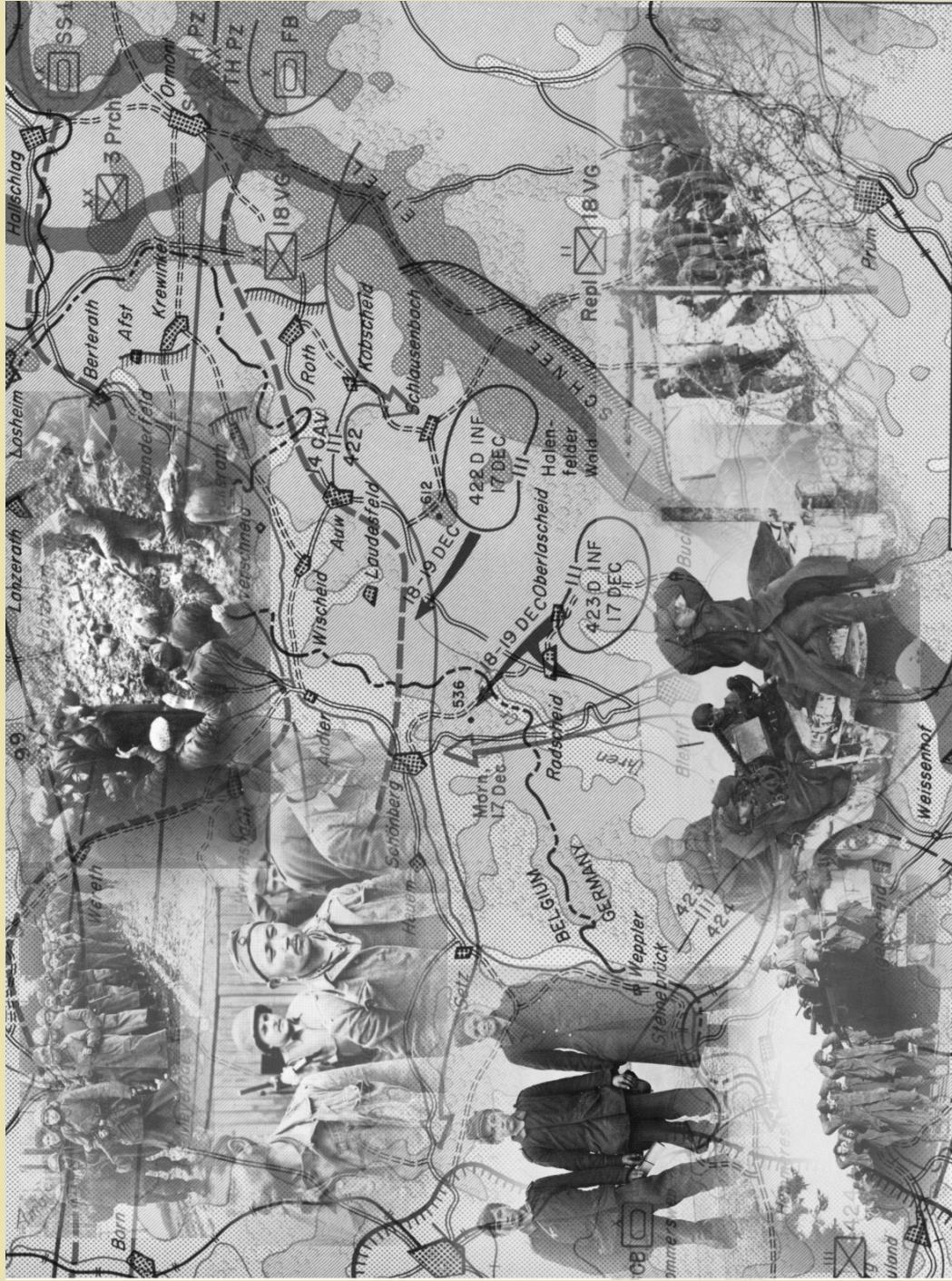


Measuring Human Factors in Combat

Part of the Enemy Prisoner of War (EPW) Capture Rate Study



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31 August 2000

Purpose

- ◆ To Develop an Estimation of Capture Rates for Enemy Prisoners of War (EPW)
 - Rates to be incorporated into the HQDA Total Army Analysis (TAA) process
 - Usable for other Army analysis and modeling



Data Consists of:

- ◆ 76 Italian Campaign Engagements
- ◆ 49 Kursk Engagements
- ◆ 77 Ardennes Engagements
- ◆ 71 World War II Operations



The Report Includes

- ◆ Measuring Human Factors in Combat
 - The Italian Campaign Engagements Comparisons
 - The Ardennes Campaign Engagements Comparisons
 - The Battle of Kursk Engagements Comparisons
 - The Campaign Database Comparisons
 - Deserction and Unit Cohesion
 - Conclusions



Performance Differences in Opposing Combat Forces

- ◆ May be examined using 3 measurements:
 - Mission Accomplishment
 - Win/lose (either judgment or advance)
 - Scoring
 - Casualty Effectiveness
 - Total battle casualties
 - Spatial Effectiveness
 - Advance rates
- ◆ Did not account for the conditions of combat except for force ratios and posture (attacker/defender)



Results from Italian Data: Mission Success

- ◆ Does not show a strong indication of any significant performance differentials between US and UK forces
- ◆ Data may show a 10-20% advantage on the part of the Germans as they are able to succeed with a lower average force ratio (only 17 cases)



Results from Italian Data: Casualty Effectiveness

- ◆ US and UK versus Germans
 - German casualty effectiveness advantage of around 30% when defending against US attacks
 - German casualty effectiveness advantage of around 70% when defending against UK attacks
 - German casualty effectiveness parity US/UK when attacking (17 cases)
- ◆ US compared to UK
 - Tendency for US forces to take and cause higher casualties
 - Casualty effectiveness advantage in the attack of 30% by the US over the UK (compared to opposing Germans)
 - Casualty effectiveness advantage of 4 by US over UK in the defense (7 cases vs. 10 cases)



Results from Italian Data: Casualty Effectiveness (cont.)

◆ Conclusions

- German and US forces roughly equivalent in combat capability
 - US may have been as much as 20% less effective than the Germans
- Combat performance of UK forces relative to US forces was clearly inferior, probably 20-30%.
 - This makes UK forces definitely inferior to German forces, by as much as 50%
- Differences are noted, no significant impact on EPW rates



Results from Ardennes Data: Mission Success

- ◆ It does not appear that the US Army performed better in the attack in the Ardennes engagements than it did in the Italian engagements



Results from Ardennes Data: Casualty Effectiveness

◆ US vs Germans

- Clear relative performance difference relative to the US vs German Army in the Ardennes compared to Italy
- Factor of 2 shift in casualty effectiveness between Italy and Ardennes when US attacking
- Ardennes data selection may be biased
- Improved air support may have been a factor
 - But cannot explain the 2-to-1 difference
- Decline in German morale may have been responsible for the difference in casualty effectiveness



Results from Ardennes Data: Casualty Effectiveness (cont.)

◆ Conclusions

- Possible that the relative performance between US and German forces in the Ardennes was different (in favor of US) from Italy
- This difference may explain the capture rate differences between the two data sets
- More research is needed



Results from Kursk Data: Mission Effectiveness

- ◆ 61% of German attacks successful
 - Average force ratio of 1.34 to 1
- ◆ 17% of Soviet attacks successful
 - Average force ratio of 1.43 to 1
- ◆ Numbers matter
 - Only 2 cases of German success when attacking outnumbered
 - 31 cases of attacker outnumbered in the 195 attacks reviewed
- ◆ Only 1 case when German attack failed when they outnumbered the Soviets (1.09 to 1)
- ◆ In all other failed German attacks, they were outnumbered



Results from Kursk Data: Casualty Effectiveness

- ◆ Significant influence of nationality on casualty and capture rates
- ◆ When attacking:
 - Soviets lost 5.63 men per German lost
 - Germans inflicted 3.33 casualties per German lost
- ◆ When odds were even in the attack:
 - Soviets lost 4.83 men per German lost
 - Germans inflicted 2.44 casualties per German lost

	Average Force Ratio	Average Loss Ratio
All Soviet Attacks (18)	1.42 to 1	5.63 to 1
Soviet Low-odds Attacks (12)	1.00 to 1	4.83 to 1
.51 - 1.34 to 1		
All German Attacks (31)	1.66 to 1	.30 to 1
German Low-odds Attacks (21)	.93 to 1	.41 to 1
.63 - 1.42 to 1		

Casualty Differential: Impact On MIAs and CIAs

	German	Soviet	Ratio
Total Casualties	10,233	40,644	1 to 3.97
When attacking	7,963	13,703	1 to 1.72
When defending	2,270	26,941	1 to 11.87
Total Bloody Casualties	9,936	27,046	1 to 2.72
Total KIA	1,523	8,008	1 to 5.26
WIA to KIA Ratio	5.52 to 1	2.38 to 1	
When attacking	5.63 to 1	2.90 to 1	
When defending	5.16 to 1	2.06 to 1	
Total MIA	297	13,598	1 to 45.78
When attacking	190	1,909	1 to 10.05
When defending	107	11,689	1 to 109.24
Total CIA	227	12,436	1 to 54.78
Percent of MIA is CIA	76.43	91.45	
Total Deserters	4	599	1 to 149.75
Percent of CIA deserters	1.76	4.82	

- ◆ As an aside, the wounded-to-killed ratio is higher for the attacker than for the defender

Issue of Soviet Deserters

- ◆ Probable correlation between number of deserters and number of CIA
- ◆ A force with more deserters will probably have correspondingly more CIA
- ◆ Measurement of deserters and AWOL is probably a reflection of the general state of a unit's morale and cohesion



Results from Kursk Data: Other Factors

- ◆ The terrain was easier for the attacker than was typical in the Italian and Ardennes engagements
- ◆ Technology and weapons were similar
- ◆ The mix of weapons was different, especially in artillery
- ◆ The German Air Force established air superiority, even though it was outnumbered. It downed enemy planes at a rate greater than 5 to 1
- ◆ Both sides had extensive combat experience, plenty of rest and training, and were well stocked



Results from Kursk Data: Conclusions

- ◆ Definite German advantage in combat capability
 - In mission effectiveness in both offense and defense
 - In casualty effectiveness in both offense and defense
- ◆ The difference appears to be by a factor of 3



Campaign Database Comparisons

- ◆ Confirms 3 of the 4 major points determined from the engagement data
 - There is a difference between Allied and German performance
 - This difference appears to change over time
 - There is a difference between US and UK performance
 - Some armies (in this case, Italian) perform noticeably worse than the norms as established by Germany, US, and UK



Difference in Performance: Allied VS German

- ◆ The Italian Campaign data from Salerno to Rome (26 cases) shows:
 - While outnumbering the defender around 3 to 1, the attacker suffered 30-50% more casualties



Difference in Performance: Change Over Time

- ◆ Compared Salerno-to-Rome operations (26 cases) to later Italian Campaign operations (14 cases)
- ◆ Degree of casualty effectiveness appears to be about 70%
 - In early operations: 1.29 to 1
 - In later operations: 1 to 1.36
- ◆ Does not appear to be any other significant influencing factors



Difference in Performance: US vs UK

- ◆ This point is **not** supported by the operations data



Difference in Performance:

US vs UK (cont.)

- ◆ Data is not “clean,” both sides had Allied contingents
 - UK corps in Fifth US Army
 - UK Eighth Army included Australians, New Zealanders, Poles, Canadians, South Africans, Indians, etc.
- ◆ Mode of fighting was different
 - US attacked at lower odds
 - Against stronger armored forces
 - Both suffered and inflicted higher casualties per day
- ◆ UK had more favorable casualty exchange ratio
 - US caused .9 casualties for every 1 suffered
 - UK caused 1.21 casualties for every 1 suffered



Difference in Performance: US vs UK (cont.)

- ◆ Army-level data shows opposite pattern from division-level data
- ◆ Six possible reasons:
 - The British divisions measured may not have been typical of British performance
 - Since US/UK operations often included other Allied units, this may not be a valid comparison of US/UK performance
 - Opposing German force on the west coast may have been better
 - Inclusion of Anzio and Salerno data in the US column (even though they included strong British forces) heavily influences the results
 - US engaged in high-casualty operations that bias the average casualty rate (Salerno, Anzio, First Cassino)



Three Cases of Germans Attacking the US

- ◆ Caused an average of 1.13 US casualties for every 1 they lost
- ◆ Average aggregate force ratio was 1.22 to 1
- ◆ Aggregate armor advantage was 1.13 to 1



Other Nationalities' Performance

- ◆ Some armies (in this case, the Italians) performed noticeably worse than the norms established by Germany, US, and UK



Other Nationalities' Performance

- ◆ Even when the large number of extenuating circumstances are considered, the performance of the Italian Army was still abysmal
 - In the offense, the Italians lost 31.25 casualties for every one they inflicted
 - In the defense the Italians lost 15.25 casualties for every one they inflicted
 - In the defense, over 90% of the Italian force surrendered ($> 4\%$ per day)
- ◆ Italian performance certainly worse than that of the Soviets



Desertion and Unit Cohesion

- ◆ Significant desertion rate differences between native Germans and ethnic Germans (*Volksdeutsche*)
- ◆ Significant desertion rate differences between Germans and non-Germans
- ◆ Allied desertion (across lines) was minimal



Conclusions

- ◆ Germans and US roughly equivalent in combat effectiveness
 - US within 20-30% of Germans, maybe lower
 - True for Italy, although they have same combat effectiveness in the Ardennes
 - Overall impact of US vs German combat effectiveness not enough to bias further analysis
- ◆ Germans and UK within same order of magnitude of combat effectiveness
 - UK somewhat inferior (20-50%)
 - May have some impact on battle results, but not enough to bias further analysis
- ◆ All data from Italian and Ardennes engagements can be used interchangeably to establish EPW rates



Conclusions (cont.)

- ◆ Italian combat effectiveness appears to be lower than Soviet combat effectiveness
- ◆ Human factors are a major determinant of desertion and capture rates
 - Further analysis needed
- ◆ Probable correlation between desertion rates (and maybe AWOL rates) and capture rates
- ◆ Probable correlation between desertion rates (and maybe AWOL rates) and combat effectiveness



Impact of Morale (Being Soviet)

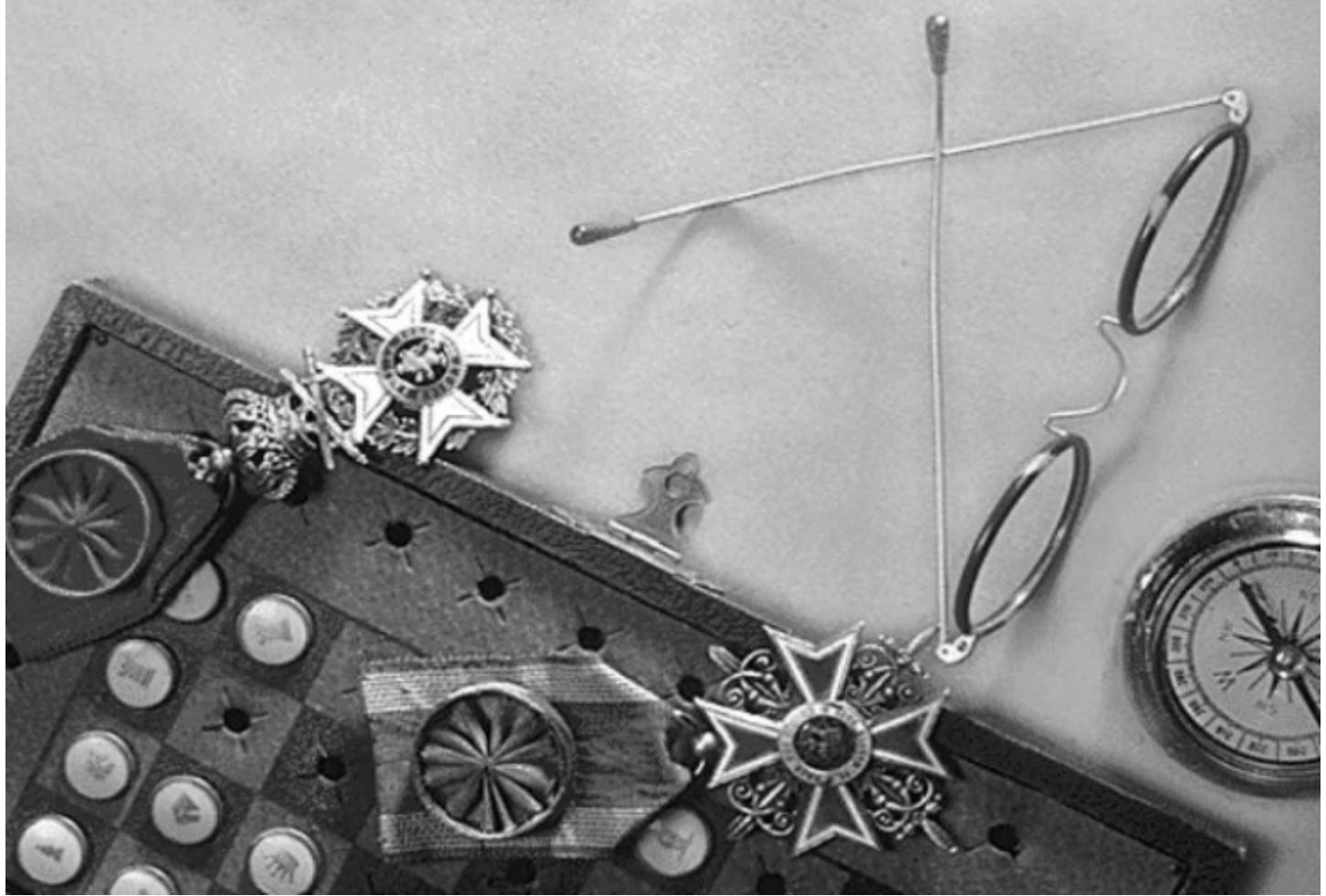
- ◆ Tentative conclusions:
 - If there is a relative casualty effectiveness disparity between two armies (order of magnitude of 3), there will be a disparity in the capture rates (order of magnitude 10), which may be reflected by decreasing the capture rate of the side with the highest morale
 - More engagements need to be developed and analyzed to strengthen/disprove this hypothesis.
 - Regardless of the “shakiness” of the data, **the impact of human factors on EPW capture rates cannot be ignored**



Study Conclusions

- ◆ Outcome is a significant determinant of EPW rate
 - Effect is by a factor of 10+, and can rise to 100+ with penetrations and envelopments
- ◆ Being attacker or defender is a significant determinant
 - Effect is by a factor of 10+
- ◆ Force mix is a significant determinant
 - Effect is by a factor of 10+ for the attacker
 - Effect is by a factor of about 4 for the defender
- ◆ Morale (being Soviet) is a significant determinant
 - Effect is by a factor of about 10
 - Historically there have been armies much worse than the Soviet Army in 1943
- ◆ We have a basis for a multiple regression model with four major independent variables

Backup Slides



- ◆ Overall, the similarities between the Italian and Ardennes Campaign engagements are more compelling than the differences

	Italian	Ardennes
Number of Engagements	75	71
Average Attacker Strength	16,945	15,024
Average Defender Strength	8,506	9,311
Average Force Ratio	2.34	2.79
Weighted Force Ratio	1.99	1.61
Average Battle Length (days)	2.41	1.61
Average Attacker Tank Strength	77	84
Average Defender Tank Strength	40	37
Average Attacker Casualties	429	256
Average Defender Casualties	421	548
Average Attacker Casualties per day	178	160
Average Defender Casualties per day	174	341
Average Attacker Percent Loss per day	1.35	1.87
Average Defender Percent Loss per day	1.93	7.16
Weighted Attacker Percent Loss per day	1.05	1.71
Weighted Defender Percent Loss per Day	2.05	5.89
Average Number of Attacker EPWs	140	283
Average Number of Attacker EPWs per Day	60	176
Average Number of Defender EPWs	52	28
Average Number of Defender EPWs per Day	22	18
Average Percent of Attacker CIA	0.41	0.24
Average Percent of Attacker CIA per Day	0.17	0.15
Average Percent of Defender CIA	1.56	7.21
Average Percent of Defender CIA per Day	0.65	4.49
Average Percent Attacker Losses are CIA	13.58	14.37
Average Percent Defender Losses are CIA	33.07	33.69
Total Percent Attacker Losses are CIA	12.24	11
Total Percent Defender Losses are CIA	33.20	51.59

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Kursk is Different

Number of Engagements	49
Average Attacker Strength	28,521
Average Defender Strength	20,782
Average Force Ratio	1.67
Weighted Force Ratio	1.37
Average Battle Length (days)	1.39
Average Attacker Tank Strength	86
Average Defender Tank Strength	59
Average Attacker Casualties	442
Average Defender Casualties	596
Average Attacker Casualties per day	319
Average Defender Casualties per day	430
Average Attacker Percent Loss per day	1.38
Average Defender Percent Loss per day	4.38
Weighted Attacker Percent Loss per day	1.55
Weighted Defender Percent Loss per day	2.87
Average Number of Attacker EPWs	236
Average Number of Attacker EPWs per day	170
Average Number of Defender EPWs	22
Average Number of Defender EPWs per day	16
Average Percent of Attacker CIA	0.08
Average Percent of Attacker CIA per day	0.06
Average Percent of Defender CIA	2.79
Average Percent of Defender CIA per day	2.76
Average Percent Attacker Losses are CIA	6.10
Average Percent Defender Losses are CIA	26.50
Total Percent Attacker Losses are CIA	4.98
Total Percent Defender Losses are CIA	39.66



The Campaign Database Consists of:

- ◆ The first year and a half of the North Africa Campaign
- ◆ The Sicilian Campaign
- ◆ The Entire Italian Campaign (almost two years)

Campaign	Start Date	End Date	# of Operations
First North African	6/11/1940	2/7/1941	9
Second North African	2/8/1941	11/17/1941	9
Third North African	11/18/1941	7/1/1942	3
Fourth North African	7/2/1942	1/14/1943	1
Torch	11/8/1942	11/14/1942	0
Tunisian	11/15/1942	5/12/1943	0
Sicilian	7/10/1943	8/17/1943	2
Calabrian	9/3/1943	9/30/1943	1
Salerno	9/9/1943	9/30/1943	1
Naples	10/1/1943	10/10/1943	2
Voltumo	10/11/1943	11/10/1943	1
Trigno	10/11/1943	11/20/1943	1
Garigliano	11/11/1943	1/20/1944	2
Sangro	11/21/1943	2/20/1944	3
Cassino	1/21/1944	3/31/1944	4
Anzio	1/22/1944	5/22/1944	7
Gustav Line	3/21/1944	5/10/1944	2
Rome	5/11/1944	6/30/1944	5
Gothic Line	7/1/1944	4/10/1945	14
Po Valley	4/11/1945	5/6/1945	4

This Allows Us to Compare the Engagement Data to the Operations Data

	Italian Division-level Engagements	Italian Army-level Operations	Ratio, Division-level to Army-level
Allied Offensive Actions	59	26	
German Offensive Actions	17	3	
Average Attacker Strength	16,945	184,949	1 to 10.9
Average Defender Strength	8,506	70,928	1 to 8.3
Average Force Ratio	2.34 to 1	3.25 to 1	
Weighted Force Ratio	1.99 to 1	2.61 to 1	
Average Battle Length (Days)	2.41	25.14	1 to 10.4
Average Attacker Tank Strength	77	562	1 to 7.3
Average Defender Tank Strength	40	157	1 to 3.9
Average Attacker Casualties	429	5,974	1 to 13.9
Average Defender Casualties	421	4,799	1 to 11.4
Average Attacker Casualties per day	178	238	1 to 1.3
Average Defender Casualties per day	174	191	1 to 1.1
Average Attacker Percent Loss per day	1.35	0.19	1 to .1
Average Defender Percent Loss per day	1.93	0.30	1 to .2
Weighted Attacker Percent Loss per day	1.05	0.13	1 to .1
Weighted Defender Percent Loss per day	2.05	0.25	1 to .1
Average Number of Attacker EPWs	140	1,559	1 to 11.1
Average Number of Attacker EPWs per day	60	62	1 to 1.0
Average Number of Defender EPWs	52	411	1 to 7.9
Average Number of Defender EPWs per day	22	16	1 to .7
Average Percent of Attacker CIA	0.41	0.30	1 to .7
Average Percent of Attacker CIA per day	0.17	0.02	1 to .1
Average Percent of Defender CIA	1.56	2.11	1 to 1.4
Average Percent of Defender CIA per day	0.65	0.11	1 to .2
Average Percent Attacker Losses are CIA	13.58	6.77	1 to .5
Average Percent Defender Losses are CIA	33.07	25.88	1 to .8
Total Percent Attacker Losses are CIA	12.24	6.88	1 to .6
Total Percent Defender Losses are CIA	33.20	32.49	1 to 1.0

Comparison of Operations

	African and Sicilian Campaign Operations	Salerno to Rome Operations	Rome to Surrender Operations	Italian Campaign
Allied Offensive Actions	16	26	18	
Axis Offensive Actions	8	3	0	
Average Attacker Strength	92,940	184,949	274,243	
Average Defender Strength	75,814	70,928	102,914	
Average Force Ratio	1.36 to 1	3.25 to 1	3.58 to 1	
Weighted Force Ratio	1.23 to 1	2.61 to 1	2.66 to 1	
Average Battle Length (Days)	29.21	25.14	34.44	
Average Attacker Tank Strength	258	562	1,021	
Average Defender Tank Strength	179	157	188	
Average Attacker Casualties	3,900	5,974	6,718	
Average Defender Casualties	16,745	4,799	19,807	
Average Attacker Casualties per day	106	238	195	
Average Defender Casualties per day	573	191	575	
Average Attacker Percent Loss per day	0.14	0.19	0.07	
Average Defender Percent Loss per day	1.38	0.30	3.33	
Weighted Attacker Percent Loss per day	0.14	0.13	0.07	
Weighted Defender Percent Loss per day	0.76	0.25	0.56	
Average Number of Attacker EPWs	14,950	1,559	14,149	
Average Number of Attacker EPWs per day	512	62	411	
Average Number of Defender EPWs	531	411	157	
Average Number of Defender EPWs per day	17	16	5	
Average Percent of Attacker CIA	3.41	0.30	0.06	
Average Percent of Attacker CIA per day	0.14	0.02	0	
Average Percent of Defender CIA	24.63	2.11	20.97	
Average Percent of Defender CIA per day	1.38	0.11	3.15	
Average Percent Attacker Losses are CIA	9.51	6.77	1.31	
Average Percent Defender Losses are CIA	44.63	25.88	51.66	
Total Percent Attacker Losses are CIA	13.62	6.88	2.33	
Total Percent Defender Losses are CIA	89.28	32.49	71.43	

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This Comparison Shows

- ◆ Army-level operations are about 10 times the size and duration of the division-level engagements
- ◆ Force ratios are similar
- ◆ Average daily casualties and EPW's are similar



Conclusions

- ◆ The casualty rate and capture rate for army-level operations are about **1/5** to **1/10** of those for division-level engagements
- ◆ The engagement data for the Italian Campaign is a fairly representative sample of battles from the campaign

Operational Tempo

The issue here is operational tempo. With forces 10 times larger and operations that are 10 times longer, the campaigns show the count of the **average daily casualties** and **average daily captures** are similar to those found in the engagements. This naturally translates into **daily casualty rates** and **daily capture rates** being 1/10 of the engagements. What this means is that these armies of 6 to 20 divisions, between the active and inactive sectors of their lines, and between the quiet and active periods of their operations, are on average maintaining one major division-level engagement a day. The operational tempo for army-level operations is about 1/10 of the operational tempo for a division-level attack.



Result: Change of Tempo

- ◆ One of the results of a revolution in military affairs (RMA) or evolution in military affairs may be a change in operational tempo
 - ◆ May result in operations of 3-4 days being far more intense
 - ◆ May result in longer periods of rest between operations

In Phase III, with modern data, we will look for a symmetrical change in intensity in division-level engagements when compared to army-level operations.



Comparison of Italian and Ardennes Performances

	Ardennes	Italy
US Successful Attack		
Number of Cases	28	22
Average US losses	207	463
Average German losses	541	538
Times US losses lower	23	10
No. of Type 5+ Attacks	14	11
Average US losses - Type 5+	212	456
Average German losses - Type 5+	606	727
Average US losses - Type 4	203	470
Average German losses - Type 4	476	350
US Failed Attack		
Number of Cases	13	15
Average US losses	223	413
Average German losses	502	427
Times US losses lower	8	7
Average US loss less outlier	231	425
Average German loss less outlier	375	342
German Successful Attack		
Number of Cases	11	5
Average German losses	428	851
Average US losses	1185	727
Times German losses lower	8	3
German Failed Attack		
Number of Cases	19	12
Average German losses	253	419
Average US losses	222	482
Times German losses lower	7	6

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Comparing the Weighted Force Loss Ratios

Kursk Campaign Data	Total Force Ratio	Total Loss Ratio
All Soviet Attacks (18)	1.43 to 1	6.04 to 1
Soviet Low-odds Attacks (12)	1.02 to 1	3.92 to 1
.51 - 1.34 to 1		
All German Attacks (31)	1.34 to 1	.30 to 1
German Low-odds Attacks (21)	.99 to 1	.27 to 1
.63 - 1.42 to 1		

Italian Campaign Data	Total Force Ratio	Total Loss Ratio
All US Attacks (37)	2.18 to 1	.89 to 1
US Low-odds Attacks (3)	1.15 to 1	.27 to 1
.72 - 1.31 to 1		
All UK Attacks (21)	2.07 to 1	1.33 to 1
UK low-odds Attacks (4)	1.30 to 1	2.31 to 1
1.17 - 1.41 to 1		
All German Attacks (17)	1.59 to 1	.99 to 1
German Low-odds Attacks (7)	.85 to 1	.57 to 1
.73 - 1.48 to 1		

Ardennes Campaign Data	Total Force Ratio	Total Loss Ratio
All US Attacks (41)	1.69 to 1	.40 to 1
US Low-odds Attacks (12)	1.29 to 1	.69 to 1
1.15 - 1.48 to 1		
All German Attacks (30)	1.52 to 1	.55 to 1
German Low-odds Attacks (13)	.85 to 1	.38 to 1
.34 - 1.37 to 1		

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US vs UK

- ◆ This point is **not supported** by the operations data

Italian Campaign	US Operations	UK Operations
Allied Offensive Actions	22	18
Average Attacker Strength	219,334	233,183
Average Defender Strength	88,923	74,470
Average Force Ratio	2.68 to 1	4.20 to 1
Weighted Force Ratio	2.47 to 1	3.13 to 1
Average Battle Length (Days)	31	32.56
Average Attacker Tank Strength	733	737
Average Defender Tank Strength	193	105
Average Attacker Casualties	7,823	5,206
Average Defender Casualties	7,043	6,285
Average Attacker Casualties per day	252	160
Average Defender Casualties per day	227	193
Average Attacker Percent Loss per day	0.17	0.06
Average Defender Percent Loss per day	0.30	0.27
Weighted Attacker Percent Loss per day	0.12	0.07
Weighted Defender Percent Loss per day	0.26	0.26
Average Number of Attacker EPWs	2,491	1,758
Average Number of Attacker EPWs per day	80	54
Average Number of Defender EPWs	455	151
Average Number of Defender EPWs per day	15	5
Average Percent of Attacker CIA	0.29	0.05
Average Percent of Attacker CIA per day	0.02	0
Average Percent of Defender CIA	3.19	2.58
Average Percent of Defender CIA per day	0.13	0.07
Average Percent Attacker Losses are CIA	5.24	3.18
Average Percent Defender Losses are CIA	33.25	25.84
Total Percent Attacker Losses are CIA	5.82	2.90
Total Percent Defender Losses are CIA	35.37	27.97
Average Daily Advance Rate	1.05 km	1.71 km
Average Outcome Value	3.36	3.33
Average Casualty Ratio	1.38	1.53
Weighted Casualty Ratio	1.11	0.83

Other Nationalities' Performance

- ◆ Some armies (in this case, the Italians) performed noticeably worse than the norms established by Germany, US, and UK

Italian Army Operations Actions	Offensive Operations	Defensive Operations
Average Attacker Strength	104,500	56,749
Average Defender Strength	65,809	73,099
Average Force Ratio	1.91 to 1	0.89 to 1
Weighted Force Ratio	1.59 to 1	0.78 to 1
Average Battle Length (Days)	36.2	23.17
Average Attacker Tank Strength	55	163
Average Defender Tank Strength	104	59
Average Attacker Casualties	1,750	3,384
Average Defender Casualties	56	51,631
Average Attacker Casualties per day	19	146
Average Defender Casualties per day	2	2,229
Average Attacker Percent Loss per Day	0.03	0.14
Average Defender Percent Loss per Day	0	4.55
Weighted Attacker Percent Loss per Day	0.05	0.26
Weighted Defender Percent Loss per Day	0	3.05
Average Number of Attacker EPWs	2	46,612
Average Number of Attacker EPWs per day	0	2,012
Average Number of Defender EPWs	72	101
Average Number of Defender EPWs per day	2	4
Average Percent of Attacker CIA	0.07	0.12
Average Percent of Attacker CIA per day	0	0
Average Percent of Defender CIA	0	73.32
Average Percent of Defender CIA per day	0	4.32
Average Percent Attacker Losses are CIA	9.84	1.90
Average Percent Defender Losses are CIA	1.82	90.44
Total Percent Attacker Losses are CIA	4.11	2.98
Total Percent Defender Losses are CIA	3.57	90.28
Average Daily Advance Rate	3.50 km	13.23 km
Average Outcome Value	1.60	5.33
Average Casualty Ratio	14.04	0.08
Weighted Casualty Ratio	31.25	0.07

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