III. HISTORY AND THE DATA OF THE BATTLE OF KURSK

A. SHORT HISTORY OF THE BATTLE OF KURSK

1. City of Kursk

The city of Kursk is the administrative center of Kursk Province in western Russia. It lies along the upper Seym River, about 280 miles south of Moscow. First mentioned in documents from 1032, Kursk is one of the oldest cities in Russia (Figure 2). Completely destroyed by the Tatars in 1240, Kursk was not rebuilt until 1586, when it became a military outpost protecting the advancing Russian colonization from Tatar attack. The town, however, lost much of its importance at the beginning of the 18th century when the Russian border was moved farther south. In World War II, fierce fighting took place around Kursk and the city was severely damaged (Figure 3). In July, 1943, the Battle of Kursk, the largest tank battle in World War II, took place around the city of Kursk and ended in the defeat of the Germans. [Ref.13].

Figure 2. Location of city of Kursk shown in two different scaled maps. Arrows point to the plus signs showing the city's exact location. [Ref.14][Ref.15].

2. The history of the Battle of Kursk

During World War II, following the German defeat in Stalingrad, the military situation in the Eastern Front was much different than it was the year before. After

Figure 3. *Monument to World War II dead* in the city of Kursk, Russia [Ref.13]

Stalingrad, the Russians knew they were going to win the war, and the Germans strongly suspected they might lose the war. The war was in mid-course—the outcome might be predictable, but the Germans were far from beaten. The Germans were still mighty, powerful and dangerous. In the spring of 1943, the Eastern Front was dominated by a salient located to the north of city of Kharkov, to the south of city of Orel, and centered on the city of Kursk. The Kursk salient was 250 miles wide and 70 miles deep. The German plan was a two-front attack on the Kursk salient in a classic pincer operation.

Operation Citadel was launched on July 5, 1943. On July 2, 1943, Adollf Hitler said, "This attack is of decisive importance. It must succeed, and it must do so rapidly and convincingly. It must secure for us the initiative for this spring and summer. The victory of Kursk must be a blazing torch to the world." [Ref.16: p.103].

With the objectives of destroying Soviet forces and eliminating the salient by linking up the area around the city of Kursk, General Model's 9th Army attacked from the north, while General Hoth's 4th Panzer Army attacked from south of the salient. The

Soviets had enough time to prepare heavily fortified defense lines because of frequent German planning delays, and this advantage was a major setback for the Germans that contributed to their defeat in this battle. (See the map in Figure 4).

General Model's 9th Army's attack from the north gained approximately 6 miles of ground into the enemy lines before being stopped on Day 4. Following Day 4, the German attack on the northern front was stalled. General Hoth's 4th Panzer Army's attack from the south was more successful. Following an initial gain of a few miles in the first two days of the battle, the 4th Panzer Army caused great damage and alarm among the Soviets. Despite their heavy losses, the Soviets were able to restrict German progress to a mere 25 miles by July 12. A German breakthrough attempt on July 12 resulted in the greatest single armored engagement in history near the town of Prokhorovka, when Germans ran into the advancing 5th Guards Tank Army, which was the Soviet theater reserve (i.e., the biggest Soviet reserve force in the battlefield at the time).

As night closed over Prokhorovka, the greatest armored battle in history had fought itself out. The field was strewn with more than 300 German tanks, including 70 of the huge Tigers, 88 SP guns and 300 trucks. Rotmisrov's 5th Guards Tank Army had suffered a 50 percent loss of his 850 tanks and SP guns. The dazed Germans described the day as the *Bluthmähle von Belgorod* (the bloodbath at Belgorod). Unable to gain a decisive victory, and stopped by Soviet reinforcements and counterattacks, the Germans drew back into defensive postures after this battle. [Ref.16][Ref.17].

While the number of German tank losses cited in historical sources is around 300, this is different than the number of German tank losses given in the KDB, which is 98.

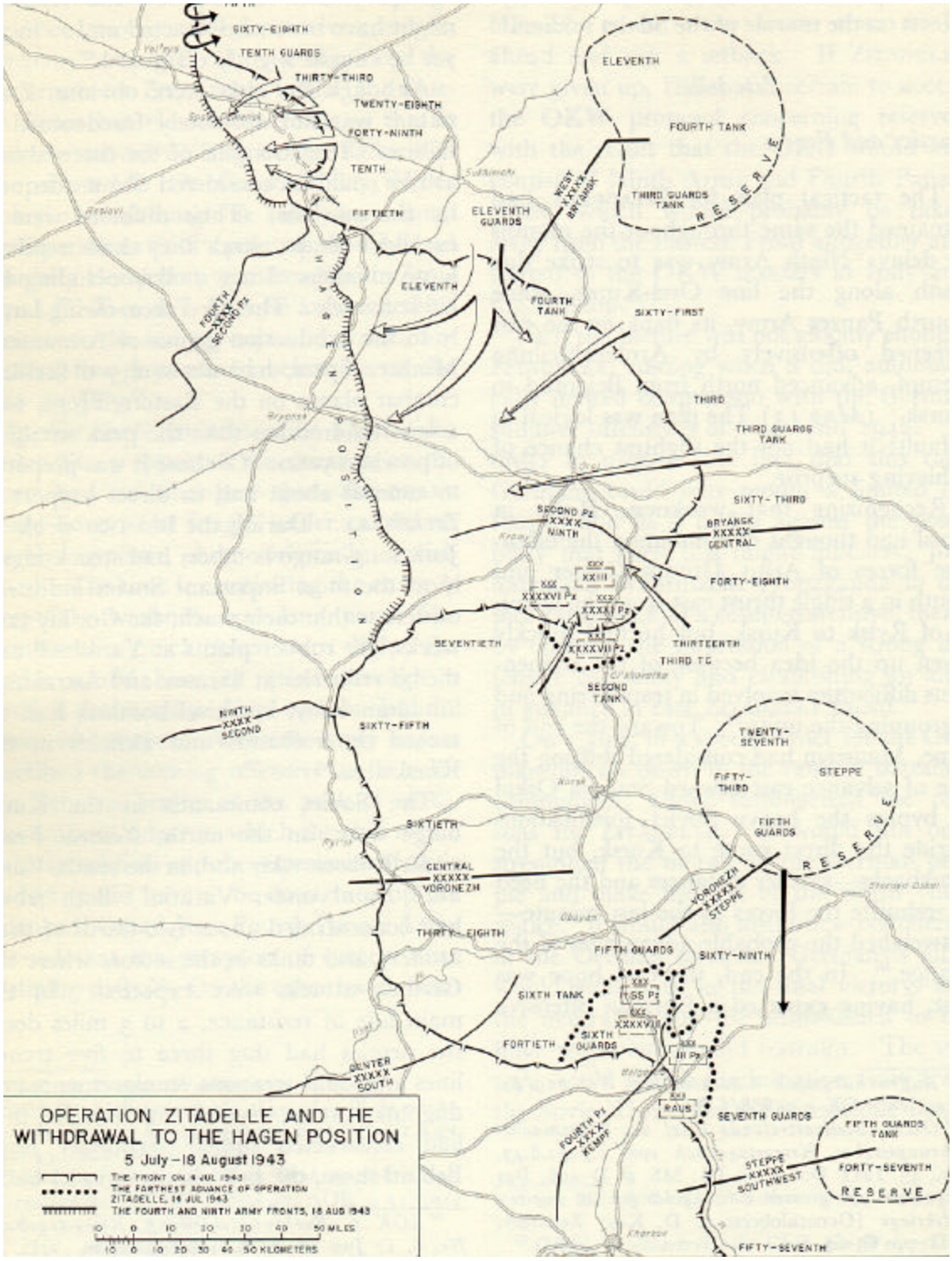

Figure 4. Operation Zitadelle and the Withdrawal to the Hagen Position. [Ref.17 : p.134]

Hitler's orders to cancel Citadel on July 13, 1943 came as a shock to the German field commanders, and consequently, further attacks were limited in scope. The Soviets began their counterattack on the southern front on July 12, and regained all ground lost in the theater by July 23, 1943.

Soviet military historians named the Battle of Kursk as "the Nazi Waterloo". Following this Battle, the military situation in the Eastern Front got worse for the Germans. Detailed information about the military aspects of the Battle of Kursk can be found in [Ref.16] and [Ref.17].

B. BATTLE OF KURSK DATA

The data presented in KOSAVE (Kursk Operation Simulation and Validation Exercise) [Ref.12] consists of mainly 6 parts:

- Units and combat posture status.
- Personnel status and casualties.
- Army weapons status and losses.
- Ammunition status.
- Aircraft sortie status.
- Geographic unit positions and progress.

1. Limitations and timeframe of the Kursk database

The KDB in the KOSAVE report includes quantified data only on the southern front of the Kursk Battle. Results are not expressed in terms of specific weapon types, and weapons are aggregated into categories or classes for tractability. Human factors like fatigue, morale, caution, aggressiveness, regulating the pace and intensity of battle are not

quantified. The data given is for 15 days of battle, from 4 July 1943 through 18 July 1943. [Ref.12].

2. Assumptions made for Kursk database

The KDB accurately represents the status and structure of forces in the southern front of the actual World War II Battle of Kursk. The personnel casualty and system kill criteria used to categorize KDB casualty and weapon losses are sufficiently consistent with each other to allow meaningful reporting and comparisons between combatants. The use of interpolation techniques for gathering data between inconsistent reports in historical records create a complete set of daily report records in the KDB is reasonable. [Ref.12].

3. Phases of the battle

With the start of the battle on July 4, 1943, German forces encountered heavy losses as they fell upon the fortified Soviet positions. The Germans were able to advance only 10 miles south and 30 miles north into the salient before the offensive stalled. The Soviets mounted their counterattack on July 12, and by July 18, had decisively won the battle. Soviets retained the initiative and used it to dominate the Eastern Front until the end of the war. In summary, the days of attack and defense are:

- July 4 - July 11 = day 1- day 8 of the battle = Germans attack
- July 12 – July 18 = day 9- day15 of the battle = Soviets attack

Throughout the thesis, the Soviet forces are known as Blue forces German forces as Red forces.

C. METHODOLOGY USED FOR GATHERING DATA

The critical data is extracted from the KOSAVE [Ref.13] report, and aggregated depending on the model used in the study. This process was the most difficult and time-consuming process of the study. Extracting only that information needed from an immense database demands great attention to detail and methodology. The methodology of how the data is gathered for modeling purposes is explained in detail in the section concerning that specific model. The general outlines, which do not change for every model, are explained in III.C.1 and III.C.2. All data used in this study are for combat units represented in the KDB. Support units, such as bridging and logistics units, are excluded [Ref.12].

1. Manpower data

Throughout the study, combat manpower is used for modeling the combat. The manpower presented as "On Hand" (OH) in the KOSAVE [Ref.12] report is summed up, including the headquarters units, and is assumed to be the number of combat forces. Thus the number of combat forces is assumed to represent all the combat forces available on hand. Combat manpower losses are killed, wounded, captured/missing in action, and disease and nonbattle injuries.

Table 6 shows the combat manpower data for the Soviet forces and Table 7 shows the combat manpower data for the German forces.

2. Weapon systems data

Throughout this study, the total number of weapon systems is used for modeling purposes. The weapon systems presented as OH in the KOSAVE [Ref.12] report are summed up, including the weapon systems of headquarter units, and assumed to be the

total number weapon systems. The total number of weapon systems is assumed to represent all the weapon systems available on hand, including the weapon systems of headquarter units.

Day	OH Manpower	KIA	WIA	CMIA	DNBI	Total
1	510252	30	73	11	16	130
2	507698	1616	3548	3281	82	8527
3	498884	1911	3861	3553	98	9423
4	489175	2160	4949	3230	92	10431
5	481947	2069	4767	2585	126	9547
6	470762	2613	6451	2561	211	11836
7	460808	2326	5189	3209	46	10770
8	453126	1792	4488	1417	57	7754
9	433813	4417	11450	3496	59	19422
10	423351	2205	6709	1556	52	10522
11	415254	2153	5315	1206	49	8723
12	419374	822	2641	575	38	4076
13	416666	619	1928	358	35	2940
14	415461	225	846	111	35	1217
15	413298	881	2198	151	30	3260
TOTAL		**25839**	**64413**	**27300**	**1026**	**118578**

Table 6. Soviet combat manpower data. KIA denotes killed in action, WIA denotes wounded in action, CMIA denotes captured/missing in action and DNBI denotes disease and nonbattle injuries.

Day	OH Manpower	KIA	WIA	CMIA	DNBI	Total
1	307365	129	516	12	143	800
2	301341	960	4817	272	143	6192
3	297205	565	3375	217	145	4302
4	293960	475	2726	70	143	3414
5	306659	503	2202	75	162	2942
6	303879	492	2201	100	160	2953
7	302014	304	1532	43	161	2040
8	300050	345	1893	68	169	2475
9	298710	420	1944	86	162	2612
10	299369	327	1533	33	158	2051
11	297395	338	1584	63	155	2140
12	296237	220	912	31	159	1322
13	296426	214	920	27	189	1350
14	296350	138	622	26	163	949
15	295750	161	707	19	167	1054
TOTAL		**5591**	**27484**	**1142**	**2379**	**36596**

Table 7. German combat manpower data. KIA denotes killed in action, WIA denotes wounded in action, CMIA denotes captured/missing in action and DNBI denotes disease and nonbattle injuries.

Weapon losses are destroyed/abandoned and damaged. In the example presented, considering a damaged weapon system as a loss is logical, because a damaged weapon system is considered to be a "temporary" loss and in a non-operational status. Therefore, damaged weapons are also included when calculating the losses of both sides. A damaged weapon system is treated as only a "temporary" loss, but the period of non-operational status can be long. Also, a damaged operational system will often function only with degraded effectiveness and efficiency. [Ref.12: p.5-13].

Likewise, since a damaged weapon is damaged "in action" and is left out of the battle indefinitely due to its non-operational status until repaired, it will be considered as a loss. "Damaged" denotes number of items damaged in action. [Ref.12: p. H-1].

In order to prevent possible confusion for future analysts, the methodology used while gathering data for the classification of weapon systems will be offered. The type of each weapon system is listed below. Table 5-1 [Ref.12: p.5-3], Table 5-2 [Ref.12: p.5-4], and the tables from the weapons lists in the Appendices of the KOSAVE II Study Report [Ref.12] are used for purposes of classification. The results are as follows.

a. Classification of Soviet weapon systems

(1) Tanks used in the study:

- KV-1, KV-2
- M-3, MK-2/3, MK-4
- T-34, T-60, T-70

(2) APCs used in the study:

- BA-64, BA-10
- Armtpt

- Bren

(3) Artillery used in the study report:

- SU-122
- 122mm Gun
- 122mm How
- 152mm Gun
- SU-152
- 203mm How

b. Classification of German weapon systems

(1) Tanks used in the study:

- PzIII(all types), PzIV(all types), PzV(all types), PzVI(all types)
- T-34(Soviet), PzIIIspt

(2) APCs used in the study:

- AC4-6w, AC8w
- LHT, MHT, LHTspt, MHTspt
- Acspt, AC8w 75mm
- MHT75mmIG
- Pz I, Pz II
- MHT Flame

(3) Artillery used in the study:

- 75mm lt IG
- 105mm Gun, 150mm Gun

- 87.6mm How, 105mm How(towed and SP),
- 150mm How, 152mm How, 155mm How, 210mm How
- Wespe (is a SP Artillery Gun with 105mm Light Field Howitzer)
- Hummel (is a 150mm SP Gun)

Using the methodology explained above, the necessary data is gathered from the KOSAVE [Ref.12] report. The data for the tank, APC and the artillery weapon systems for the Soviet forces are given in Table 8, Table 9 and Table 10, consecutively. The data for the tank, APC and the artillery weapon systems for the German forces are given in Table 11, Table 12 and Table 13, consecutively.

Day	OH Tanks	Damaged	Dst+Abnd	Total Loss
1	2500	0	0	0
2	2396	19	86	105
3	2367	69	48	117
4	2064	120	139	259
5	1754	100	215	315
6	1495	149	140	289
7	1406	77	80	157
8	1351	51	84	135
9	977	210	204	414
10	978	58	59	117
11	907	57	61	118
12	883	45	51	96
13	985	9	18	27
14	978	16	26	42
15	948	58	27	85
TOTAL		**1038**	**1238**	**2276**

Table 8. Soviet tank data. Dst+Abnd denotes destroyed and abandoned tanks. OH denotes the on hand amount.

Day	OH APC	Damaged	Dst+Abnd	Total Loss
1	511	0	0	0
2	507	0	4	4
3	501	0	6	6
4	490	2	9	11
5	477	1	12	13
6	458	12	7	19
7	463	0	3	3
8	462	2	2	4
9	432	15	15	30
10	424	2	6	8
11	418	2	6	8
12	417	0	1	1
13	417	0	0	0
14	417	2	0	2
15	409	6	2	8
TOTAL		**44**	**73**	**117**

Table 9. Soviet APC data. Dst+Abnd denotes destroyed and abandoned APCs. OH denotes the on hand amount.

Day	OH Artillery	Damaged	Dst+Abnd	Total Loss
1	718	0	0	0
2	705	2	11	13
3	676	2	28	30
4	661	7	8	15
5	648	2	12	14
6	640	0	9	9
7	629	1	12	13
8	628	1	6	7
9	613	2	14	16
10	606	3	7	10
11	603	0	5	5
12	601	2	3	5
13	600	0	3	3
14	602	0	0	0
15	591	0	4	4
TOTAL		**22**	**122**	**144**

Table 10. Soviet artillery data. Dst+Abnd denotes destroyed and abandoned artillery. OH denotes the on hand amount.

Day	OH Tanks	Damaged	Dst+Abnd	Total Loss
1	1178	2	2	4
2	986	175	23	198
3	749	216	32	248
4	673	107	14	121
5	596	92	16	108
6	490	107	32	139
7	548	32	4	36
8	563	48	15	63
9	500	89	9	98
10	495	50	7	57
11	480	32	14	46
12	426	70	9	79
13	495	15	8	23
14	557	6	1	7
15	588	6	0	6
TOTAL		**1047**	**186**	**1233**

Table 11. German tank data. Dst+Abnd denotes destroyed and abandoned tanks. OH denotes the on hand amount.

Day	OH APC	Damaged	Dst+Abnd	Total Loss
1	1170	0	0	0
2	1142	23	6	29
3	1128	13	1	14
4	1101	16	11	27
5	1085	14	2	16
6	1073	12	2	14
7	1114	33	9	42
8	1104	12	4	16
9	1099	3	9	12
10	1096	3	1	4
11	1093	5	1	6
12	1089	4	1	5
13	1092	0	1	1
14	1095	0	1	1
15	1098	4	1	5
TOTAL		**142**	**50**	**192**

Table 12. German APC data. Dst+Abnd denotes destroyed and abandoned APCs. OH denotes the on hand amount.

Day	OH Artillery	Damaged	Dst+Abnd	Total Loss
1	1189	1	0	1
2	1166	10	14	24
3	1161	2	3	5
4	1154	3	4	7
5	1213	9	4	13
6	1210	4	2	6
7	1199	9	3	12
8	1206	4	11	15
9	1194	1	11	12
10	1187	2	5	7
11	1184	0	5	5
12	1183	1	2	3
13	1179	4	0	4
14	1182	0	2	2
15	1182	6	5	11
TOTAL		**56**	**71**	**127**

Table 13. German artillery data. Dst+Abnd denotes destroyed and abandoned artillery. OH denotes the on hand amount.

D. COMPARISON OF MANPOWER AND WEAPON SYSTEMS

1. Personnel statistics

This section presents statistics on Soviet and German personnel strength and casualties during the campaign for the purpose of gaining insight about the Battle of Kursk.

a. On hand personnel

Figure 5 shows daily OH personnel for both forces in the southern front of the Battle of Kursk, as represented in the KDB. The OH total includes all personnel, attached to all combat units (line units and headquarter units through Army), both committed and uncommitted.

b. Personnel casualties

Figures 6 and 7 show daily and cumulative total casualties for both sides in the southern front of the Battle of Kursk. The total casualty includes all personnel,

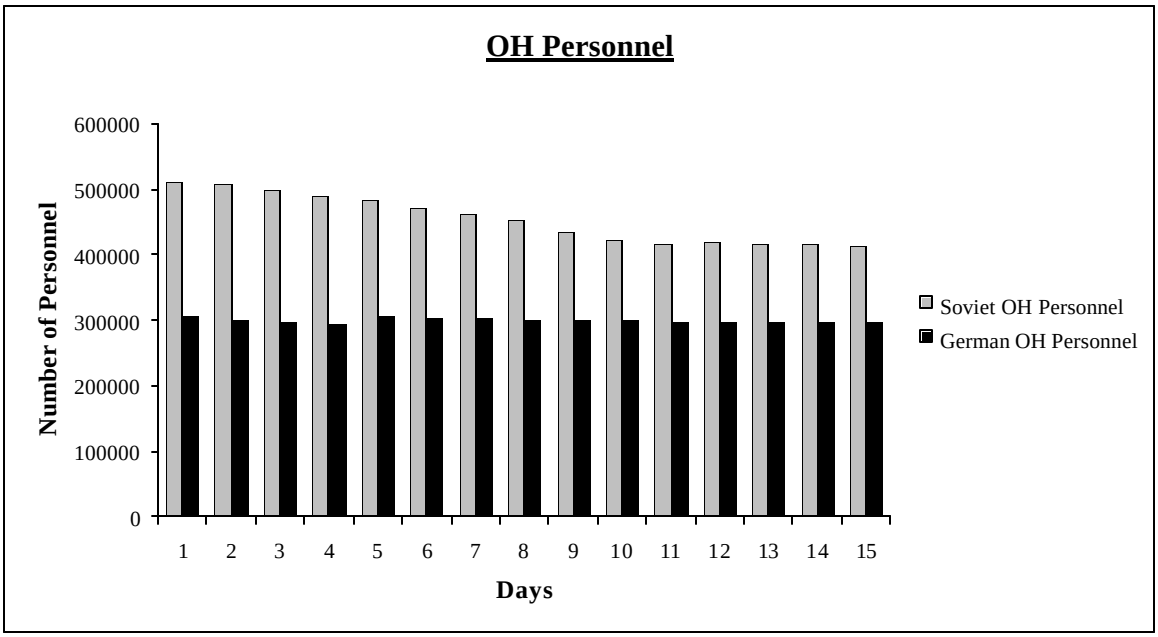

Figure 5. Daily total OH personnel for Soviet and German forces. Notice the steady decline in number of Soviet OH personnel until they counterattacked on July 12.

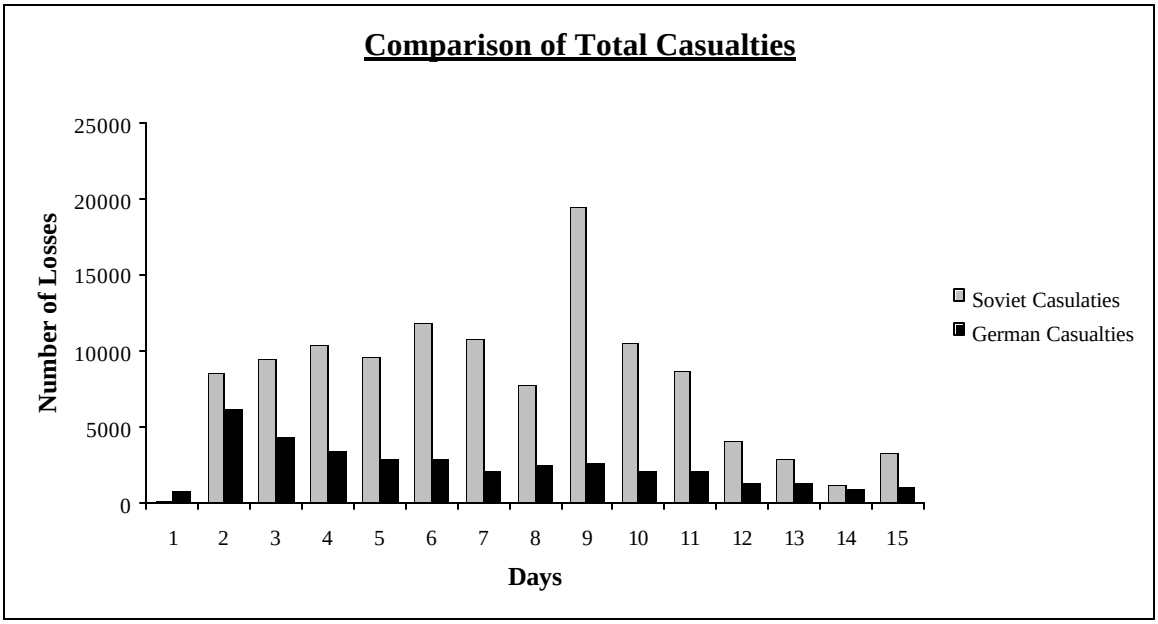

Figure 6. Daily total personnel casualty. Notice the great amount of casualties the Soviets had on July 12. Following this day, the battle lost its intensity for both sides.

both committed and uncommitted. When initial forces are considered, total casualties amounted to 23 percent of the initial Soviet force and 12 of the initial German force. Overall, the Soviets had three (3.24) casualties for every one German casualty.

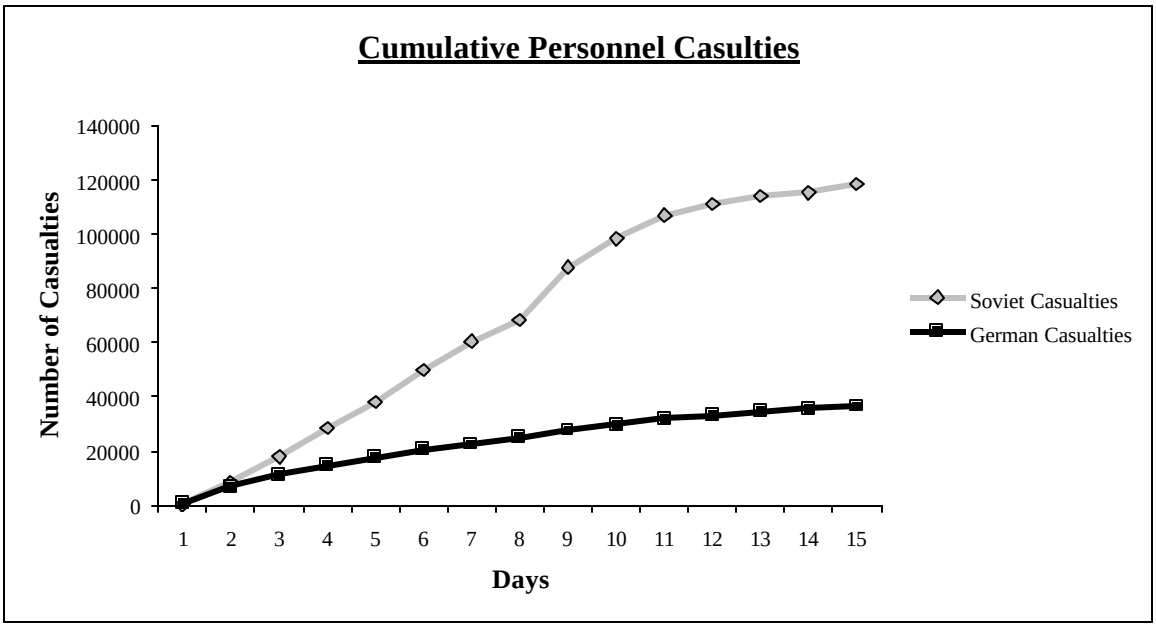

Figure 7. Comparison of daily cumulative number of total personnel casualties. There is a sharp increase in the number of Soviet casualties on July 12.

For more detailed information about the type of casualties, see Appendix A Part A.

2. Tank statistics

This section presents statistics on Soviet and German tank weapon system strength and losses during the campaign for the purpose of gaining insight about the Battle of Kursk.

a. On hand tanks

Figure 8 shows daily OH tanks for both sides in the southern front of the Battle of Kursk, as represented in the KDB. The number of OH tanks includes all tanks, both committed and uncommitted.

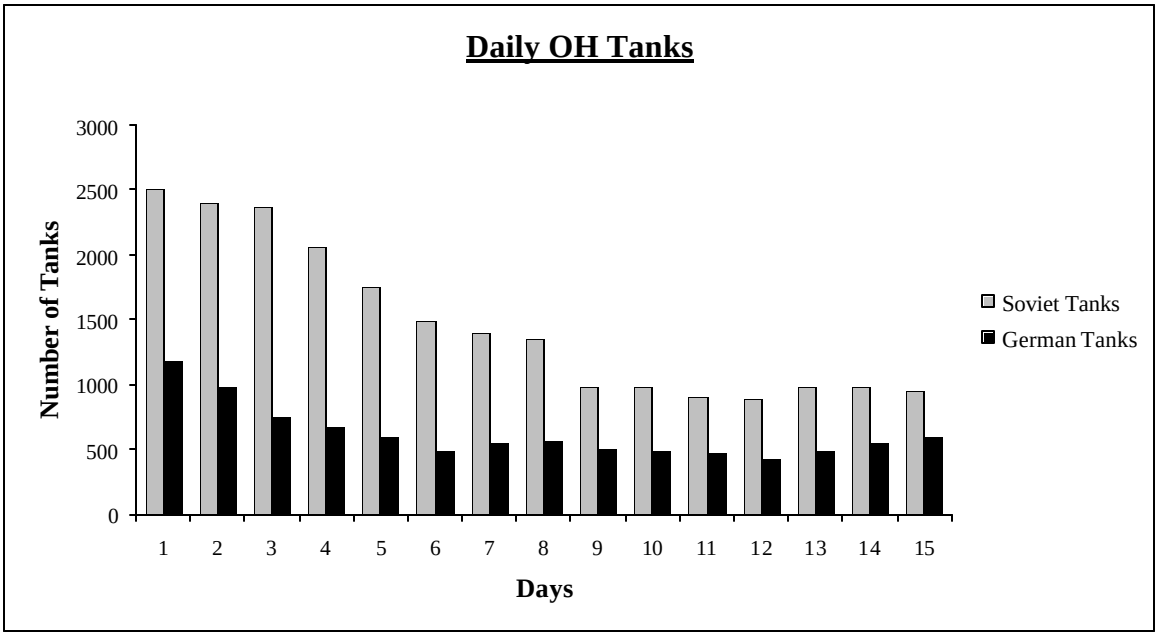

Figure 8. Comparison of daily number of total OH tanks. The Battle of Kursk was a major tank battle. Notice the sharp decline in the number of tanks for both sides in the first half of the battle.

b. Tank losses

Figures 9 and 10 show daily and cumulative total tank losses, respectively, for both sides in the southern front of the Battle of Kursk. When initial forces are considered, total tank losses amounted to 91 (0.910) percent of the initial amount of Soviet tanks and 104 (1.046) percent of the initial amount of German tanks (i.e. the Germans lost more tanks than their initial number of tanks). Overall, the Soviets lost almost 2 (1.84) tanks for every German tank lost.

3. Armored personnel carrier statistics

This section presents statistics on Soviet and German APC weapon system strength and losses during the campaign for the purpose of gaining insight about the Battle of Kursk.

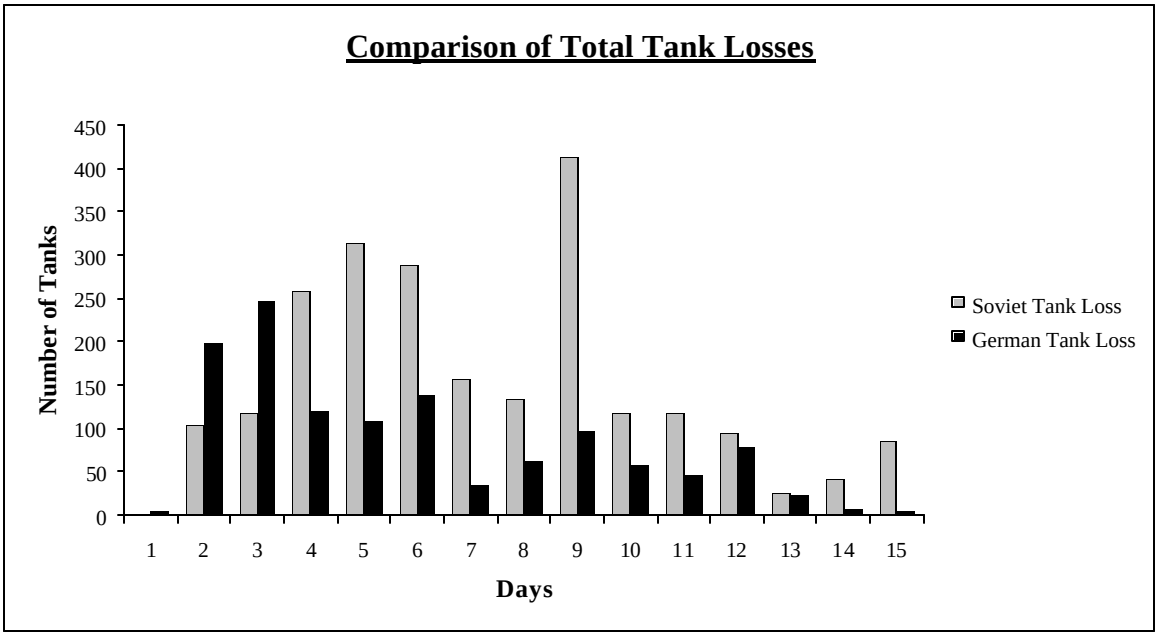

Figure 9. Comparison of daily number of tank losses. Notice the enormous number of Soviet tank loss on day 9.

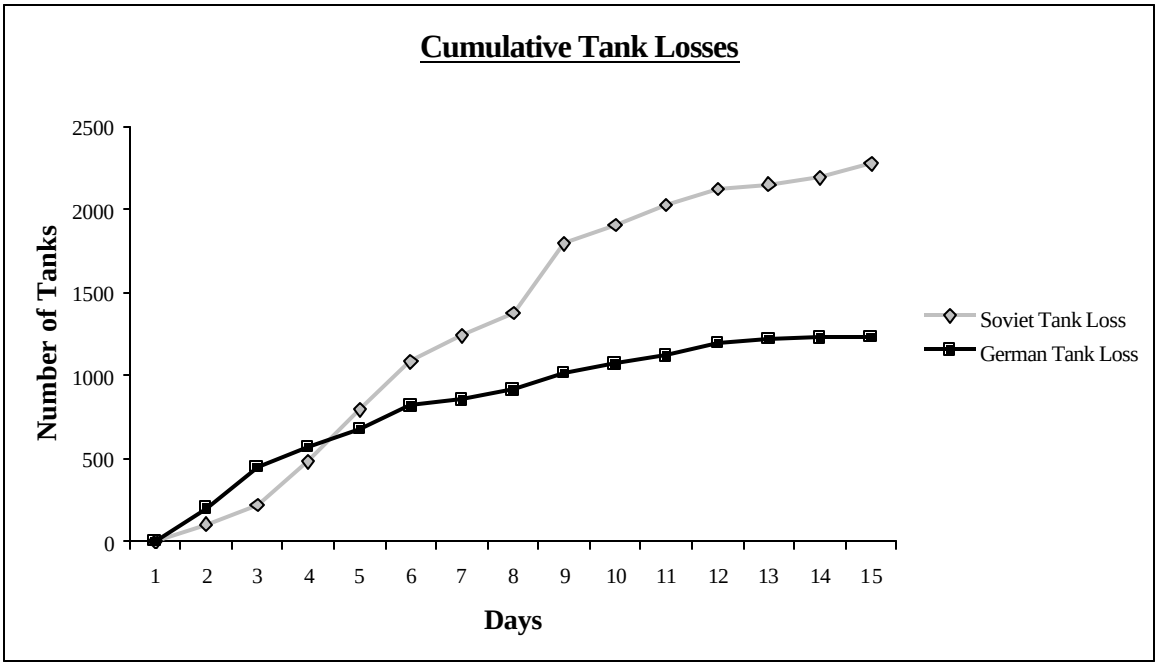

Figure 10. Comparison of daily cumulative number of tank losses. The Soviets lost almost 25% of their OH tanks on day 9.

a. On hand armored personnel carrier

Figure 11 shows daily OH APC for both sides in the southern front of the Battle of Kursk, as represented in the KDB. The number of OH APCs includes all APC, both committed and uncommitted.

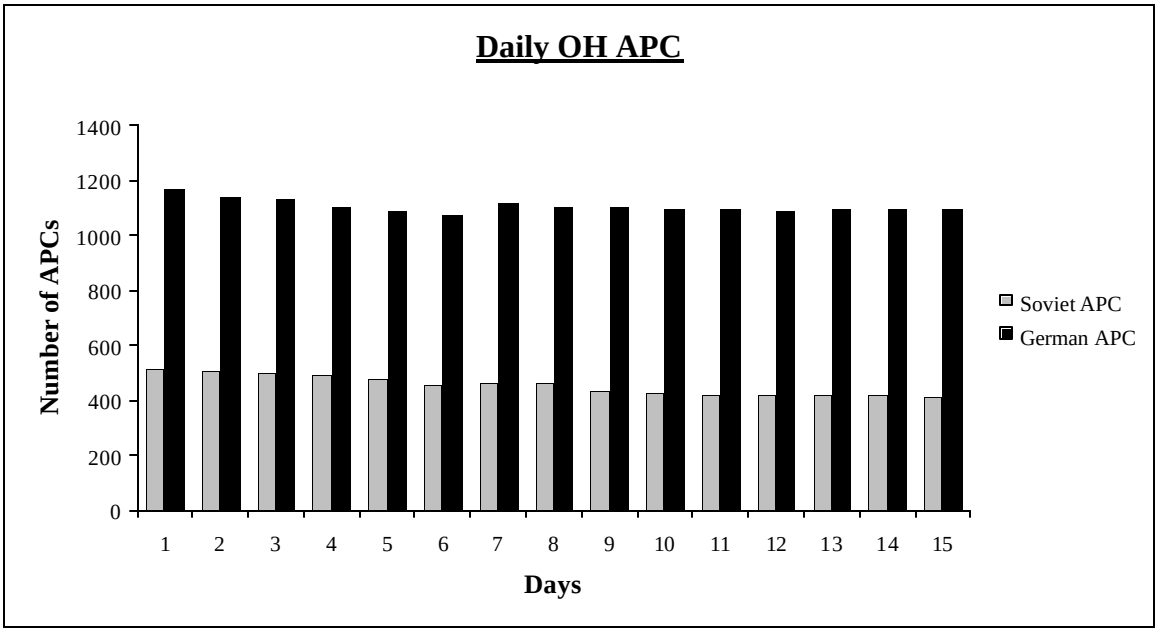

Figure 11. Comparison of daily number of total OH APCs. The number of Soviet OH APCs showed a general decline throughout the battle.

b. Armored personnel carrier losses

Figures 12 and 13 show daily and cumulative total APC losses, consecutively, for both sides in the southern front of the Battle of Kursk. When initial forces are considered, total APC losses amounted to 23 (22.89) percent of the initial amount of Soviet APCs and 16 (16.41) percent of the initial amount of German APCs. Overall, the Germans lost 1.64 APCs for every Soviet APC lost.

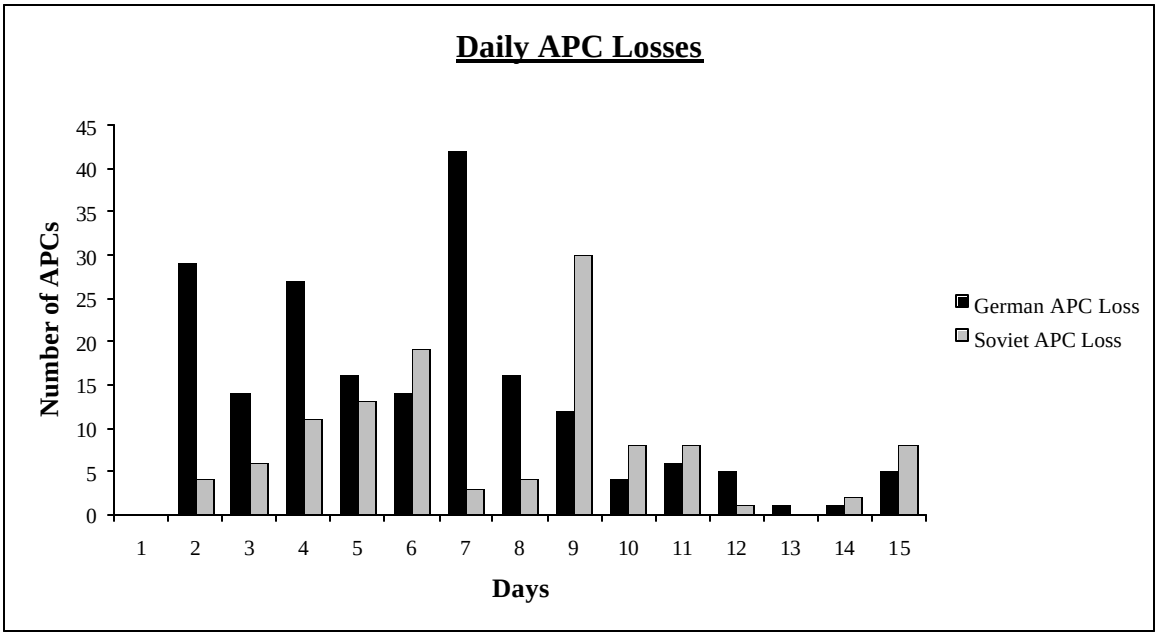

Figure 12. Comparison of daily number of APC losses. Notice the high number of German APC losses on day 7 and the high number of Soviet APC losses on day 9. Both sides did not lose any APCs on day 1.

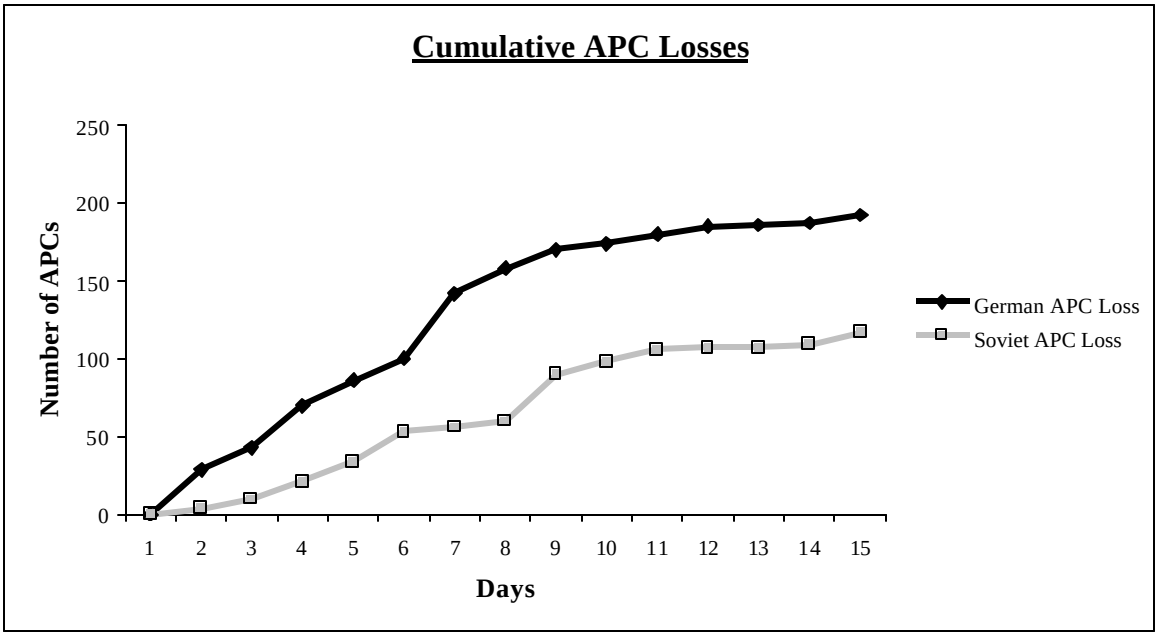

Figure 13. Comparison of daily cumulative number of APC losses. Throughout the battle, Germans lost more APCs than the Soviets did.

4. Artillery statistics

This section presents statistics on Soviet and German Artillery weapon system strength and losses during the campaign for the purpose of gaining insight about the Battle of Kursk.

a. On hand artillery

Figure 14 shows daily OH Artillery for both sides in the southern front of the Battle of Kursk, as represented in the KDB. The number of OH artillery includes all artillery, both committed and uncommitted.

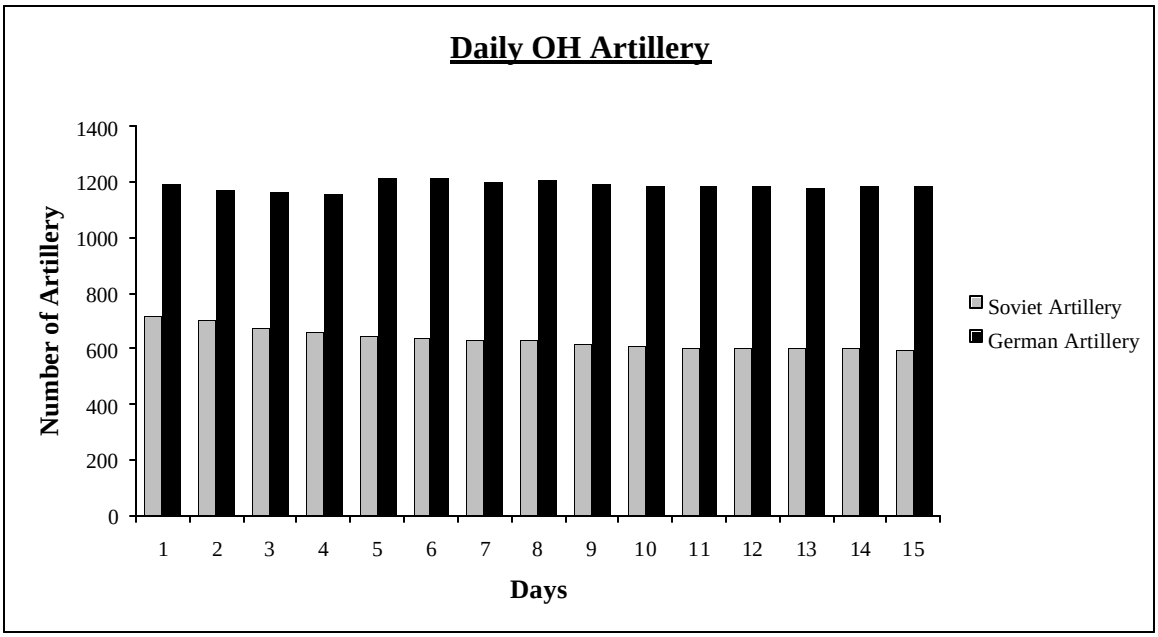

Figure 14. Comparison of daily number of total OH artillery. The number of German artillery was higher than the number of Soviet artillery throughout the battle.

b. Artillery losses

Figures 15 and 16 show daily and cumulative total artillery losses, consecutively, for both sides in the southern front of the Battle of Kursk. When initial forces are considered, total artillery losses amounted to 20 (0.200) percent of the initial

amount of Soviet artillery and 11 (0.106) percent of the initial amount of German artillery. Overall, the Soviets lost 1.13 artillery for every German artillery lost.

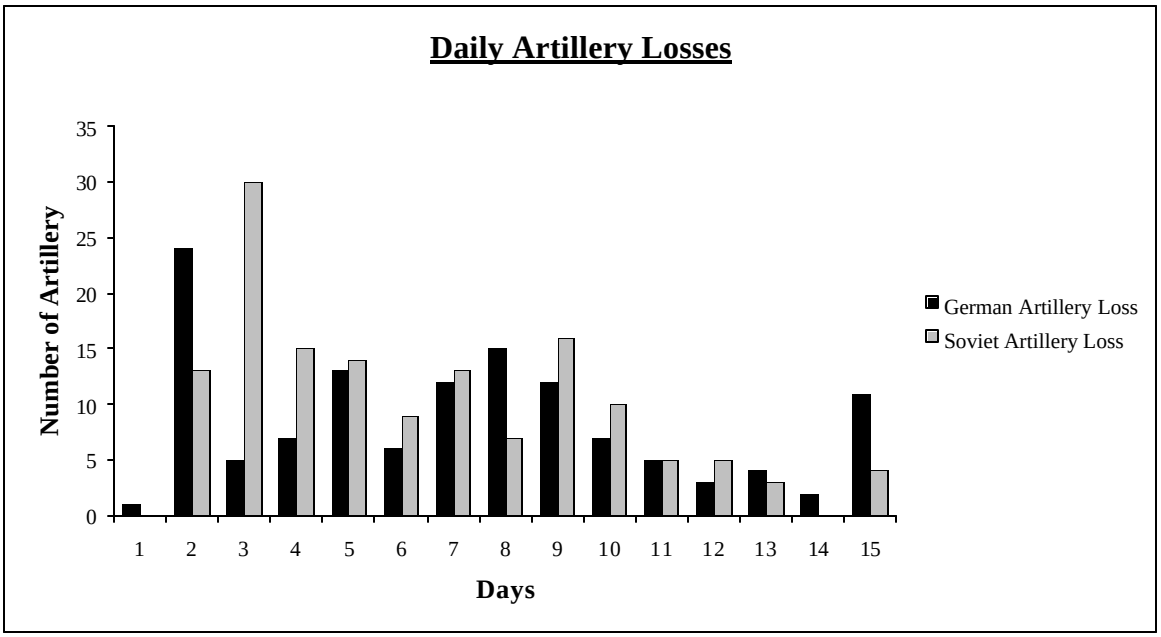

Figure 15. Comparison of daily number of artillery losses. German artillery loss was higher for the first few days of the battle. There were no Soviet losses on days 1 and 14.

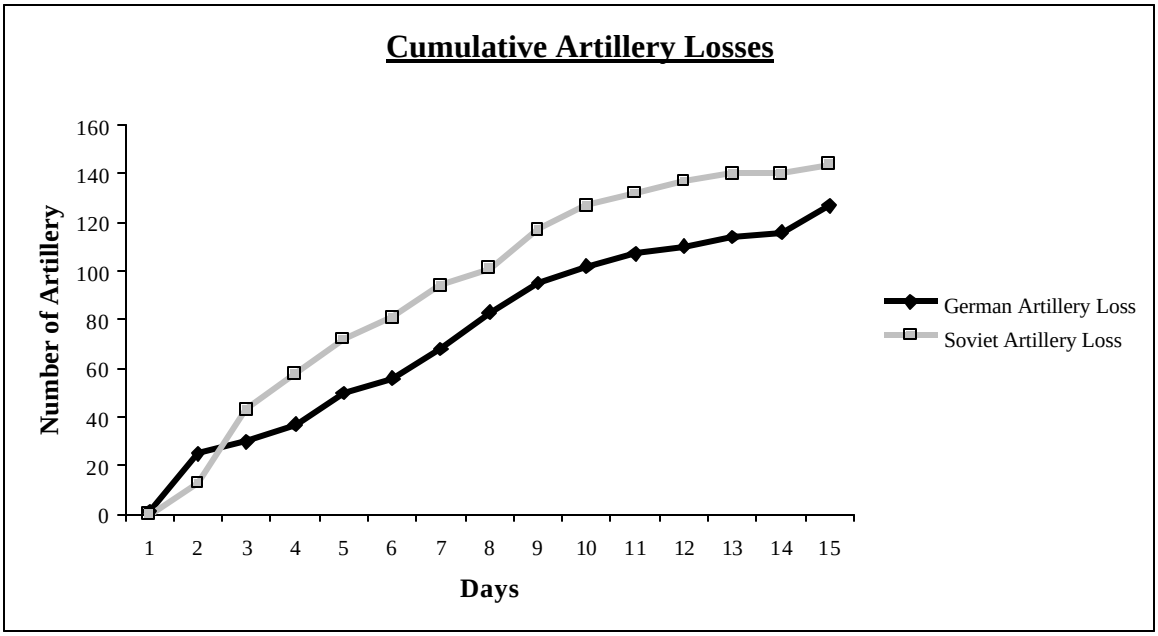

Figure 16. Comparison of daily cumulative number of artillery losses. Soviet artillery losses began to increase on the third day and remained higher throughout the battle.

For more detailed information about the type of losses for the tank, APC and artillery weapon systems, both for the Germans and Soviets, see Appendix A Part B, Part C and Part D, respectively.

5. Air sorties

The air sortie data given in the KOSAVE [Ref.12] report consists of the number of air-air role sorties, ground attack role sorties, reconnaissance role sorties and evacuation role sorties (used solely by Germans). The information on air sorties is given in Table 14.

Days	Soviet			German			
	air-air	**grnd att.**	**recon.**	**air-air**	**grnd att.**	**recon.**	**evac.**
1	143	1	15	64	160	0	0
2	1051	600	14	371	1942	74	67
3	778	613	20	253	1356	77	138
4	899	661	14	297	1499	91	117
5	707	669	62	229	1426	82	129
6	490	472	65	248	1286	99	83
7	322	383	71	116	530	44	81
8	410	348	25	176	809	66	70
9	501	603	67	191	460	57	107
10	406	623	58	204	451	55	136
11	593	704	46	238	1147	88	135
12	182	369	48	132	541	37	116
13	454	681	33	145	278	82	95
14	268	336	17	40	122	33	71
15	239	377	13	40	18	41	68
TOTAL	**7443**	**7440**	**568**	**2744**	**12025**	**926**	**1413**

Table 14. Number of air sorties for Soviets and Germans. Air-air denotes number of air-air role air sorties, grnd.att. denotes the number of ground attack role air sorties, recon. denotes the number of reconnaissance role air sorties and evac. denotes the number evacuation role air sorties. Evacuation role air sorties are used solely by Germans.

Figure 16 shows a comparison of the number of each type of air sorties for both sides for the Battle of Kursk.

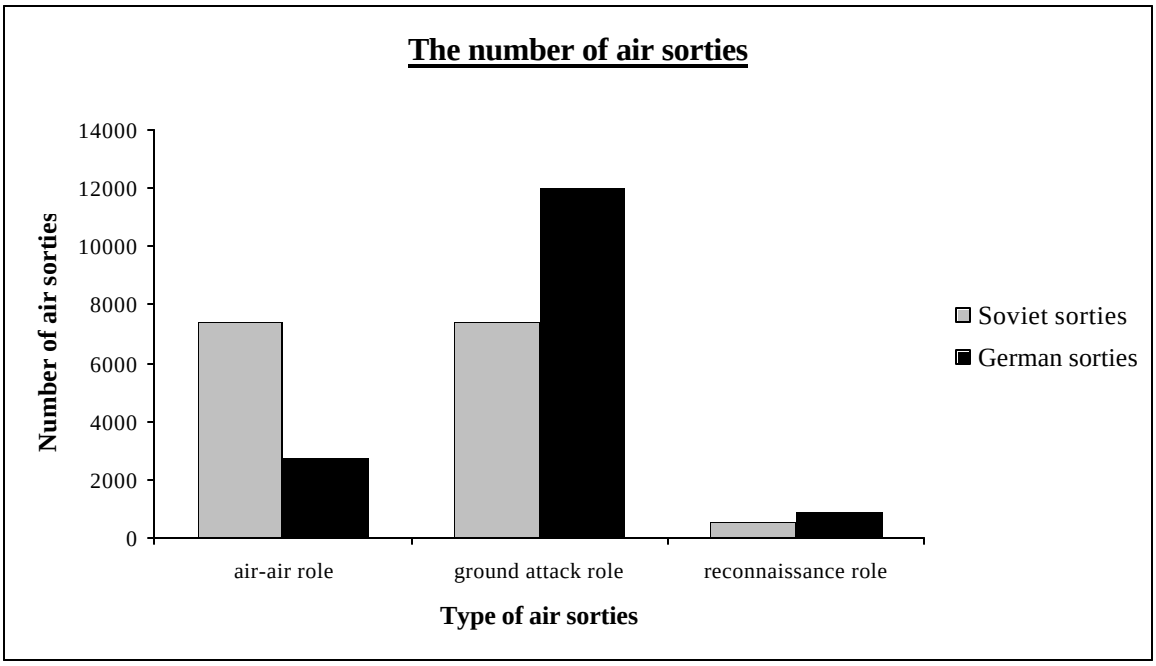

Figure 17. Number of each type of air sorties for Germans and Soviets. When the number of air-air role sorties are compared, the Soviets are superior to the Germans. When the number of ground attack role sorties are compared, Germans are superior to Soviets.