
# Vehicular Defense and Movement Factors in the Dunnigan System

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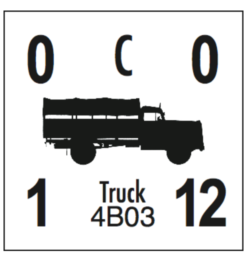
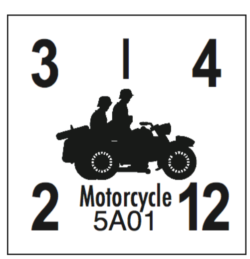
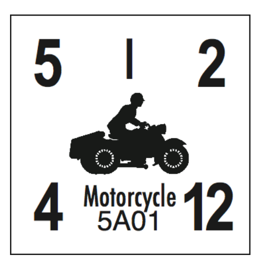
## Defense Factors

Non-Armored Vehicular Units:

Most non-armored vehicular units are transport units (trucks, jeeps, wagons, and non-armored halftracks). Transport vehicles usually stick together, traveling in convoys when on the move and parked in a central location when not. Thus they received the mandatory minimal defense factor of 1. Other non-armored vehicular units included self-propelled anti-aircraft units, self-propelled multiple rocket launchers, and motorcycle units. Self-propelled anti-aircraft units shared the same disadvantage as dismounted anti-aircraft units: they have to be in the open in order to get all-round coverage, thus they receive the same defense factor, that of 1. The self-propelled multiple rocket launchers were a different story. Normally they would share the same disadvantage as their dismounted versions, a defense factor of 1 due to the close proximity of the rocket reloads. Since, however, they were motorized, and their reloads, also on trucks, could be kept at some distance until it was time to reload, plus they themselves could quickly change position after firing a salvo, it was decided to give them a defense factor with their equivalent artillery class. Thus they were given a defense factor of 2. Motorcycle units were classified as mounted units, in other words, units where each individual rides his own transport vehicle. For the platoon size units that the Germans and French have, this meant an automatic defense factor of 2. For the Russian motorcycle companies the defense factor became a 4, not the 6 that one would expect for a three platoon company. However the Russian motorcycle platoons were somewhat smaller than those of the Germans and the French so the combined company would be somewhat smaller than a stack of three German or French motorcycle platoons.

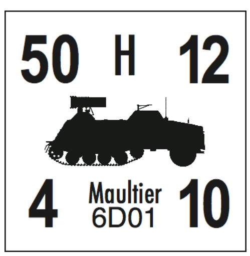


<u>Armored Vehicular Units</u>:

The defense factor of armored vehicular units was based on the maximum thickness of their armor in millimeters (modified by any sloping of the armor) divided by 10 with any leftover fractions rounded up to the nearest whole number. The thickest armor was usually found on the turret front, though sometimes the mantlet around the main gun could be thicker. However, some vehicles had a thicker hull than a turret and in those cases, that thickness is used. This formula is employed in any vehicle where the crew com-partments are fully enclosed in armor or just have an open top turret as in some armored cars, tank destroyers, and self-propelled anti-aircraft units. The basis for this type of defense factor was that the vehicles in question had to be in the open most of the time, either because they were an offensive weapon like tanks or because of mission requirements like SPAA units.


For vehicles that have open top crew compartments the formula was to take the maximum armor thickness as derived above, then double it, then divide by ten, rounding any fractions to the nearest whole number. This doubling accounts for the tactical doctrine of supporting from a distance: as these vehicles usually have light armor, thus they support by fire alone. They tend to look for and fight from covered positions in order to increase their chances of survivability. Vehicles that this formula is applied to are halftracks and their derivatives, some self-propelled artillery, open top assault guns, and open top tank destroyers. (Note that there were some halftrack vehicles that were fully enclosed in armor like the Sd Kfz 250/9 and the Maultier, but they were rated using this formula because they were still halftracks.)

<u>Sloped Armor</u>:

While most people know that the sloping of the armor plating increases it effective thickness, only a few know by how much. What follows is a table showing the relative increase in the effective armor thickness based on the angle from the vertical (in degrees) of the armor slope:

15° — 1.1 x Armor Thickness
30° — 1.2 x Armor Thickness
45° — 1.4 x Armor Thickness
60° — 2.0 x Armor Thickness
70° — 3.0 x Armor Thickness

Although these figures are only rough approximations, they can still give a pretty good idea of the effects of the sloping of armor in terms of protection.

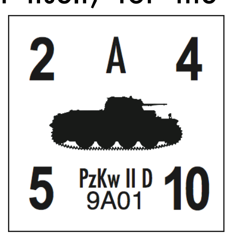
<u>Face Hardened Armor Plate</u>:

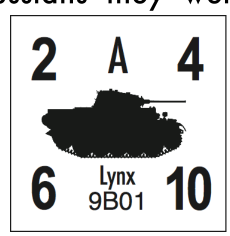
There has been some speculations on the effect of face hardened armor plate on armor penetration and whether Dunnigan used it in his calculations.

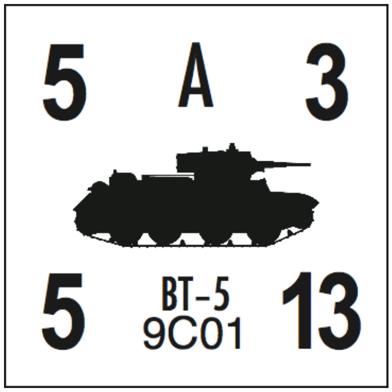

Face hardened plate is where the armor plating has been heated on high temperatures for an extended period in order to harden the surface of the plate to a greater degree than the rest of the armor. Warships had their armor treated in this way. The difference is that warship armor is heated in this fashion for months, resulting in up to half of the thickness of the armor being hardened. This is not a problem as it takes years to build a warship anyway. Tanks are another problem as hundreds of them must be produced in a month. There just is not enough time to face harden the armor to any great degree, at best only about 10 per cent of the armor thickness was hardened and that was on the Tiger tanks. Still the only real effect that it had was to break up the AP rounds when they struck before they could penetrate. However APCBC rounds were invented to combat face hardened armor plating and since they are the primary anti-tank round used to determine the base attack factor of the various A Class weapons, any face hardened plate used by the various opponents (primarily German) is therefore neutralized and is not taken into consideration. For that reason Dunnigan never used the effects of face hardened armor plating.

Offensive Tactics:

In the late 1930s, there was a demonstration in Switzerland of the effects of sloped armor plating against anti-tank rounds. Military observers from many different foreign armies were there to witness the demon-stration. Of all the forces represented, it was the German and the Russians who took a keen interest in the results. Both sides developed a tactic for their tanks based on these results. The tactic was to approach the source of fire or an objective at an oblique angle, so as to keep the corner of their vehicles pointing towards the source of fire, thus creating an artificial slope for their front and side armor, thereby increasing the relative thickness of the armor. This tactic was to compensate for the relatively thin armor that most of the tanks of the two powers had. Not only that, the Germans, and to a lesser extent the Russians, were very keen in using the terrain to enhance the defensive properties of their vehicles, both offensively and defensively. For the Germans, these tactics were an end in itself; for the Russians they were merely an intermediary step while they designed and built tanks with sloping armor on the vehicles themselves. The Germans used the technique as a standard tactic in the early years of the war for their panzers, most especially the Pz II, Pz II (Fl), Lynx, Pz IIId, Pz 38t, and Pz IVd series of tanks. The Russians used it as a tactic for their light tanks, most especially their cavalry tanks of the BT series.






This tactic, being such a prominent practice in both armies in the early years of the war, thus gave rise to a defense factor modifier for early war vehicles. However, by 1942 everybody was using these tactics so it is not used on vehicles introduced in that year or later – in essence the modifier is cancelled out. This modifier was developed by Ramiro Cruz and first introduced in his PanzerBlitz 1941 article (at least in the counters given in that article). But it was in the Panzer Leader 1940 article that the defense factor modifier reached its full fruition in the German counters. The modifier is that the chosen vehicle defense factors are derived using the formula for the open top vehicles described above. This modifier was accepted into the Dunnigan System by Avalon Hill basically by default. The AH staff accepted Cruz's works almost without hesitation and did not bother to check up on his figures. Thus the defense factors that were derived by this modifier, and the counters these factors were printed on, became canonical.

<u>Four Vehicle Tank Platoon</u>:

In Panzer Leader we were introduced to the four vehicle tank platoon. Normally, the number of vehicles that a counter represented had no bearing on the defense factor. However, Randall Reed felt that some difference should be shown between the five and four vehicle tank platoons as Panzer Leader had both. To do this, he reduced the attack factor of a given vehicle by 20 per cent, reduced the defense factor by 1, and left the range and movement factors alone. His rational for reducing the defense factor by 1 for every vehicle deleted from the counter was that defense factor represented more than just the thickest armor on a given tank. It also represented the tactics used by the individual tanks in the platoon, both as themselves and as a team. To reduce the defense factor by the same percentage as the attack factor would penalize the four tank platoon too much. Thus the reduction by 1 represented the reduction of tactical defensive options that a four tank platoon had compared to the five tank platoon. In the case of a mixed four tank platoon counter such as the Sherman UK, Randall merely added the defense factors of three normal Sherman UKa counters and one Firefly counter and then divided the total by four to get the defense factor of the final Sherman UK counter.

Heavy Armor:

There are some heavy tanks and tank destroyers that seem to have their defense factors underrated in terms of what they should be given due to their true maximum armor thickness. This was due to the fact that their heavy weight tended to slow them down, thus giving the enemy greater opportunities to flank them and get shots at the side and rear where the armor was thinner, thus negating the really heavy armor in the front. Note that is applied to vehicles with a real armor thickness of more than five inches, not vehicles with thinner armor but with an excellent armor slope which gives them the equivalent protection of a heavy tank. The formula applied to these tanks was to take the maximum armor thickness (modified by the slope of the armor), divide by 10, then round any fraction to get the base defense factor. Then the base defense factor is reduced, based on the movement factor of the vehicle. If the movement factor is 8 or greater, the defense factor is reduced by 4, if the movement factor if 7 or less, the defense factor is reduced by 8. (The theory being the slower the vehicle, the easier it is to flank.) The following vehicles had this formula applied to: Elefant, Tiger II, JdgPz VI, JS II, and JS III. Below are what their base defense factors were and the final defense factor.

| | |
|---|---|
| Elefant: | Base – 23, Final – 15 |
| Tiger II: | Base – 24, Final – 16 |
| JdgPz VI: | Base – 26, Final – 18 |
| JS-II: | Base – 16, Final – 12 |
| JS-III: | Base – 18, Final – 14 |


There is a notable absence from this list. Of course I am talking about the M-4A3E2 Jumbo Sherman. This ve-hicle had up to seven inches of actual armor (on the turret mantlet) so it would certainly qualify for this modifier. Yet when studying the Jumbo Sherman I found that it maneuvered more as a medium than as a heavy tank. It had only lost 2 mph of speed compared to a regular Sherman tank and, thanks to improved components, it lost little of its cross country maneuverability. If I were to follow the rules above, the Jumbo Sherman would have a base of 18 and a final factor of 10, given its movement factor of 7. This would make it only as good as a regular M4/74mm counter. But I could not just leave it alone either, as it would be too powerful for its size. So what I did was to take its thickest side and rear armor of 6 inches (on the turret) and used that as the defense factor (152mm equals a defense factor of 15).

False Armor Thickness:

All the above sounds pretty simple, doesn't it? Well it turned out to be a bit more complex than that. The maximum


thickness of the armor plates of the vehicles were those listed back in 1970. For the German vehicles most of them were pretty accurate as the Western Allies had plenty of captured vehicles from the war which were analyzed back at the proving grounds of the capturing power. Not only that, they had plenty of captured German documentation on their own vehicles to glean information from. However, some of the released figures were fudged by the government, given their Cold War mentality of the time. The Russian vehicles were another matter though. For early to mid-war vehicles, there was enough information available, again given the captured German documentation on their study of captured Russian vehicles. Not only that, the U.S. Army had several captured AFVs of Soviet manufacture from the Korean War, which included most versions of the T-34, and some SU-76s as well. The rest of the vehicles, from mid to late war, had to be speculated on by experts. While some intelligence had come in on some of the late war vehicles, for the most part it was inaccurate and the experts were not sure as to its validity. It was not until after the Six Day Arab Israeli War of 1967 that the West was able to get hold of captured late war vehicles (from the Israelis) that they were able to get accurate statistics on them. In some cases their previous calculations were right on the money, in others they were way off. But the government waited until the mid Seventies before releasing these figures to the public, thus the defense factors for units in PanzerBlitz was arrived at using still tainted data. Listed below are units from PanzerBlitz which had defense factors which are incorrect by today's standards but in 1970 were the most correct given the data available back then. Besides them are their original counter values and what their corrected real counter values would be using the above formulas and the armor values that are available today.

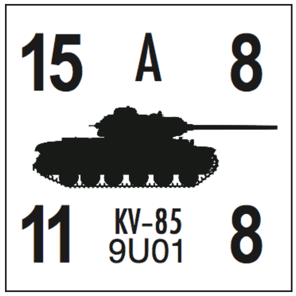
**German:**

| | | |
|---|---|---|
| SG IIIg: | Counter:12 | Real: 9 |
| Jgd Pz IV/L70: | Counter: 9 | Real: 11 |
| Jgd Pz VI: | Counter: 18 | Real: 20 |

**Russian:**

| | | |
|---|---|---|
| SU-76: | Counter: 9 | Real: 8 |
| SU-85: | Counter: 12 | Real: 9 |
| SU-100: | Counter: 15 | Real: 11 |
| SU-122: | Counter: 11 | Real: 9 |
| JSU-122: | Counter: 15 | Real: 11 |
| SU-152: | Counter: 16 | Real: 9 |
| JSU-152: | Counter: 17 | Real: 11 |
| T-35:[1] | Counter: 9 | Real: 6 |
| KV-85:[2] | Counter: 13 | Real: 11 |
| JS-III: | Counter: 14 | Real: 19 |

Notes:
1. And this is being generous as only some of the T-35s had 60mm armor plate, the rest still had 40mm armor plate.
2. I had this changed a long time ago but I am including this to make the table complete.




In Panzer Leader there was not a problem with false armor thickness in the Allied as there was a wealth of information available for the Western Allied vehicles in the early 1970's. And since there was not any really exceptionally heavy armored vehicles in the Allied inventory (save the Jumbo Sherman), plus the fact that all of the vehicles represented in the game were obsolete by the 1970s, at least as far as their original manufacturing powers were concerned, there was no need to lie about the armor thickness of the vehicles. As for the German vehicles, it was decided to just accept the values of the vehicular counters from the PanzerBlitz game at face value as Reed and his crew did not have time to redo all the German counters when getting the game ready for production.

Does this mean that the previously mentioned counters ought to be changed? No. PanzerBlitz, and to a lesser degree Panzer Leader, were designed using tainted hard technical data and in order to keep them pure, any new counters would have to be created using the same data so as to keep the old and new counters relative to each other. (Exception: The KV-85 was changed because I found data from 1970 showing that it only has a maximum armor thickness of 110mm, not 130mm.)

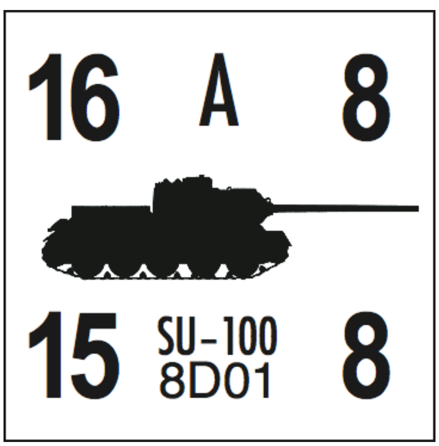
## Movement Factors

The movement factors of all vehicles used a simple formula. The vehicle's maximum speed was divided by 3 (rounding any fractions down) to get the movement factor for the vehicle in question. However there were some modifiers involved with some vehicles.

As noted in a previous article, horse driven vehicles were given a manda-tory movement factor of 3. This reflected their average speed over the course of the time period covered by the scenario in question, especially when towing artillery units or hitched up to the transport wagons.

Wheeled vehicles used their maximum operational speed as the basis from which to derive the movement factor. While they were certainly faster than what the movement factors would indicate, these faster speeds were only used when getting out of a hot spot or tight situation, the movement factor represents the maximum operational speed that these vehicles could operate as a tactical unit.

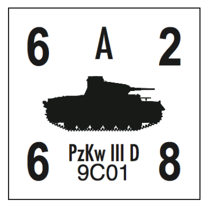
There were other AFVs that had their operational speed well below the maximum speed for mechanical reasons. Most of these units had a high ground pressure and a low horsepower to weight ratio. These vehicles could not maintain their maximum speed without breaking down. In fact their maximum speeds were only attained on the proving grounds, in service they had a operational maximum speed imposed on them to reduce the frequency of breakdowns. Perhaps the two best examples of this were the Tiger II and the Jgd Pz VI. These vehicles had a maximum speed on the proving grounds of 24 mph and 23 mph respectively. However because of their high breakdown rate they had an imposed operational maximum speed of 20 mph and 16 mph. This is what their movement factors of 6 and 5 actually represent. Another vehicle that this happened to was the SU-100. It had a maximum speed of 35 mph. However, its transmission broke down at speeds higher than 25 mph. Rather than delay its entry into the war while designing and building a new transmission for SU-100, the Russian sent it into combat with an imposed speed limit of 25 mph and then fixed the problem with the transmission after the war. This is why the SU-100 has a movement factor of 7 in Arab-Israeli Wars (35 mph) while having a movement factor of 8 (24 mph) in PanzerBlitz.

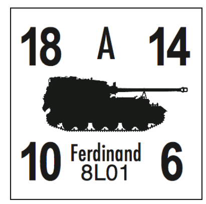



Coming up with the movement factors is perhaps the easiest because of the simple formula, but one has to do some research into a vehicle's history to see if there was some imposed speed limit on it as this would be considered the maximum speed for game purposes.

**Odd Counters**

Pz IIId:
This counter came with two defense factors. The first one appeared in PanzerBlitz 1941 in the General 13-3 with a defense factor of 5. The second one appeared in Panzer Leader 1940 in the General 15-2 with a defense factor of 6. The second one is correct. Old Ramiro Cruz was still formulating his Offensive Tactics modifier for defense factors in the PanzerBlitz article and so got the defense factor for the Pz IIId and possibly the Pz IVe wrong. (I am not sure about the Pz IVe though.)




Elefant/Ferdinand:
These two counters are the same vehicle, just two different names. The Elefant was created by myself for PanzerBlitz and introduced in the General 28-2. The counter values are correct for this counter. The Ferdinand was introduced in the General 31-6 and was made for a specific scenario in Panzer Leader. Since this counter represents training vehicles for the Ferdinand, it stands to reason that its defense factor is a 10 since half of its armor plating had been stripped off and as a result, the lessened weight of the vehicle caused an increase in speed, resulting in a movement factor of 6.