Tactical, Tactical-Operational, Operational and Strategic Military Simulations

Military simulations, or war games, are normally categorised as tactical, tactical-operational, operational or strategic. The predominant feature that decides how a war game is categorised is the space and time scale used by the units involved in the simulation.

The concepts and terms (definitions) used in the following discussions, are based on military applications in the first half of the 20th Century. It should be noted that some of these concepts and terms used vary slightly if applied to military history and organisations in the 19th or late 20th Century.

Tactical Level Simulations

Tactical level simulations, or war games, have space scales ranging from 40 to 150 meters per hex, and times per turn ranging from 2 to 6 minutes. Tactical war games are concerned with the tactics related to moving and fighting small combat units over a limited timeframe (usually a few hours), and in small areas.

Small combat units are: squads, sections, individual artillery pieces and individual AFVs. In tactical games each turn includes time for movement and combat. Combat involves mostly 'line of sight' calculations, where opposing forces shoot at what they can see from particular terrain features. Indirect fire is used for short rang weapons such as mortars, and abstractly simulated for off map heavier weapons. The combat models used are usually extremely detailed, although not always that realistic. They include individual weapon characteristics, AFV characteristics (such as armour thickness, slope, shape and facing), rate of fire, target ranges, all terrain features (including elevation and depression), and a multitude of other factors. In addition, an assessment of the tactical combat proficiency for each side is included.

Some very good tactical level military simulations with realistic combat models are: Squad Leader and Advanced Squad Leader[1], Panzer[2], Steel Panthers[3] and Tigers on the Prowl[4].

Tactical-Operational Level Simulations

Tactical-operational simulations have space scales ranging from 150 to 300 meters per hex, and times per turn ranging from 6 to 12 minutes. Tactical-operational war games fill a gap between tactical and operational games. Many war gamers would call these tactical games because the manoeuvre units are normally platoon size and the thinking behind the deployment of such units is tactical in nature. In addition, these simulations are also concerned with the tactics related to moving and fighting 'small combat units' over a limited timeframe and in relatively small areas. However 'small combat units' are now platoon size infantry or tank units, and artillery batteries.

In tactical-operational war games, each turn includes time for movement, combat and limited 'operational type' activities. Operational type activities may include: immediate ammunition and fuel replenishment, coordination of attacks between different companies, battalions and even divisions (on very large scenarios), and fatigue and disruption recovery using higher headquarters. Combat still involves mostly 'line of sight' calculations from particular terrain features. Indirect fire is more developed, with short and long range weapons (artillery) on the map. The combat resolution models used are usually detailed, although in most tactical-operational war games the combat model is less involved and less realistic than the smaller scale tactical war games.

[1] Multi-Man Publishing, MMP. (For Avalon Hill). Many rules. ASL is probably the most advanced tactical level war game ever made, and has achieved more sales than any other board (map) based war game.
[2] Excalibur Games.
[3] Strategic Simulations Inc, SSI.
[4] HPS Simulations.

If possible, a well designed tactical-operational simulation should include all the combat resolution model details found in purely tactical simulations. If it is not possible to include the combat model detail directly, then a 'weighting factor' should be included to simulate the detail parameter. This does make the design of tactical-operational war games more challenging. For example, in a good tactical level simulation, tank armour protection over different parts of a tank is simulated. However in many tactical-operational war games only the strongest part of the tank (the frontal armour) is usually used in calculating the defensive (armour) strength of the tank platoon. This is because it is generally assumed that the portion of the tank platoon engaging the enemy would always manoeuvre to face the enemy. But, it is simultaneously unrealistic to assume that the entire tank platoon would always face in one direction at the same time, or that certain types of weapons (eg aircraft and artillery) would normally hit the tanks frontally. Thus if there is no weighting factors to compensate for non-frontal hits on the tanks in the platoon, then outlandish and unrealistic results will occur. This is because the majority of tanks in WWII were actually destroyed by non-frontal hits, and if there is no weighting factor to represent this then certain types of tank become much stronger in the simulation than they were historically.

In addition to more complex combat resolution models, tactical-operational simulations need to establish the tactical combat proficiency for larger combat units: this is now much more critical, and has far more impact, than in smaller tactical simulations. For example, in tactical level simulations the tactical combat proficiency of individual tanks is considered, which includes factors for the ergonomics of the tank's crew and average crew training. But in tactical-operational simulations, the tactical combat proficiency of individual tanks as well as how well the tanks in the platoon worked together and with accompanying infantry, needs to be considered. This difference in tactical-operational level combat proficiency was critical in tank combat: factors such as the presence of radios in the tanks, and the training and combat doctrine of the tank platoon as whole, made a huge difference to historical combat outcomes.

The above are just two examples of why military simulation design becomes progressively more challenging as you move up the scale. Some examples of good published tactical-operational simulations, with reasonable combat resolution models, are: Steel Panthers III[5], Eastern Front II[6], West Front[7], Battleground Ardennes[8], Across the Rhine[9], PanzerBlitz[10], and Panzer Leader[11]

Operational Level Simulations

Operational level simulations have space scales ranging from 500 meters to 30km per hex, and times per turn ranging from 2 hours to 2 weeks. A good description of the 'operational level' is "a view of the battlefield on a scale just exceeding that at which differing ranges of various direct fire weapons are significant".[12] Operational level simulations cover the widest range of space and time scales: as such they are the most challenging and complex to 'play', and the most difficult to design well.

I'm sure many tactical level aficionados and 'Advanced Squad Leader' players would dispute this statement! However the fact is that most tactical simulation rules are related to the application of the laws of physics to combat (which can itself be very complex), with more limited rules relating to human behaviour and logistics. A good operational simulation has to simulate all the factors at the tactical level, and simultaneously all the operational factors at all other levels: the

[5] Strategic Simulations Inc, SSI.
[6] Talonsoft, Campaign Series.
[7] Talonsoft, Campaign Series.
[8] Talonsoft.
[9] MicroProse Software Inc.
[10] Avalon Hill Game Company, Old 1970 board game, still good with modified rules. Few operational elements
[11] Avalon Hill Game Company, Old 1974 board game, also still pretty good. Few operational elements.
[12] The Operational Art of War, Century of Warfare User Manual, Talonsoft, page 6.

simulation designer and player are forced to think about multiple, wide ranging problems simultaneously, and how they will interact. Operational level simulations are concerned with the tactics related to moving and fighting small and large combat units, over a large timeframe and in large areas. Moreover, combat units range from company size to entire divisions, and the thinking behind the deployment of such units is simultaneously tactical and operational.

In well designed operational level simulations, each turn includes time for movement, combat and all 'operational' type activities. Operational activities should include all the following:-

1. Decision making in regards to the geographic and military objectives of the battle or campaign.
2. Interpretation of intelligence and likely enemy deployments.
3. Formulating a plan and deploying suitable units to achieve the objectives, taking into account: terrain, available forces, available logistics, known tactical and operational combat proficiencies (the latter includes unit cooperation, and overall command and control), weather forecasts, and likely enemy actions.
4. Planning the long term 'health' and readiness of all combat and non-combat units. This includes supply of the unit, fatigue effects, receiving replacements, and even training in long campaigns.
5. Transport and supply logistics such as: moving units by rail or road to the combat sector, deployment of 'marching' units, supply stockpiling, organising the supply lines and the continuous resupplying of units.
6. Organising rear area security. This includes protection of supply lines, and supply and support infrastructure (eg bridges, railroads, ports etc), against enemy interdiction.

Combat resolution in operational level simulations, generally involves calculations based on the 'strengths' of the units involved, taking into account: terrain, weather, unit entrenchment (fortifications), and unit posture (i.e. defensive or attacking). The 'strength' of each unit is calculated based on the unit's TOE, actual equipment and personnel present, readiness, and tactical and operational combat proficiency. Indirect fire should be fully simulated with most weapons deployed on the map, and each side's historical artillery command and control systems in place. The same applies to aircraft ground support and interdiction operations.

Well designed operational simulations should include as many of the combat model details found in tactical-operational war games, as possible. Obviously it is not usually possible to include the detail directly, so weighting factors have to be included to simulate the detail parameter. This is where operational level simulations take a quantum leap in complexity of design over tactical simulations: it is also where many operational level 'war games' start to depart from reality. If a simulation designer is looking to maintain realism in the operational level simulation, at least to the level of a good tactical-operational simulation, the main problem areas to be overcome are as follows:-

1. Incorrect balance between the space scale and time scale of the simulation.
2. Incorrect use of Zone of Control (ZOC) effects, and incorrect force density or frontage.
3. Using the equipment and personnel historically available in each unit, and NOT its TOE: i.e. using the combat unit's actual strength and not its authorised strength.
4. Using the correct attack and defence factors for equipment and personnel resources in the unit, to accurately calculate its correct maximum overall attack and defence strength.
5. Creating air combat units that are fully integrated into the land combat model, and with the ability to fulfil conditions 3 and 4 above.

6. Using an accurate measure of the tactical and operational combat proficiency for each side, including historically accurate command and control systems.
7. Developing a realistic series of Combat Results Tables (CRTs) for manual map based simulations, or using realistic algorithms for combat resolution in computer based simulations.

As a rule the combat algorithms (item 7 above) used in calculating combat results have been carefully worked out in most current operational level war games, not least by the military themselves. However the historical research needed for items 3-6 (above) is often superficial or missing altogether. In addition, items 1 and 2 (above) are often poorly designed and thought out in many operational level war games, leading to predictable outcomes which are more attributable to the simulation's mechanics than any command decisions made by the 'players'. Coupled with the need to simulate all operational activities, it is easy to see why these war games are the most challenging to design, and why realism is often sacrificed for 'playability'.

A few operational level 'systems' utilise a full equipment and resource database, (including aircraft). This enables these systems to fully address items 4, 5 and therefore 3, in the above list of problem areas: computational methods and the power of modern computers mean that even at the operational level, the life cycle of individual weapons, vehicles and infantry squads can be tracked and used in combat resolution. Despite the millions of calculations involved, these systems repeat this process for each game turn, tracking how each individual combat unit losses or gains resources.

Operational level systems utilising a full equipment and resource database, have huge advantages in achieving realism compared to other similar types of system. These advantages include:-

1. The exact maximum attack and defence strength of the manoeuvre unit (combat unit) can be calculated, based on the individual tactical attack and defence values of the individual resources ACTUALLY in the unit. This enables most of the combat model details found in tactical war games to be directly included in the operational level combat model, without having to use abstract weighting factors. Systems without a full equipment and resource database have to use a fixed maximum strength value for each unit, set by abstract calculations by the game or scenario designer. The player has to hope the designer is using the correct TOE, actual equipment and tactical rating of the equipment, because it cannot be verified within the simulation's parameters.
2. It allows mixed equipment in the manoeuvre unit. Therefore the unit is not rigidly classified as a 'hard' (armoured) target, or a 'soft' (none armoured) target, but a mixture of both. This also applies to air units with fighters, bombers, reconnaissance and ground attack aircraft.
3. The exact attack and defence strengths of each manoeuvre unit is calculated for each turn as the individual resources within the unit change. The unit may effectively become more 'hard' (if it losses infantry or gains tanks) or more 'soft' (if it losses tanks or gains infantry). This means the type of weapons lost by combat or attrition, or gained from replacements, is included in the combat unit's strength change each turn. Other systems can calculate changes in strength only as a percentage of the full strength and then reduce or increase this over time.[13]
4. It allows much higher resolution of changes in overall manoeuvre unit strength. Thus if an entire division losses only 1 infantry squad (around 10 men) then even this is registered as a microscopic reduction in the unit's (division's) overall strength. Other systems have varying

[13] For example, a Soviet 1941 tank brigade normally contains a tanks and infantry component. If the tank brigade lost all its tanks (which often happened in 1941-42) it would no longer realistically be a 'hard' armoured force. Operational level simulations without a full equipment and resource database would still classify the tank brigade as an armoured force at reduced strength, when in fact it was a soft (infantry) force at reduced strength. In real terms, the actual overall combat power of the two was very different.

degrees of resolution in unit strength ranging from 3 to 4 steps in board games (which is very understandable), to 1% point of the unit's maximum strength.

5. It enables air combat units to be properly integrated into the land model, and for them to meet conditions 1 - 4 (above). Most other operational level simulations still have to treat air to air combat and air to ground combat in an abstract fashion, often using 'off map' units. Designers and players cannot therefore verify the air strengths of individual air combat units within the simulation's parameters.
6. It enables new equipment types to be issued to air and ground units in the course of the campaign, with the resultant changes to unit strength accurately calculated. Other operational level simulations simply cannot simulate this directly: they have to utilise more abstract means to simulate new equipment introduction, which is again difficult to validate within the simulation's parameters.

Some of the better published operational level war game systems, with good to reasonable combat models and good operational level control, are: The Operational Art of War (TOAW)[14], Decisive Battles of WWII[15], Panzer Campaigns series[16], V For Victory Series[17], World at War series[18], War in the Pacific[19], and Army Group North, Centre and South.[20]

Notably, of the aforementioned list only 'The Operational Art of War' and 'War in the Pacific' have a full equipment and resource database. Other important combat model parameters and operational activities are simulated by different games in a variety of ways. For example, the 'V For Victory Series' and 'World at War series' are excellent at simulating the periodic nature of supply, and command and control, at the operational level.[21]

Finally it has to be said that the large Army Group North, Centre and South series, is probably the most realistic manual (map based) simulation of operation Barbarossa available. By using a unique sequence of play, which is different for the German and Soviet player, the game system attempts to provide a proper simulation of the differences between the two sides at the operational level in 1941. This is something that many other operational level simulations struggle to do, and is quite an achievement in this age of computers. Apart from some excellent features in TOAW, most current operational level simulations do not separate tactical level and operational level combat proficiency, but group them together as 'overall combat proficiency'. The result is that 'operational level combat proficiency' is often poorly and inaccurately simulated (if at all).

Strategic Level Simulations

Strategic level simulations have space scales ranging from 31 to 100km per hex, and times per turn ranging from 1 week to 3 months. Strategic simulations rarely focus on one front or campaign, but usually the conduct of a war as a whole.

The combat aspect of strategic level simulations is concerned with the strategy related to moving and fighting very large units over a large timeframe in very large areas. Manoeuvre units are normally corps units with 3-6 divisions per corps. At this scale realism in the combat and operational model is not the predominant objective. Most of the operational decision making, painfully thought out at the operational level, has been done by the divisional, corps and army

[14] Matrix Games (Ex Talonsoft).
[15] Strategic Studies Group (SSG), (Matrix Games). A series of simulations for various WWII campaigns.
[16] HPS.
[17] Three-Sixty Pacific Inc, C Atomic Games.
[18] Avalon Hill, Atomic Games.
[19] 2 by 3 Games, (Matrix Games).
[20] GMT Games. Large, map based manual war games. They utilise a scale of 8km per map hex.
[21] Each side's commander has to plan ahead and think carefully about objectives and available supply. Supplies and HQ command and control functions are allocated to selected combat units, only once in every 24 hours.

commanders. Strategic simulations abstractly simulate most operational issues such as: command and control, unit cooperation, small area geographic objectives such as crossing rivers, tactical and operational combat proficiencies, the 'health' and readiness of individual units, and transport and supply logistics.

A good strategic simulation should still simulate the dominant factors at the operational level, namely: overall supply, replacements, overall combat proficiency, weather, terrain, and the integration of land, air and sea forces. The good design habits for operational level simulations still apply, particularly those related to: the balance between the space scale and time scale of the game, ZOC effects and force density or frontages, and developing realistic Combat Results Tables (CRTs) or realistic algorithms for combat resolution. At the same time the Strategic level simulation has to address strategic issues facing the country.

In well designed strategic level simulations, each turn includes time for movement, combat, supply etc, which are all operational activities, as well as more 'strategic activities'. Strategic activities should include all the following:

1. Decision making as regards to the political and geographic objectives of the war.
2. Formulating a strategic plan and ensuring suitable units are going to be available to achieve the strategic objectives using military action, i.e. we are not interested in diplomacy and trade agreements here!
3. Implementing all aspects of strategic warfare such as strategic bombing and submarine warfare.
4. Mobilisation of the country's war economy. This includes: recruitment and training of new military personnel, war production, and management of energy and raw material resources.
5. Research and development of new weapons, and selection of weapon production to support the strategic plan. For example, it is not a good idea to increase submarine production if you've just launched a land invasion of the Soviet Union (as someone did)!

Some good strategic level simulation systems, with reasonable combat models are: World in Flames[22], Advanced third Reich[23] and The Operational Art of War. The latter can go up to 50km per hex as a system and obviously enables all the operational level aspects to be simulated. However as the system is entirely operational in its focus, it struggles to address the strategic activities (above).

Probably the finest strategic manual (map based) simulation of WWII available is 'World in Flames' (WIF). The full simulation includes 7 maps, 4 400 counters and a 122 page rule book with additional designer and scenario notes! WIF manages to simulate most of the dominant operational issues facing land armies in WWII, and includes a fully integrated land, air and sea combat model. The naval and naval-air combat models (and hence the war in the Pacific), is particularly realistic for a strategy game. The main focus of the simulation is however strategic and full attention is paid to all the strategic activities detailed above.

[22] Australian Design Group, ADG. WIF 6th Edition is probably the most detailed manual (map based) simulation of WWII available.
[23] The Avalon Hill Game Company.