CE-30 Thesis

Fort Lakota

*

Building the Marine Fort under Combat Conditions

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* Combat Engineering Branch Logo rebuilt by
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The marines are about combat. Marines are about maneuver, firepower, tenacity, and combat. A marine unit is at all times, 24 hours day, 7 days a week, 52 weeks a year, about Combat. They live in the field, they die in the field, they are the field. A Marine never needs rest, relaxation, food and comfort, or any other luxury considered minimal by civilians, because they are … Marines. Right??!!?? In the words of an American General in the late 20th century, that is so much "Bovine Scatology". Starfleet Marines are the finest combat warriors in the galaxy. They have stood up to Romulan Centurions, Klingon Bezerkers, Jem'Hadar, and Borg. But they are humanoids, and like the machines and power armor suits they will wear out, break down, and fail, unless the Corps provides proper maintenance to its finest combat weapon and tool. The Marine.

During peacetime, the bulk of the Starfleet Marine Corps is in Garrison waiting its turn to cycle out into Fleet Marine Force units. But during combat those Garrisons must be pushed forward into the combat zones, onto the border reaches, on the other side of the disputed Border. These "Forts" are build by the SFMC Combat Engineers, often under fire, and provide much needed centers for Marines to rest, recuperate, recover, and reorganize. These Forts are the focal point for reinforcements and replacements to join up to line units, and new vehicles and supplies to be distributed to the troops.

This thesis will detail the construction of one such fort, Fort Lakota, from its design, construction under fire, and final tear down. The thesis will further detail how a modern SFMC Fort can be both garrison and a hinge point in the war of maneuver that is the trademark of the SFMC.

In my IN-30 thesis it was shown, that the Marine Infantry component of the Mobile Cavalry is a very heavy unit, from the squad to the division level, and requires more replenishment, more rearmament and for the troops more down time (rest and recuperation) than one would normally suspect. The veteran fire team leaders, squad leaders, Platoon leaders will wisely give their troops as much off time from the rigors of combat as possible. In addition to taking care of that most valuable asset, the marine himself, the weapons and equipment must also be given downtime, maintenance, and repair. A dirty weapon is a useless weapon, but it becomes geometrically more difficult to clean a weapon in the field as opposed to in the garrison.

The AR-30 thesis detailing the structure of the Marine Mobile Armored Cavalry units: Troops, Squadrons and Regiments, details the need for the triple R even more so then the Infantry. More troops, more weapons, more equipment, Ammunition, Batteries/Fuel cells, replacements, Medical Supplies? How do we house these Marines while they are in the field, how do we get the Marines from the battlefield to the MASH's, how much training does it take to provide this level of high energy combat operations. These questions were asked. AND … this paper will endeavor and succeed in answer them. From how each Marine gets a rack to sleep in, a HOT meal to eat while sitting on a bench or stool, to how each phaser rifle, IFV, and Tank can get washed down, maintained, and just not used for awhile. Down time is as important to the unit as it is to the individual. Time for the marines to play some cards, throw a ball around, or just talk about the sweetheart back home, is as important as digging a foxhole out on the line.

Next came the SU-30 paper on logistical support for the Mobile Armored Cavalry Unit. And yet another is asked, where do the drop ships and shuttles offload the marines and vehicles too? As the *Pumas, LeJeunes* and *Gallipolis* bring reinforcements and re-supply to the units on the ground, where do they go? Where is the equipment stored, where do the marines cycling out stay, while waiting to leave planet, where do the new marines meet up with the on planet units. Again, we are directed to the forward Marine Garrison.

All of these previous papers show a need for a forward Garrison, but obviously they do not appear out of nowhere, not can they be replicated at a drop of a hat, and the larger the Marine unit on the ground, by extension the larger the Garrison that is needed. So they have to be designed, transported and erected. Who will perform this monumental task? The answer is simple, and since the days of the Roman Empire on Earth it's the same hard-hatted, thick necked, stubborn type as it is today. The Combat Engineer!!!

This paper will thus show how a forward garrison is erected under fire. How is the garrison/fort designed? What are the logistical needs in its construction? What methods will be used in that construction? Finally how will the garrison/fort be used after construction is complete? From the initial command decision to place a fort in enemy territory, until the time the last plasti-steel component is put into place, the hard working design specialists of the Combat Engineers are hard at work, drawing and re-drawing the blue prints and schematics necessary for a building complex large enough to house more than 3000 marines and the support facilities they will need. In addition, the tugs

and transports as well as expeditionary landing ships, and their escorts necessary to carry the millions to trillions of tons construction materials from the “safe” areas behind the front lines, to the battle-zone itself must be arranged, loaded, transported, and unloaded, a task that requires the close cooperation of the Combat Engineers, Marine Support personnel, and Starfleet Logistic specialists. Construction while normally straight forward, (planets that are too difficult to erect a garrison, are normally passed over by strategic needs anyways), will require every engineer to keep one eye on the powered shovel, arc-welder, wiring diagram, and one eye on their rifle, ready to defend the construction site, from attacks from any direction or vector. Finally the Fort can be used for many purposes, deterrence, re-supply, defensive staging, offensive staging, training, or just simple showing the flag, and keeping the locals from getting too nervous. Each of these four stages of the life of the garrison/fort will be further analyzed in the next sections of this paper.

PART ONE: THE CONCEPTION OF FORT LAKOTA

THE DESIGN STAGE

Once the command decision is made to build a Marine forward garrison/fort, the first question the first question the architects and designers must ask the brass is “WHY?”

This is not a facetious question, but an honest and required step in the process. Once the designers know why the fort is being built, to what purpose it is to serve, how many troops will be garrisoned there, what kind of troops will needs to be housed, where it will be built, and when it needs to completed, then, and only then can the design work

begin. Then the Layout of the fort can be laid out, it's Defensive capabilities laid down, and it's Offensive capabilities planned for.

The layout out of the fort must take into account three main physical structures: the Outer wall, the Inner wall, and the Keep itself. The outer wall must be built with an eye to keeping out attacking forces, while maintaining overlapping fields of fire by the defenders upon any onrushing attackers. This must also consider the fact that attacks are three-dimensional. While sub-surface attacks are possible, these are best defeated by designing the facility with a firm plasti-steel foundation, with chobham style active defenses built into that foundation. Fields of fire overlapping both on ground and aerial attackers can be built by using multiple defense batteries with overlapping arcs of fire (see Figure One).

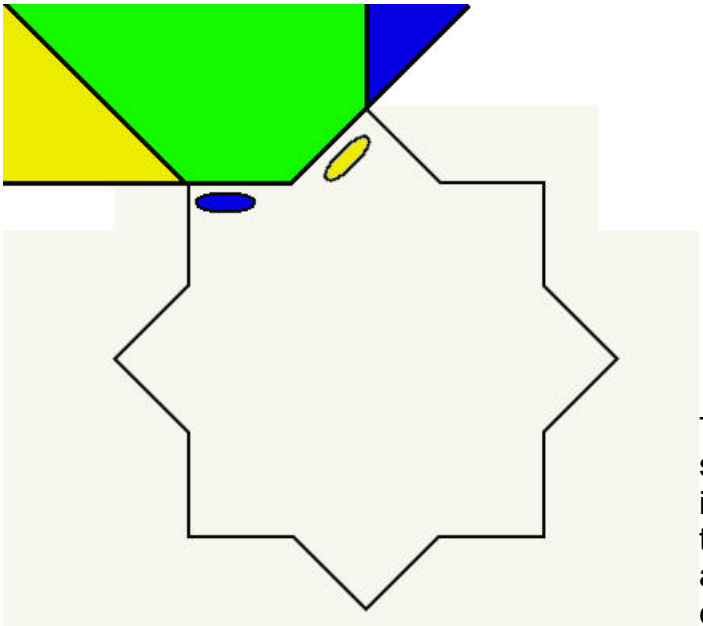


Figure One

The Blue emplacement in this simplified diagram has the fields of fire indicated by the blue and green areas, the Yellow emplacement by the yellow and green areas. Both emplacements cover the green area, thus providing overlapping fields of fire.

The inner wall, serves two vital purposes; first, to provide shelter to the keep and troops transitioning from the keep to the outer wall from direct external fire, and second, to provide a second line of defense in the unlikely scenario that the outer wall is breached. The inner wall's defensive batteries are situated and aligned to create very deadly fields of directed fire, down the avenues between the two walls. Once the enemy breaches the outer wall, they are effective channeled into these "killing zones", and a situation is created where the enemy actually defeats himself by breaching the outer wall. (See Figure Two.)

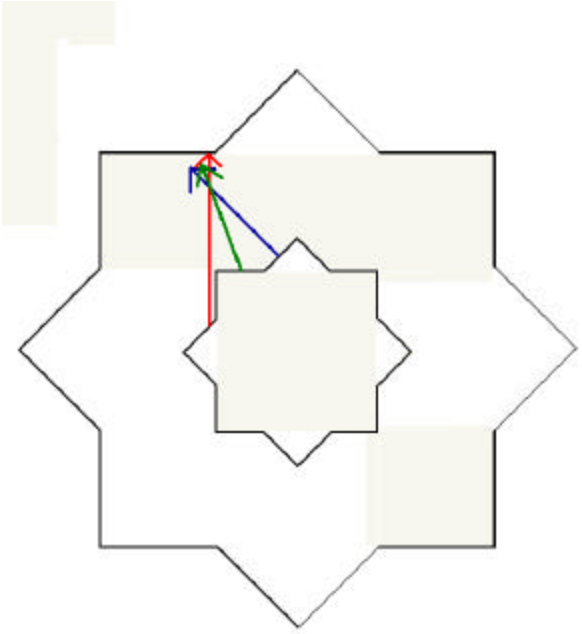
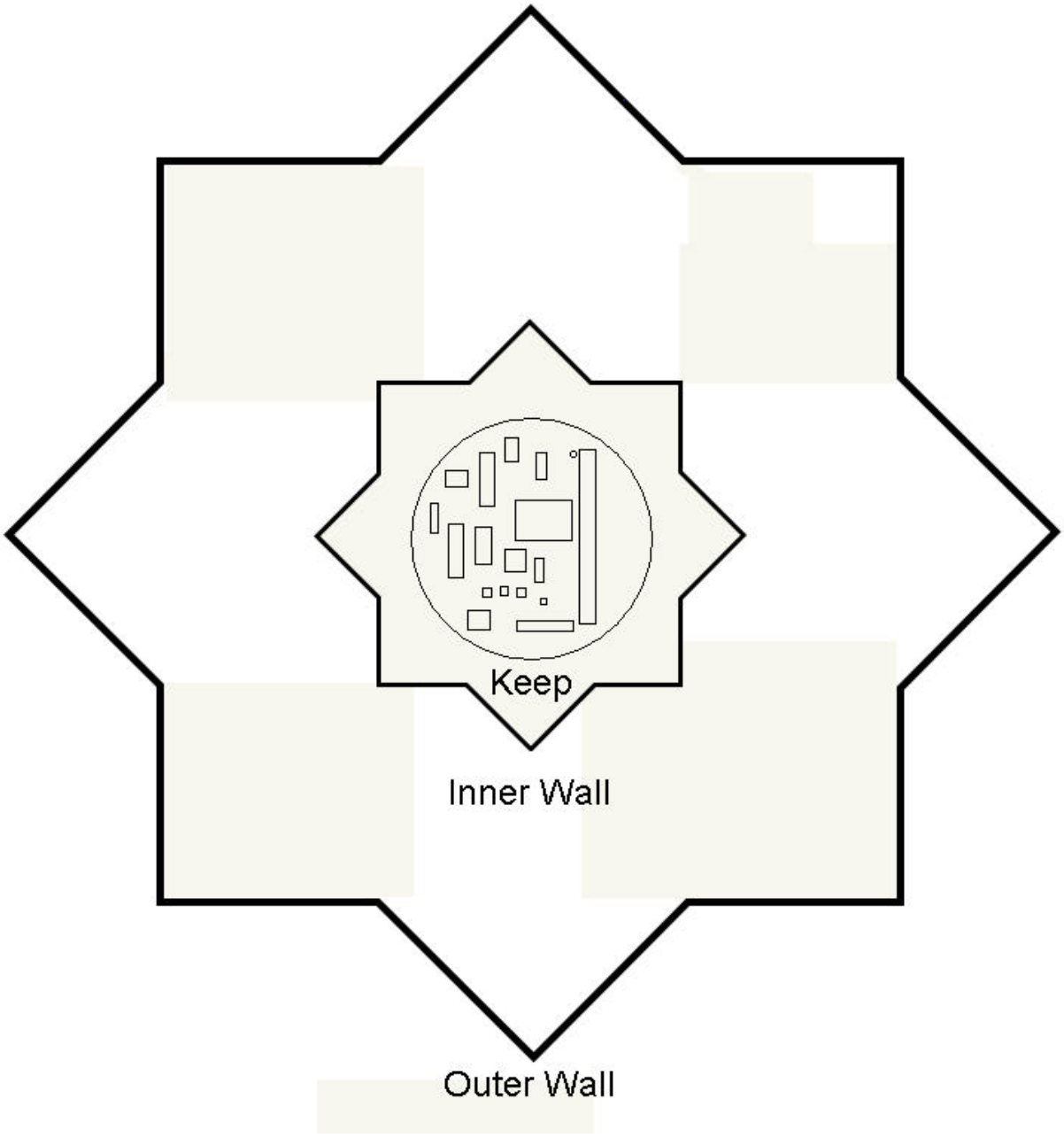


Figure Two

As can be seen from the crossed red, blue and green arrows, nearly every point of the channels between the inner wall and outer walls has a triple overlapping field of fire. Any attack that breaches a wall walks into a deadly cross fire from the inner wall, and any emplacements that can be spared to swing inward will add to the chaos the attackers must face.

Finally the inner keep, is where the command facilities, landing strips, hospitals, repair shops and barracks are situated. Inside these last walls, are the final defenses for the fort, as well as all of the living quarters for the entire unit being garrisoned. The design team thus needs to start with the size of the garrison force, and design their facility

layout, then the keep that will contain those facilities, then the inner wall that will contain that keep, and finally the outer wall that will contain the inner wall. And then, they must find the location on the target planet that will support such a large facility. This is much like peeling an onion in reverse, putting each layer on as appropriate and required. (See Figure Three)



The defense of Fort Lakota will be divided into three tiers, and thus the design team will need to take these into account, when designing the facility. These tiers are: Forward Defense, Defense in Depth and Anti-Air Defenses. The forward defenses combined the bastions and weapons mounts on the outer wall, along with the garrisons own organic aerospace and infantry/armored/cavalry units. While the aerospace units can deploy from the airfield inside the keep, and can also deploy smaller ground units from the same airfield, there will need to be openings for the larger ground units. These openings will weaken the whole structure, as well as provide the obvious breaching points for the enemy, thus they will require additional defenses, emplacements, and shielding. An external facing phaser mount may be mounted in either a parapet, a cavalier, or in the case of collimated strips – attached directly to the external wall itself. All of these types were part of a bastion, which was that part of the wall that stood out from the rest of the wall (the curtain). See Figure Four for examples.

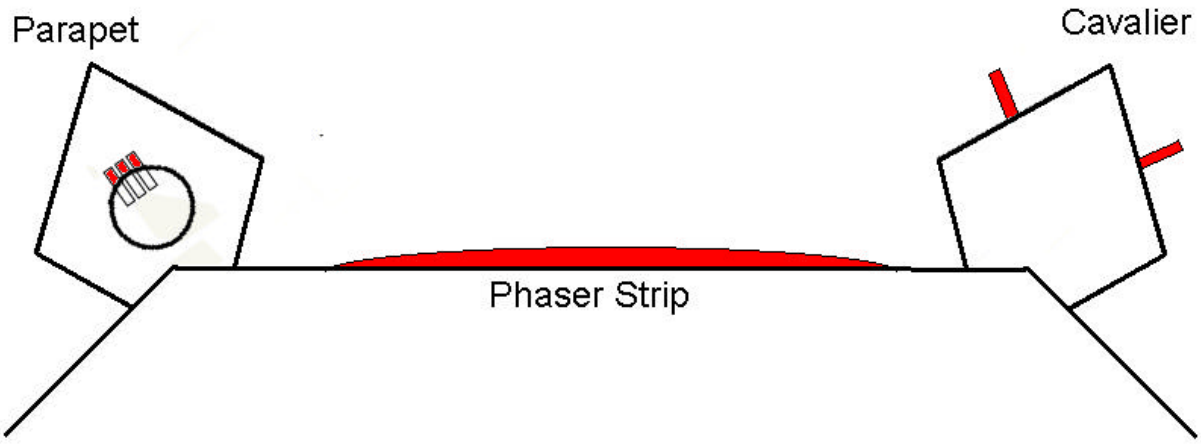


Figure Four.

The design of the defense must also take into account the defense in depth provided by the inner wall and its weapons mounts. The bastions of the inner wall along with the sub-surface access-ways to the outer wall, and the tenaille lines along the inner curtain, provided for the massive cross fire, elaborated above, here the phaser strips become hugely advantages, as their fields of fire reach nearly the full 180 degrees of the plane of the curtain wall itself.

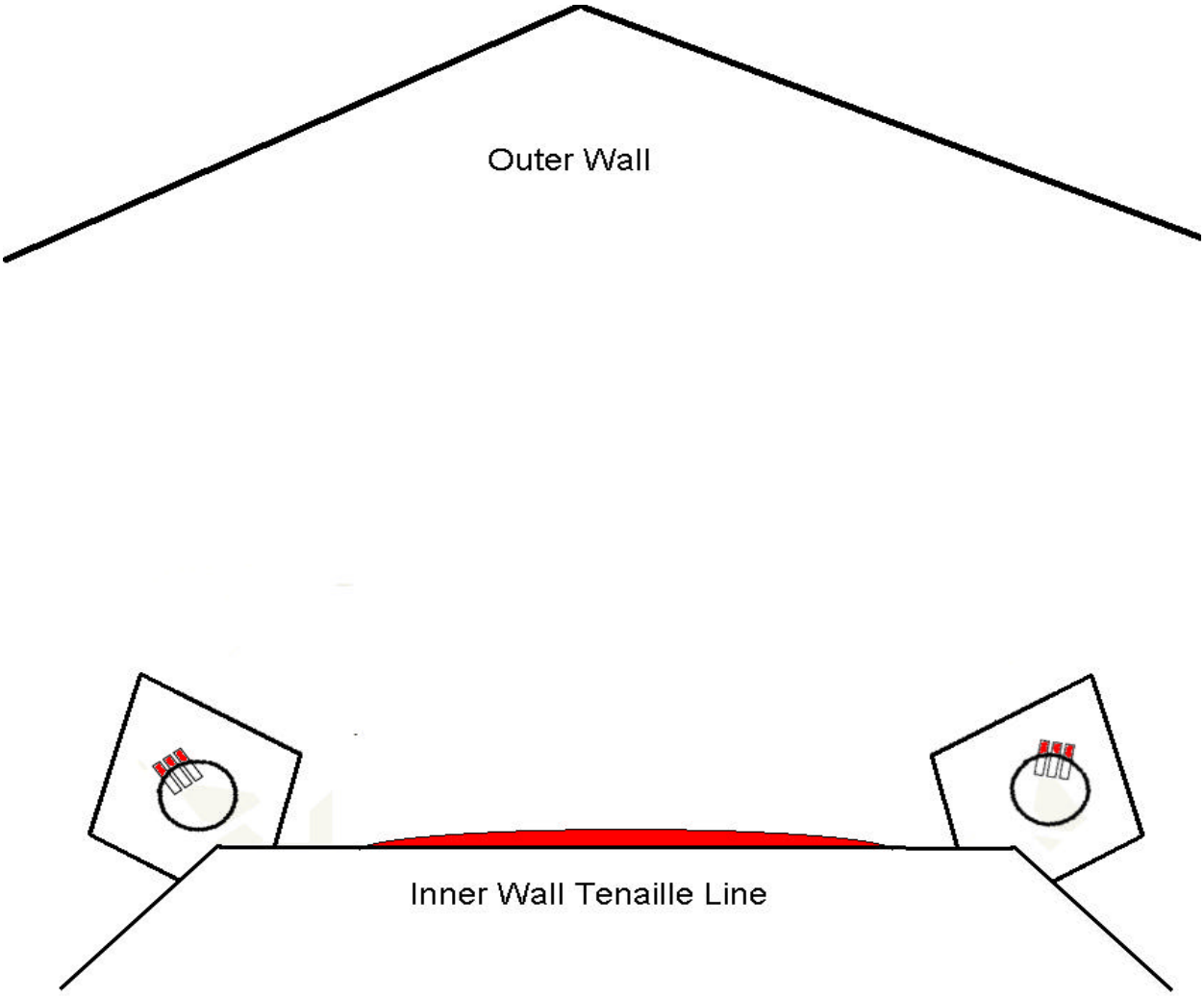


Figure Five

Finally in designing the fort for defense, anti-air/aerospace weaponry will be a must. And due to the high speed of air/aerospace attacks computer controlled phasers in blister mounts, slaved to the Fort's sensors are the ideal form of a defense in this situation, and benefits from being both all weather, and without need of ammunition re-supply. The blister mounted Type V Phaser emitters are less than a meter in diameter and extrude from the top or sides of the fort's exterior less than 10 centimeters and have an arc of fire nearly 85 degrees off the perpendicular.

Next, the fort is designed with offensive operations in mind. This should allow the forces within to be able to do two types of operations as well as allowing the fort to be used in larger operations for example: Patrols, both short and long range can be used both as a defensive tool, as well as an offensive one. Counter-offensives, can be used following the enemy's failed attack upon the fort, the forces within are relatively more well rested and their equipment ready, than those who have spent themselves upon the walls of the fort. Finally, the fort can be used as a hinge for attacks upon the enemy, which will be explained below.

Both the long-range and short-range patrols are an integral part of offensive operations from the fort. While used defensively to keep besieging forces off balance, offensives they are a hugely effective means of gathering intelligence, as well as behind the line special operations. The fort must have the ability for sallies to be conducted, as well as providing ready avenues of retreat for those patrols, if they are being chased back to the fort by superior forces. Offensively this can be an ideal tactic, as the patrol can lure

larger units (Company to Battalion in size) within range of the forts powerful emplaced weapons.

Counter-Offensives are one of the most important reasons for the existence of Marine garrisons/forts. As explained when the attacking force is beaten back by the fort's defenses, they have taken massive losses, and their weapons and equipment are low on fuel and ammunition. When the Cavalry Unit sallies forth, they are fully armed, fully fueled, and often much better informed on the lay of the land. The former attacking force now has very few options, retreat, or throw up field fortification, or try to fight a battle of maneuver with the above mention shortage of fuel and ammo. The fort's design then must be such that while a difficult onion to peal apart from the outside, it must also allow friendly forces the ability to egress rapidly to take full advantage of the opportunities provided by a fluid battlefield situation. And again, the same ability to retrieve these forces if they are being overwhelmed is important, there is no logic falling into the same logistical situation as the attacker, when friendly forces should be able to fall back into the safety of the fort's walls.

Hinging Operations highlight the strength of Marine and Marine Cavalry operations on the ground. When major offensive operations on the planetary surface are conducted, continually chasing the invaders around the planet only causes more needless destruction of non-combatant areas. The Fort as a hinge provides the field commander several tactical/operational options. The forces can swing on the point provided by the fort, knowing that the enemy cannot swing around that flank, and thus greatly reducing

his maneuvering options. Or, the field commander can use the fort as an anvil, and push the attacking forces back upon its large emplaced weapons with the 'hammer' of his mobile forces. (see figure six) Much of this is predicated upon the location of the fort with the available topography of the planet. Thus the design team when considering the offensive operations requirement of garrison/fort will need to carefully consider the location on the planet for placement, in light of possible mobile operations of friendly and enemy forces.

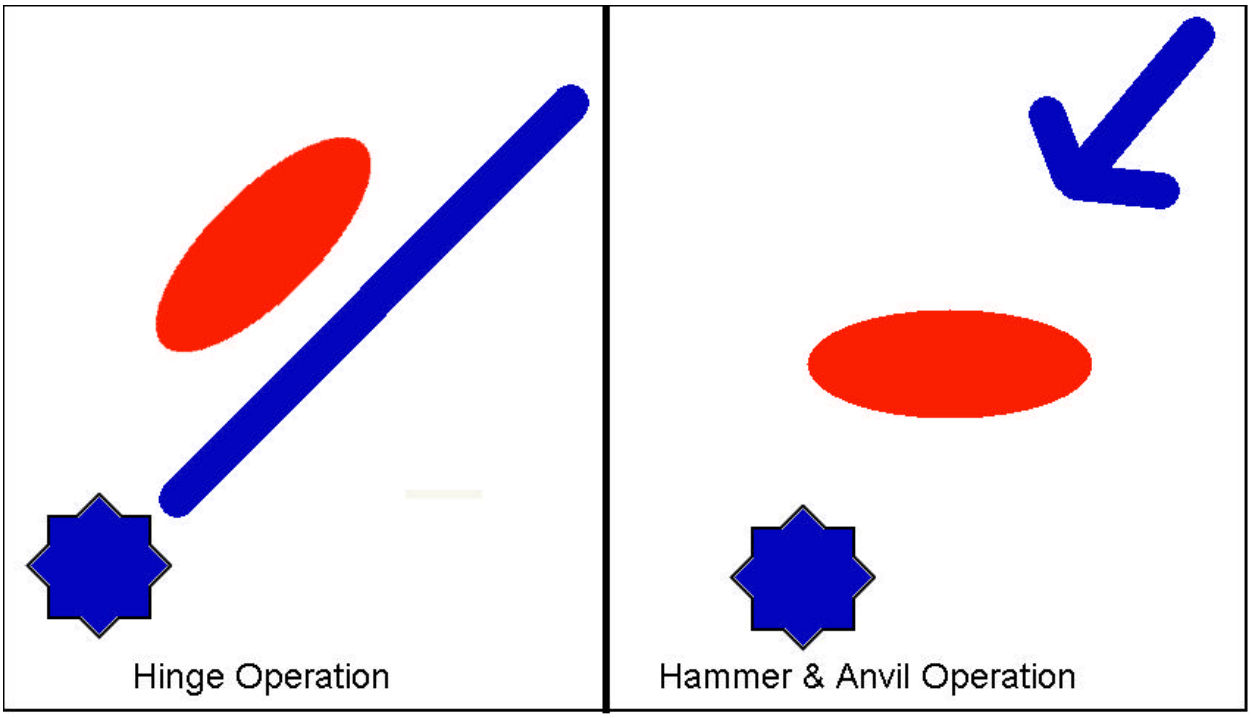


Figure Six

PART TWO: THE GROWTH OF FORT LAKOTA

THE LOGISTICS STAGE

Logistics: as quoted in the SU-30 paper *The Care, Feeding and Transport of the Armored Cavalry Regiment*, General e'Tsha Clthinia, of Andor, wrote in his memoirs *Andor Rising*: "Brave Soldiers win battles, Trained Soldiers win battles, New Weapons and Technologies win battles, Expert Tactics win battles. But… It is only Logistics that wins Wars." A Marine Garrison/Fort is not build of sand, or of good wishes, but of millions and billions of tons of reinforced plasti-steel, ferro-concrete, and electronics, hardware, and advanced weaponry. Before the Starfleet Supply Corps can arrange the delivery of the materials, and the vessels to carry them to the target planet, the design team will have to decide how much to order, and to do that they need to know how big the fort will be. Once it is determined how large the unit will be that is housed within the fort, then the fort's dimensions can be determined and from there, what quantity of resources needed.

For our Fort Lakota, we have decided that the unit housed will be a full Marine – Mobile Armored Cavalry Regiment. The Unit will have its full complement of Marines, Vehicles (AFVs, IFVs, Support, and Aerospace Assets), two weeks mobile supplies, and six weeks stored in garrison supplies, and the support assets necessary to provide for such a large unit: including Doctors, Counselors, Armorers, Mechanics, Instructors, Cooks, Launderers, and even Seamstresses.

The M-MAC Regiment is built around the Cavalry Squadron (see Appendix Four); joining the three Cavalry Squadrons is the Aerospace Cavalry Squadron (Air-Cav), the Fire and Support Squadron, and the Headquarters Squadron. Each Aerospace Squadron is equipped with an Aero-Scout Troop, three Aero-Attack Troops, an Aero-Transport Troop, and a Headquarters Troop. With 72 Aerospace craft of different configurations, the Air-Cav squadron is a welcome and powerful addition to the ACR.

In addition to the Air-Cav Squadron, the Fire & Support Squadron brings 36 Artillery Moduled Pattons, 12 Smith-Webbers, 6 Shandars, and 24 Puller variants carrying supplies and additional ammunition. The Headquarters Squadron has a security detail of 10 Guderians, 10 Smith Webbers, 5 Shandars, its own 7 Command Shandars, as well as 24 Smith-Webbers variants, including Ambulances, Military Police, Combat Engineers, and kitchen vehicles. In all the ACR have 452 vehicles, 72 Aerospace craft, and over 3600 Combat Marines.

Supplies for this unit for a two-week period of time equals 441 metric tons of food, 245 metric tons of Fuel Cells, and 703 metric tons of ammunition equaling over 110 thousand cubic meters of volume. Figuring in THREE times that amount for garrison stored supplies as well as 6000 metric tons of replacement vehicles and you come up with a regimental supply need of 350 thousand cubic meters of required storage area.

Finally, the support personal ration for standard Marine Units is one support marine for nine combat marines, the M-MAC units are even more self-reliant that a standard marine units and the ration rises to one in twelve, or 300 supports marines – from the Surgeons in the Hospital to the Dieticians in the Galley.

Next then, the volume needed to house these units can be calculated, and thus the total size of the keep, its walls, the Inner Wall and its fortifications, and finally the Outer Wall and its fortifications can be also so calculated. Again topographical features will need to be factored in, but in this instance we are assuming Fort Lakota sits on a flat plain.

The simple equation for volume per marine, is 5 cubic meters for sleeping/resting, 10 cubic meters for eating, cleaning, other daily living, 10-15 cubic meters for working, office space, repair facilities, and 25-30 cubic for training. Totaling 50 cubic meters per Marine, with 3600 Regimental marines and 300 Garrison marines: 3900 total, would equate to 195,000 cubic meters. The equation for vehicles totals the volume of the vehicle, a likewise volume for repair/storage of the vehicle, and thirteen times the volume of the vehicle for training. Totaling 13 times the volume of the vehicle with 452 vehicles and 72 aerospace craft in the regiment, and 48 vehicles and 6 aerospace craft with the garrison, with 1,040,000 cubic meters for the vehicles and 137,904 cubic meters for the aerospace craft, the total volume needed for the combination of all 578 vehicles/crafts is 1,177,904 cubic meters. A two week total of regimental supplies totals out at 158,277 Cubic Meters, factoring in another 8.33% for the Garrison, and then multiplying that by four, to get a total of 8 weeks of supplies, to meet the minimum

requirements for Fort Lakota gives a total of 1,371,734 cubic meters of supplies. Finally we need to take into account the support facilities extra to the Barracks, vehicle Bunkers/Repair facilities, Dining Halls, etc. Such as, Intelligence/Situation rooms, the Hospital, and other Regimental Command spaces, factor to 2 cubic meters per marine in the garrison or 7,800 cubic meters, plus a five hundred meter runway that is forty meters across, and takes up 4 meters of airspace for 80,000 cubic meters. Calculating all of the subtotals gives Fort Lakota, a total of 2,753,438 cubic meters of space needed for the keep. Figuring buildings of at most 6 meters in height, and another 3 meters underground, gives an area of square meters, and thus the keep will need to be 625 meters in diameter. Fort Lakota's Inner Wall complex than would be 1000 meters across on the inside of the inner wall, (allowing for more than a 25% free fire zone if the Inner Wall complex is breached) and the wall itself would be thirty meters thick, with enough room for two armored vehicles to pass each other inside of the five foot thick ferro-concrete and plasti-steel walls. This would make the entire Inner Wall complex 1060 meters from one point of the star to the opposite point. Fort Lakota's Outer Wall complex that would be 2120 meters across on the inside of the inner wall, (again allowing for more than a 25% free fire zone if the Outer Wall complex is breached) with the wall itself being 65 meters thick, with enough room for two double lanes of traffic, with a supporting reinforced wall between all of which is inside of the TEN foot thick ferro-concrete and plasti-steel walls. This would make the entire Fort Lakota complex 2250 meters from one point of the star to the opposite point. (see figure seven)

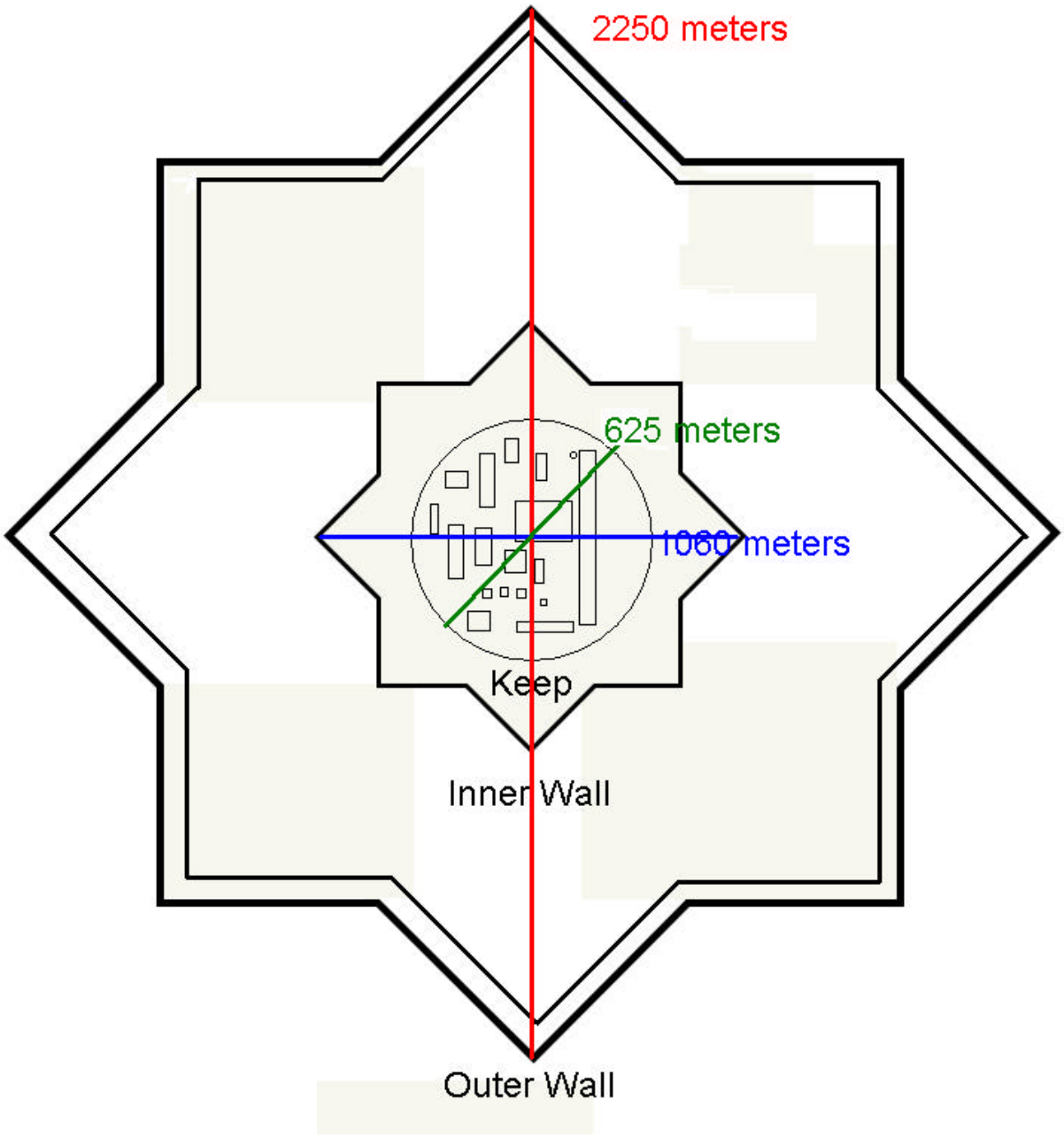


Figure Seven

Now Fort Lakota is designed, and laid out, now the process of calculating the total amount of raw materials, fabricated materials, finished equipment and weapons systems. First the Keep's needs can be calculated, then the Inner Wall, and then the

Outer Wall, and finally all three summed up to the total resource need for Fort Lakota. Of the 2,753,438 cubic meters needed to garrison the Regiment in the Keep, only 1,835,625 cubic meters is of structures. Of that, 917,625 cubic meters is of ferro-concrete materials, 612,000 cubic meters of plasti-steel sheets, 204,000 cubic meters is of pre-fabricated walls, doors, windows, counters, etc, and 102,000 cubic meters of manufactured equipment: appliances, computers, sensors, etc. In addition to the weapons of the regiment, and the garrison's own vehicles, there are also 30,000 cubic meters / 105,000 tons of weapons systems within the keep itself.

The Inner Wall complex has a perimeter of 3,771 meters, with a width of 30 meters, and a height of 24 meters, less an internal corridor space of 3,771 meters x 20 meters x 12 meters totaling 1,800,080 cubic meters of materials, 900,040 cubic meters of ferro-concrete, 600,020 of plasti-steel, 200,020 of pre-fabricated materials, and 100,000 cubic materials of manufactured equipment. The Inner Wall complex also contains 7,500 cubic meters / 26,250 tons of weapons systems.

The Outer Wall complex has a perimeter of 8000 meters, with a width of 65 meters, and a height of 24 meters, less an internal corridor space of 8000 meters x 40 meters x 12 meters totaling 8,640,000 cubic meters of materials, 4,320,000 cubic meters of ferro-concrete, 2,880,000 of plasti-steel, 960,000 of pre-fabricated materials, and 480,000 cubic materials of manufactured equipment. The Outer Wall complex also contains 16,000 cubic meters / 40,000 tons of weapons systems.

The combined total then of raw materials: 6,127,665 cubic meters of ferro-concrete and 4,092,020 cubic meters of plasti-steel. Total of pre-fabricated materials equals 1,364,020 cubic meters and manufactured equipment equals 682,000 cubic meters. In

regards weapons system there are a total of 53,500 cubic meters / 171,250 tons. Total materials that need to be shipped to the planet in addition to the Regiment and the Garrison force equals 12,319,205 cubic meters of materials. A massive amount of volume of materials and over sixty million metric tons of mass no matter how you measure it.

PART THREE: THE BIRTH OF FORT LAKOTA

THE CONSTUCTION STAGE

The actual construction of Fort Lakota can be divided into three stages: First, the landing and deployment of the Construction Team, next, the Defense of the construction team, provided by organic units of the Combat Engineers, and external units provided by both local and expeditionary troops, finally, the actual erection of the Fort and it's facilities.

Landing the construction team itself, also has three general stages: The Advance Team, Landing the Combat Engineers either under fire, or in the clear, and Establishing the Initial defensive Perimeter. The Advance Team will determine the best location for the Fort, taking into account topography, location of both friendly and enemy assets and dispositions, and the actual needs for the Fort's erection. This team will be comprised of Combat Engineers cross-trained as Special Operations specialists. Deployed often behind the lines, these engineers are taking risks most Marine much less Fleet engineers would never dream of. However, they are not called Combat Engineers for

traditions sake, but for the fact that they like every other marine is first and foremost a rifleman.

Once the construction site is chosen the landing zone for the initial construction team is established. A flat area able to contain four to six runabouts at best, or three to five combat transport shuttles at worst, is laid out. Beacons are placed at the corners of the landing zone off center to the desired landing points of each vessel. Then transporter scramblers are set up to prevent the enemy being able to simple transport a nuclear (or more powerful) warhead into the landing zone. This of course will prevent friendly use of transporters until a secure beam corridor can be established (see figure eight).

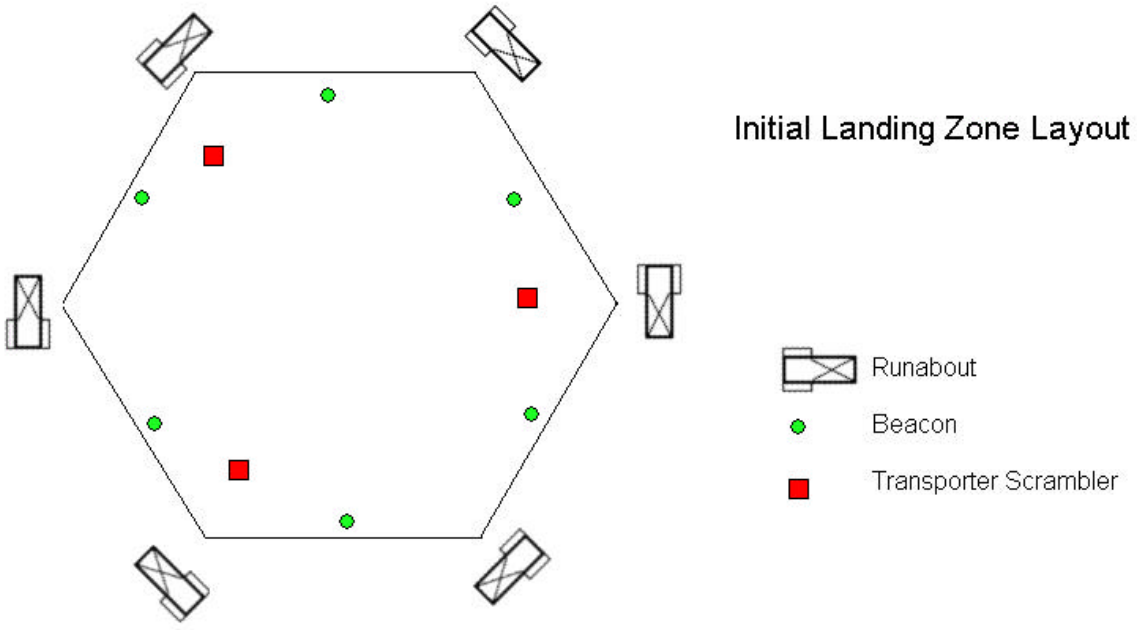


Figure Eight

Assuming the landing zone is hot, and the runabouts are under fire, the space support vessels will need to lay suppression fire onto the enemy forces engaging the runabouts. Depending on the location of non-combatants the overhead platform (starship) can choose between Torpedoes, Phasers on destructive settings, or Phasers on stun. This suppression fire, vital to a successful landing, will allow the runabouts to land, and disembark first combat vehicles, and then troops, and then supplies and construction equipment. The combat engineers will immediately board their construction equipment vehicles and begin working on the initial perimeter.

As the tractors and bulldozers of the engineers move into position to begin digging fighting trenches for the dismounted Marines, the Armored Fighting Vehicles and Infantry Fighting Vehicles move into position between the Runabouts to form a virtual wall of armor and weapons mounts facing outward to any potential enemy. This line is actually external to the initial desired perimeter by about fifteen meters, this allows the tractors to dig a trench completely around the landing zone, egress ramps are then set up so that the vehicles can come and go, as well as dismounted troops, but which can be collapsed in dire situations. As this is going on other engineers begin laying foundations for a headquarters, sanitary facilities, aid station, and a mess hall. Behind each of the Runabouts at the corners of the trench, foundations are quickly laid to set up observation posts and both anti-ground and anti-air Phaser turrets. Once the OPs and the trench is established, the initial perimeter is established, the armored vehicles can be brought back into the perimeter and the runabouts can launch, returning to the overhead platform for more supplies and marines.

Once the construction team has landed, and the Landing Zone (LZ) is secured, then the extended Defensive Perimeter can be established. The border of the eventual keep will be laid out and then the defensive forces can expand out to that line. Then temporary firebases will be set up outside of this line. Once this is line secure the line of defense where the eventual inner wall will be, can be set up with temporary firebases established at each of the corners of that wall. Then this step will be repeated with a line of defense where the eventual outer wall will be.

With the LZ in tact and temporary Command and Control facilities established, half of the defensive vehicles will move out to the line of the wall of the eventual keep. After they are in place, the construction vehicles will move into place, establishing a defensive trench and hard points throughout the perimeter. Meanwhile other vehicles will establish the first temporary landing strip within the LZ, while shuttles and runabouts bring down more engineers, line troops and supplies. As the keep's border is established more and more of the defensive forces will move out from the LZ lines to the new line. Because of the physical and mental stress of combat in these situations, the goal is to cycle all of the initial LZ troops (engineer and otherwise) off planet within 24 hours.

As mentioned above, the next step is to establish forward firebases outside of the keep's perimeter. These are simple plasti-steel and ferro-concrete facilities that allow a measure of protection for the troops within, and an over watch capability of the terrain outside of the keep. Each Firebase has three to six towers with phaser cannons and

anti-air weaponry, to keep at bay attacking forces threatening the construction of the keep's walls, as well as the walls of the Inner Wall and Outer Wall each in their turn. The firebase also as an immediate station, sleeping facilities for the off-watch marines, and the ability eat, clean up, and maintain weapons. In addition a properly sited firebase will have a dedicated transport corridor, to allow emergency evacuation of casualties to better medical facilities within the fort proper. In extreme situations this corridor can also be used to abandon the firebase, but in such situations, hostile transporter scrambles may remove this option. Each firebase has from a platoon to a company of troops assigned to its defense, and fields of fire overlap with the neighboring firebases to the left and right flanks.

As the keeps walls are finished, new firebases are constructed at what will become the corners of Inner Wall. Slightly outside of that new perimeter, these firebases duplicate those built earlier and once completed form a two-tier extended defense providing the keep with external protection from attack from the ground or air. The lines of fire between the inner firebases and outer ones, is as meticulously laid out, as those lanes of fire will be erected between the Inner and Outer Walls. As the Inner Wall begins to be completed the block houses on the corners will be complete first, allows the firebases within to be broken down and moved outward.

These then will be the basis of the Outer Wall's frebase line, again erected at the corners of the eventual Outer Wall, and external to it so as to protect the engineers working on it. In effect the entire usage of the fire bases during the construction of the

fort is a series of leapfrog actions: establish perimeter, set up defense, build extended firebases, replace perimeter with a wall and blockhouses, establish new perimeter, repeat.

During the entire process of building defensive positions, firebases, walls and blockhouses, other Combat Engineers are building the Fort itself. As the walls of the Keep are completed, some of the engineers are assigned to make the Fort operational as soon as possible.

First the Barracks and Offices of the Marine Garrison, and the assigned Marine Cavalry Regiment are built. A tired marine is a marine that makes mistakes. Getting the roof over their head, and the rack under their back, will go a long way in maintaining the effectiveness of the individual marine and his/her unit. The offices provided for the Unit OICs from Platoon to Regiment, also increase the effectiveness of the line commanders, while also providing them a place to get away and close their eyes for a moment or two.

Next support facilities will be erected. The initial Medical Aid Station will be upgraded to a MASH, and then to a full Base Hospital. The reasons for this are obvious, the Triage and Treatment of patients in the field, at Aid Stations, at MASHs and at Hospitals are all handled differently, and with the upgrade of facilities the likelihood of full recovery and even survival of the patients increased by factors of magnitude. Also mess halls, laundry rooms, and even gyms are built. Again the well-fed and clean marine is a

happy marine. Also maintenance facilities for the weapons, power armor suits, vehicles and other equipment used by the Cavalry Regiment will need to be built.

As the wall goes up for the Keep, the weapons and defensive emplacements need to be installed. With the firebases external to the Keep set up, the most important of these would then be the anti-air weaponry and shield generators. Once these are in place, then the Keep's anti-ground weaponry can be put into place, to act as the back up for the firebases and later for the Inner Wall, if that should fail to withstand an enemy attack.

Next then would be the need to expand the airfield (previously enlarged from a mere landing zone) to a full-fledged albeit small spaceport. The runway needs to be reinforced, hangars erected, and bunkers erected around the hangars. In addition maintenance facilities for the Aerospace craft, refueling facilities, and Selenium, Deuterium and munitions storage tanks and magazines will be needed. In addition where applicable sea docks can be erected to provide support for marine operations on and below the surface of the water. Fort Lakota is not projected to have docks as it is constructed in a field. However maritime operations must be considered as well as aerospace operations in constructing the Fort.

From landing the initial heavily armed and armored engineers, to the initial perimeters being built and defended, to the actual construction of the Keep, Inner Wall, and Outer

Wall, the combat engineers will be there to fight and build. - Can do, Will do, Done - The engineer in action.

PART FOUR: THE LIFE OF FORT LAKOTA

THE USAGE STAGE

The life of the Fort after its construction and the departure of the Combat Engineers is divided into three phases: combat, peacetime, and the decommissioning of the fort. The Combat Phase is variable and depends on the situation and needs of the moment; including but not limited to taking or retaking the planet from hostile forces, maintaining a planetary defense, and as a staging point for offensive operations on or off the planet. Peacetime usage consists mostly as a garrisoning point to deploy forces into combat zones away from the planet, or as a recruiting depot and training facility. Finally decommissioning the fort can come in one of three manners: simply turning over the physical structures to the local civilian authorities with or sometime without removal of weapons systems, dismantling and moving the materials to another more forward location, or simply dismantling and reducing the materials to base components, as if the for never existed at all.

The Combat Usage of the fort is the primary reason a facility like Fort Lakota exists. Its' crenellated wall design with multiple lines of defense are meant to withstand attacks of marauding attackers. As it was built under fire, it is designed to be able to deploy the Armored Cavalry Regiment into combat, to take or retake the planet in question with a

minimal amount of damage to the planet and non-combatant populations. It also provides a well-defended landing zone / spaceport, for continued introduction of friendly forces and equipment into the combat zone. Much like Normandy Beach became for the Allied forces during Operation Overlord, so can Fort Lakota be for any expeditionary needs of the SFMC.

As a bastion for planetary defense, Fort Lakota is ideal. As a star port and base for an entire squadron or Aerospace Fighters, any would be attackers would take devastating losses approaching the planet. Lakota's anti-aerospace emplacements can not only keep hostile fighters out of the sky, but also keep all but the most heavily armored and shielded starships out of line of sight of the fort, restricting landing options for any invaders. This then allows the Cavalry Regiment the option of choosing the ground to fight the enemy, taking the battle to the invaders, or allowing them to come under the guns of the fort. Finally the fort also acts as a safe focal point for the Federation to rush in replacements and re-supply.

Finally, Fort Lakota is and can be a staging point for operations throughout the sector, as the Marine Cavalry Regiment deploys, more troops can be brought forward, as replacements for forward units, or as an assembling point to form new units, or combine existing units (strike groups, platoons, companies) into their parent battalions or regiments. As troops are cycled through the fort, their equipment can be ready checked, repaired or simply just oiled up. The marines themselves can get a moment

or two of shut-eye before moving out again, and a hot meal planet-side with some fresh air can never be beat.

This staging point usage actually leads into the two primary usages of the fort during peacetime: Garrison Duty, and as a Recruit Depot and Training Facility. As the fort can serve as a staging depot during war time, it can also serve as a Garrison during peacetime, placing a full regiment of Marine Armored Cavalry as close to the border as possible in as cost effective manner as possible without tying up supercargo space on patrolling and exploratory cruisers until necessary. With the fort's defensive capabilities, the Garrison can constantly train against itself, keeping the marines as fully prepared as possible. In addition smaller Cavalry Units can be deployed from the fort, without decreasing its long-range deterrence factor, as its own organic defense garrison will not be deployed. The training capability in addition allows the fort to be the ideal location to use as a recruiting depot for the corps (and for the fleet), and also allows it to be used as an alternative Basic Training facility, increasing the training capability of the Corps several fold.

The battle is over, the planet is secure, and the combat zone has moved hundreds of light years away. It is no longer strategically necessary or economically logical to keep Fort Lakota open on the planet, so what is next? Will the fort be abandoned and left to raise weeds like so many fortresses of Earth's history? Most likely that is not the case. There are three general options for the fort's last stage. First, turning over the entire facility to the local civilian authorities. This is actually the most preferred by Starfleet, as

the planetary population has in an indirect but accurate measure been those who have paid the price for the construction of the fort. The spaceport inside the Keep can be expanded and become a major inter-stellar facility that will benefit the entire population. The Inner Wall and Outer Wall facilities can be partially dismantled, with the blockhouses remaining as planetary defenses, in the extreme case the planet is attacked despite it being located far behind the front line (witness attacks on Earth during the recent Dominion War). This enables the planet's own militia to provide for its own defense while strengthening the planetary economy. In addition, these militias using modern Starfleet and Starfleet Marine equipment and facilities provide a firm prior training resource and recruiting tool for the Fleet and Corps, thus diversifying the ranks and rosters of the Federation forces.

The next option is to dismantle the entire facility and move it forward into the combat zone. It goes without saying that this is a HUGELY expensive use of Fleet resources. However, if time is the critical factor, then moving the fort is the best option. The keep, walls, and weapons emplacements, are designed to be modular, and as modules they can be disconnected from each other, beamed to waiting freighters, and rushed to the front lines. This option is also only possible if the planet is not yet contested and is expecting an invasion, or the planet has been taken and is expecting a counter-offensive. Normal dismantle time for a three-tiered defensive position like Fort Lakota, is nine standard days, with another twelve days to set it up again. The garrison and assigned Armored Cavalry Regiment can then beam into place, or land at the spaceport/airfield as appropriate.

Finally, the last option is to dismantle and destroy the components. This is the least desirable option, and usually exists when the local population wants nothing to do with the facility, or by treaty it must be destroyed. The components once dismantled will then essentially be reverse replicated back into the base ferro-concrete, plasti-steel, and electronic components, these then will be beamed to waiting freighters and transported to wherever these materials will best serve the Federation.

CLOSING

THE LIFE AND TIMES OF FORT LAKOTA

As the paper comes to a close, three last tasks are required of the research and the writer. First, a review of the paper and what has been discovered during the research and analysis. Second, a summary of the new questions have been raised during the research and the paper, which were not covered in the paper itself. Finally, a conclusion needs to be reached and our thesis answered and/or substantiated.

In reviewing Fort Lakota, it is apparent that each stage of the fort's life is as important as the others, and that the actual usage of the fort is only ¼ of the total picture. The design phase, the logistics phase and the construction phase are EACH equally important as the actual use of the fort once completed. For without a proper design stage, where the planet, the mission, and the technology available are all taken into account, the SFMC could be fighting the wrong war, with the wrong equipment, maybe even on the wrong planet. There is an old expression: "Never bring a knife to a gun fight", the modern

corollary is even truer for the Corps. Bring the right marines, with the right equipment and put them in the right facility on the planet, and no force in the galaxy will resist them.

The second stage was the logistical stage, how much, of what, needs to go where, by when, and who needs to do what. The design stage depended on the why. But the; who, what, where, when and how, are the logistical stage. The paper showed the immenseness of the undertaking and million and billions of tons and credits needed to erect Fort Lakota. Was it worth it? Was all the work, and materials, and manpower worth the effort. President John Adams of the United States back in the early 1800s of Earth once said “Millions for defense, but not one red cent for tribute”. The Federation and its military arm Starfleet exist to protect the citizens from the forces of oppression and evil. Fort Lakota can, has and will act as one more bastion for freedom and barrier those who will steal that freedom. Yes the logistical effort was worth it.

The third stage was the construction stage, and this is where the Combat Engineers prove that both part of their name is applicable. The Engineers are trained and prepared to land under fire, build under fire, and complete the fortifications under fire. It is this ability that gives the **ENTIRE** SFMC such an edge. The marines are not just restricted to fighting from foxholes desperately dug to give some small protection while fighting the enemy, but can within hours, have a firebase build around them, and as shown in the paper, within days be fighting from the protection and comfort of Fort Lakota.

And finally, the fourth stage – Actually Using the fort. While its usage is not much concern for the Combat Engineers, the fact that someday, the fort will end its usefulness and unless it is transferred to local authorities the engineers will be called back in. To either tear down the fort and move it to a new location, or completely dismantle its part to the base resources and materials. Combat Engineers can build, can dismantle and can build again.

What questions then has this paper produced? The first that came to this author's mind, was about the Fort/Base hospital's relationship with the Aid Stations, and further its relationship with the Medic's on the line. As every fort, and firebase has some medical facilities, the question arose, on who uses what facility and why. The following is an excerpt of what some of these questions could be:

> The silence of the patrol is suddenly pierced by incoming mortar rounds… "WHEEEEEEEEEEEEE, KATHUMP KATHUMP KATHUMP." Dirt flies into the air, and other 'things', a phaser rifle, shreds of power armor, … blood. Red, Green, Ocher, all shades of that vital fluid necessary for humanoid life. And then one more sound, a call that has echoed on the battlefields for millennium…. "MEDIC!!!, Marine Down!!!"
>
> The combat medic rushes forward, his medical bag on his hip, he reaches the crater, and their lies the four marines of the lead patrolling fire team, all are down, all are injured, all are like the medic, under fire. The medic has to decide who is treated first, who gets those first few precious seconds of treatment, he can't be everywhere at once, and only he can decide.
>
> * * * * *
>
> The aid station has been treating patients on a steady but manageable level for hours, then the call comes in, casualties in bound from the front line, you clear the four aid tables, and prepare the medicines and the staff. Then Sgt Jones pokes his head, a normally calm and collected marine with 15 years of combat experience, you notice his face his very pale,

even for a human. “Sir, we have forty-two casualties coming in, RIGHT NOW”

You grab your tricorder, you know the medics on the front line, you gave refresher training to many of them onboard the USS LeJeune as it was enroute to the planet, you know they know their job, and the first two litters you face, you see two of those medics, with bloody mangled chest wounds, and you have to choose, who goes first.

* * * * *

The MASH has been quiet for a week, but you’ve been alerted that patients are inbound from the Aid Station, Captain C’Salek, an outstanding Vulcan Physician, is sending some critically wounded but stabilized marines. Seven are in need of thoracic surgery for critical and traumatic injuries to their cardiac system. Evac to an orbital star ship would be nice, if one was still around. Because of the nature of their injuries stasis is the least desirable option. You are the only thoracic surgeon available, the chief surgeon defers to your judgment, who goes first, who waits, who may not make it long enough to hit the operating table?

* * * * *

It’s called ‘Triage’, the process for sorting injured people into groups based on their need for or likely benefit from immediate medical treatment. Triage is used in hospital emergency rooms, on battlefields, and at disaster sites when limited medical resources must be allocated. What is needed is an analysis in a more detailed manner, of the process of Triage on the Battlefield, at the Aid Station, the MASH, and finally the Hospital (Ground or Ship Based). Each of these have a different set of Triage rules, and each needs to be more fully examined for the sake of those Marines who face the enemy on our behalf.

The second question that comes to mind is one that has been one building as each of these –30 level theses papers have been completed. And that is an analysis of what role continuing education and cross training for the line marine is needed. The ACR

and its sub-units being so far from the center of the Federation, is like a starship in its needs to be able to be all things and all times. The simplest way for the Cavalry Commander to ensure this is to have his or her troops highly trained not only in their specialty, but also in the specialties of those units across the ridge, on the next continent, or the planet three stellar systems away. Thus an analysis of how the Officers in Charge at the various command levels can inspire their troops to further educates themselves will need to be done.

Finally, the matter of Maritime Operation was brought up. Maritime Operations in the SFMC?, that's the job for the Navy. What Navy? In the modern Starfleet, Fleet is tasked with space operation, and the Corps with planetary/ground operations. Maritime operations are then part of ground operations and come under the SFMC's purview. An advanced analysis of the need, requirements, tactics, and equipment for SFMC Maritime Operations is needed and will be proposed in the near future.

Fort Lakota. A simple name, but as we have seen it is a very complex undertaking. Is it necessary to have the capability for Fort Lakota? The Earth-Romulan War, the Four Year War with the Klingon Empire, the Cardassian Conflict, the Dominion War, the Voth Incursion, are just a few of the many wars the Federation has had to fight in its short history. Protecting the marine who fights on the ground. Allowing the marines to protect the civilians that live on the planets that ground is on. Providing support and recovery for the marines, and even the Fleet personnel who fight in the skies above that planet. All of these actions are capable because Fort Lakota can exist. We have

shown how a fort can be designed, how a fort's logistical needs are met, how it is built, how it is used and how it is dismantled. The final question is thus answered, should the Combat Engineers plan for a Fort Lakota, and the answer is yes. It is necessary and it is possible. Those two requirements make it mandatory, that the Corps be ready to build it any day, of any week, of any year on any planet in the Federation.

A final suggestion comes from the research and the analysis, and that is pre-positioning. A general idea on how much material is needed for a fort of generic size. Place that material onboard dedicated transport container ships. Fort Lakota in all of its immenseness only require three such containers. Strategically pre-positions sets of these supply-trios around the borders of the Federation, will save one to four weeks in collection and transport of the materials to the front line. Such time will mean not only that the battle may be won not only easier but also quicker, but also mean that more marine's lives and civilians lives will be saved.

We end with the words of Weyoun 5 the Vorta who was the primary representative of the Founders during the Dominion War:

> The Marines of the Federation Starfleet were maddeningly persistent in their combating the Jem'Hadar and disrupting the wishes and goals of the blessed Founders. But even more annoying was their habit of building forts on every border planet possible. We would deploy ground forces on this planet, only to find the marines building their forts close enough to the populations centers to frustrate our plans, and far enough away, that the

combat would not endanger their civilians. The worst was their so-called combat engineers, more like Capellan fire cats with shovels. I saw the reports where one of these 'engineers' killed four Jem'Hadar with a shovel, before taking the fourth's rifle away and killing both the First and Second in that unit, and holding off the rest until more of those marines showed up. Madness I tell you, if they had build more of these forts on their populated planets, we would never had taken Bajor, attacked Earth, or been able to threaten Vulcan. And don't get me started on the fortification on Andor, it makes me wish that glass of kanar laced with voraxna poison had actually killed me."

Can Do, Will Do, DONE!

Forging the Future

Combat Engineers

Appendix One
Vauban, Sébastien Le Prestre de

(b. May 15, 1633, Saint-Léger-de-Foucherest [now Saint-Léger-**Vauban**], Fr.--d. March 30, 1707, Paris), French military engineer who revolutionized the art of siege craft and defensive fortifications. He fought in all of France's wars of Louix XIV's reign (1643-1715).

Early career

Vauban was from a family of very modest means that belonged to the petty nobility. In 1651 he became a cadet in the regiment of Louis II de Bourbon, prince de Condé, who was about to rebel against the young Louis XIV. **Vauban**'s talents were soon revealed. He distinguished himself by defending towns in the Argonne region and in the siege and capture of Sainte-Menehould for Condé. In 1653 he was taken prisoner by the government's forces. Honourably treated, he was soon induced to change sides and to help the royalists to recapture Sainte-Menehould. During a siege in 1654 he was twice wounded. In 1655 he was admitted, as a "king's ordinary engineer," into the corps of officers that was gradually being built up, outside the regular military hierarchy, for specialized work on fortification and siege craft. After taking part in operations against various fortresses and cities between 1655 and 1657, he was engineer in chief at the siege of Gravelines in 1658.

During the interval of peace, from 1659 to 1667, **Vauban** was employed in demolishing the fortifications of Nancy, in Ducal Lorraine, from 1661 to 1662 and in fortifying Alt-Breisach, a French outpost on the right bank of the Rhine, from 1664 to 1666. In 1663 he was given a company in the King's Picardy regiment. His services in the capture of Tournai, Douai, and Lille in the French invasion of the Spanish Netherlands in 1667 were rewarded with a pension, a lieutenancy in the Royal Guards, and the governorship of the Lille citadel.

Vauban's growing responsibilities included those as "commissary general of fortifications"--though that title remained with the nominal holder of the office until 1677; he travelled constantly and conducted an immense correspondence with the King and with the war minister, the marquis de Louvois. **Vauban**'s technical memoranda made his systems of fortifications the focus of military studies in Europe for more

than a century. In the period of peace from 1668 to 1672 he not only inspected the defenses of Roussillon, the French Low Countries, Picardy, and Lorraine but also was sent to Piedmont (1671) to advise the Duke of Savoy on the defenses of Verrue, Vercelli, and Turin--advice that France later had cause to regret.

Innovations in siege craft.

Louis's Dutch war of 1672-79 brought conspicuous glory to **Vauban** because of the King's presence, in supreme command, at sieges that he was directing. At the siege of Maastricht (1673) he used a complete system of "parallels"--*i.e.,* trenches dug parallel or concentric to the perimeter of the defenses and connected by radical zig-zag trenches that made the approach comparatively safe from the defenders' artillery fire. For his success at Maastricht he was promoted and given a grant of money that enabled him to buy the château of Bazoches (near his family's seat of **Vauban**), and further successes won him the rank of *maréchal de camp* (equivalent to brigadier general) in 1676. At the siege of Valenciennes, in 1677, he persuaded the King, against the advice of Louvois and five marshals, to authorize a daylight assault, partly because the conventional assault in darkness often resulted in the attackers' shooting at one another by mistake. For the capture of Valenciennes he received another grant of money.

In 1680-81 **Vauban** undertook another great tour of the French frontiers, inspecting or improving fortifications. For Strasbourg (1681) he designed a splendid fortress of the most advanced kind. Having directed the siege of Luxembourg in 1684, he subsequently also redesigned the defenses of that city. His design for the fortification of Landau in Bavaria is sometimes reckoned as his greatest work (1687).

In September 1688, early in the War of the Grand Alliance, in which Louis was opposed by the combined forces of the Netherlands, England, the Holy Roman Empire, and their lesser allies, **Vauban** was promoted to lieutenant general; and in October, under the command of the dauphin Louis, he took Philippsburg, on the right bank of the Rhine south of Speyer. At this siege he introduced ricochet gunfire, whereby a cannonball was made to bounce forward over parapets and to hit several objectives before its force was spent. At the same time he was advocating use of the socket bayonet, another invention of his. This bayonet was slipped over the muzzle into a socket and did not have to be removed before firing of the musket. He took Mons in 1691 and Namur, rapidly and with few casualties, in 1692. At the siege of Charleroi, in 1693, he was for the first time in command of an infantry division. Diverted to Brest in 1694

to guard against an English threat to Brittany, he returned to the Low Countries for the defense of Namur in 1695 but could not save the city. In 1697 he participated in the siege and capture of Ath and was wounded again. During the peace of 1698-1701 **Vauban** reconstructed the defenses of Neuf-Brisach in Alsace, the last of the 160 fortresses on which he worked. By this time his health was failing him, but he still wanted active employment in the War of the Spanish Succession (1701-14). In a letter of 1702 to the King, he asked to be created a marshal of France so as to avoid the embarrassment of having to serve under marshals junior to himself. Louis XIV, knowing (as all Europe did) that many of France's victories were due far more to his discerning patronage of the petty gentleman **Vauban** than to the performances of higher nobles whose birth alone had hastened their appointment as marshals, created **Vauban** marshal of France in January 1703. **Vauban** had, however, never commaded an army in the field--as was customary for marshals of France--and was only really capable of "engineering," which was considered beneath a marshal's dignity. After directing operations for the recapture of Alt-Breisach (1703), he was recalled from service. In 1705 and again in 1706 he offered to help an incompetent general in the siege of Turin, whose fortification he had himself planned, but the offer was rejected. **Vauban**'s last effective commission was to organize an entrenched camp at Dunkerque (1706).

Writings.

Vauban was indefatigable. He devoted his time between duties and in convalescence to writing assiduously on matters of public concern. Some of these writings concerned his profession, others were external to it; many were assembled by him in manuscript volumes under the collective title of *Oisivetés* ("Leisures"). His treatises *De l'attaque et de la défense des places* ("On Siege and Fortification"), written in 1705-06, were printed in 1737 and reprinted in 1829 (several interpretations of his systems of fortifications had been published in his lifetime). He wrote also on the expediency of recalling the banished Huguenots to France (1689); on routes for canals and inland navigation; on privateering at sea; on the geography of the Vézelay district; on forestry and pig breeding; on overseas colonies; and on international affairs, with regard to the concessions that could be made, strategically and politically, for a satisfactory peace (1706). His most important "leisure," however, was his *Projet d'une dixme royale* (printed anonymously, 1707; *Project for a Royal Tythe, or General Tax*), suggesting the abolition of nearly all France's existing taxes and the substitution of a tax of 10 percent on all land and trade from which no

one should be exempt. He substantiated his arguments with a mass of statistical documentation practically unprecedented and, in so doing, pioneered the use of statistics in economics. But the French government--too deeply committed to the system of tax farming, reluctant and even unable to revoke the exemptions of the privileged classes because of dependence on them, and lacking interest in fundamental reforms--suppressed the publication of his book. **Vauban** was crushed by this rebuff, but the story that his book made Louis XIV forget his past services is untrue.

Personality.

Vauban was of medium height, squarely and solidly built. Although he was unpretentious and straightforward, his martial appearance and unpolished manners disguised his kindness and his truly considerate readiness to help people. On the battlefront, he was always concerned to save soldiers' lives, and he often let other officers take the credit for the fruit of his own courageous efforts. The Duc de Saint-Simon, the outstanding memorialist of the reign of Louis XIV, who never squandered praise, described **Vauban** as "the most honourable and virtuous man of his age . . . incapable of lending himself to anything false or evil."

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The most comprehensive monograph is P. Lazard, ***Vauban**, 1633-1707* (1934), well illustrated and covering the development of France's corps of military engineers from its origins to **Vauban**'s time. There is also a shorter life, in French, by A. Rebelliau, ***Vauban*** (1962). English readers may consult Sir Reginald Theodore Blomfield, *Sebastien le Prestre de **Vauban**, 1633-1707* (1938), which owes something to Lazard and is quite well illustrated.

Crozon's fortress, designed by Sébastien Le Prestre de Vauban

http://viking.gmu.edu/http/projects/Vauban/vauban.html

Vauban's influence on history might be described as considerable. But his impact on warfare must be described as enormous, and not just in his own lifetime. To support such a bold statement one simply has to cite Vauban's personal service record. He directed forty seven sieges during the many campaigns that shaped France's emerging frontiers under Louis XIV. And, in addition, during peace-time and war-time, he worked tirelessly at designing & building new fortresses, and strengthening existing ones. These, served to stabilize & secure France's new borders.

Central to these achievements were the methods he developed for attacking & defending fortified places - especially his method for conducting an attack. He carefully recorded everything [in beautiful detail] so that it could be passed on to his compatriots. And his many writings were later handed down to successive generations of grateful French engineers.

Vauban's *Méthode* for the attack upon a fortified place remained influential a hundred years & more after his death. The sieges conducted by Napoleon's armies in the Iberian Peninsular in the second decade of the nineteenth century were clearly recognisable as *Vauban Style* assaults. Indeed, such was the esteem in which Vauban was held by the French engineer corps that, so far as the art of defence was concerned, they undoubtedly clung onto his methods too long. This completely stifled original thought. The irony being that Vauban himself, ever the original thinker, was constantly evolving his ideas. Accordingly, he would have been horrified at the thought of his successors' lack of originality.

We also need to acknowledge the many inventions & innovations Vauban has been credited with, among which was the design of the first ever socket bayonet. This fitted *around* rather than *inside* the muzzle of the soldier's firearm, as the old *plug* bayonet had done. The result being he had enhanced personal protection without loosing the offensive capability of his firearm. It was Vauban also who encouraged the French Army to adopt the *new* flintlock musket in preference to the less efficient *Matchlock*. These two things together had a very significant influence toward ushering out the age of the *Spanish tercio* - the mix of musket and pike armed infantry. Instead footsoldiers began to be deployed in shallower formations, leading to a revolution in tactics and grand-tactics.

Of great significance also to generations of soldiers - French and others alike - Vauban was perhaps the first since the classic age of Rome to systematically build proper, permanent barracks accommodation for them. This was a vital step in promoting their health, well-being and discipline.

Finally, Vauban directed his genius towards strategic considerations. He wrote numerous memoranda concerning the direction of France's military efforts. He proposed and carried into effect a double line of fortress defences in the North of France - his Pre Carre. And his strategic thinking was even later to influence President Charles De Gaulle's post-war defense policy.

> ***"He fortified all our frontiers - the Pyrenees, the Alps, our ports and even Belgium. We went everywhere, we made war everywhere. There is no reason why this strategy, which has always protected us against everything, should not be perpetuated."***

It is perhaps no coincidence that De Gaulle was born in Lille, the city Vauban captured for Louis XIV in 1667 and then fortified in such magnificent style. Lille was also one of the principal fortresses in the first line of the Pre Carre.

PLAUDITS & HONORS

As was to be expected, Vauban's King was extremely pleased with him. Louis XIV [*image left*] bestowed on him a variety of ranks, titles, and offices. Some of the latter Vauban retained. Others, as was usual in France at that time, he sold on to countrymen. It was an accepted part of public life that one might buy & sell office. Especially marketable were those allowing the holder to come close to the King. Louis no doubt bestowed some offices suspecting the recipient would only sell them on to realise a cash sum. It was simply one of the many ways in which he would reward those who'd served him well. However, in Vauban's case, he also bestowed some huge cash sums, principally as reward for cities captured. Also of note, the King permitted Vauban a considerable degree of familiarity. There could scarce be any better indication of his affection for, and trust in, his servant.

***"... Continue to write to me about anything you have in mind, and do not be disappointed if I am unable to see my way to adopting your suggestions, or if I do not reply regularly. ... It is impossible to have more regard, esteem and friendship that I have for you."* - King Louis XIV writing to Vauban**

In addition to the gratitude shown by his sovereign, Vauban enjoyed the respect of most of his contemporaries - like every successful person, he had some personal enemies. Very many *respected and great men* sang his praises. One measure of how high a regard in which he was generally held was the fact that, even at a time when France & England were at war, writings attributed to Vauban were published in London - actually there is some doubt whether it was Vauban's work, but the fact remains his enemies thought enough of him to want to imitate his methods.

Significantly it was not just those with a blind lust for *La Gloire* who remembered Vauban fondly. He was, it has been attested by many, an extremely compassionate and *humane* man. He never once treated his men like cattle. He was horrified whenever they risked their lives unnecessarily. He constantly strove to protect them from enemy fire and otherwise generally improve their lot. He astounded the world, and won the undying love of the French soldier, when he took pains and devised means whereby he could capture an enemy fortress with fewer losses than those he inflicted on the besieged!

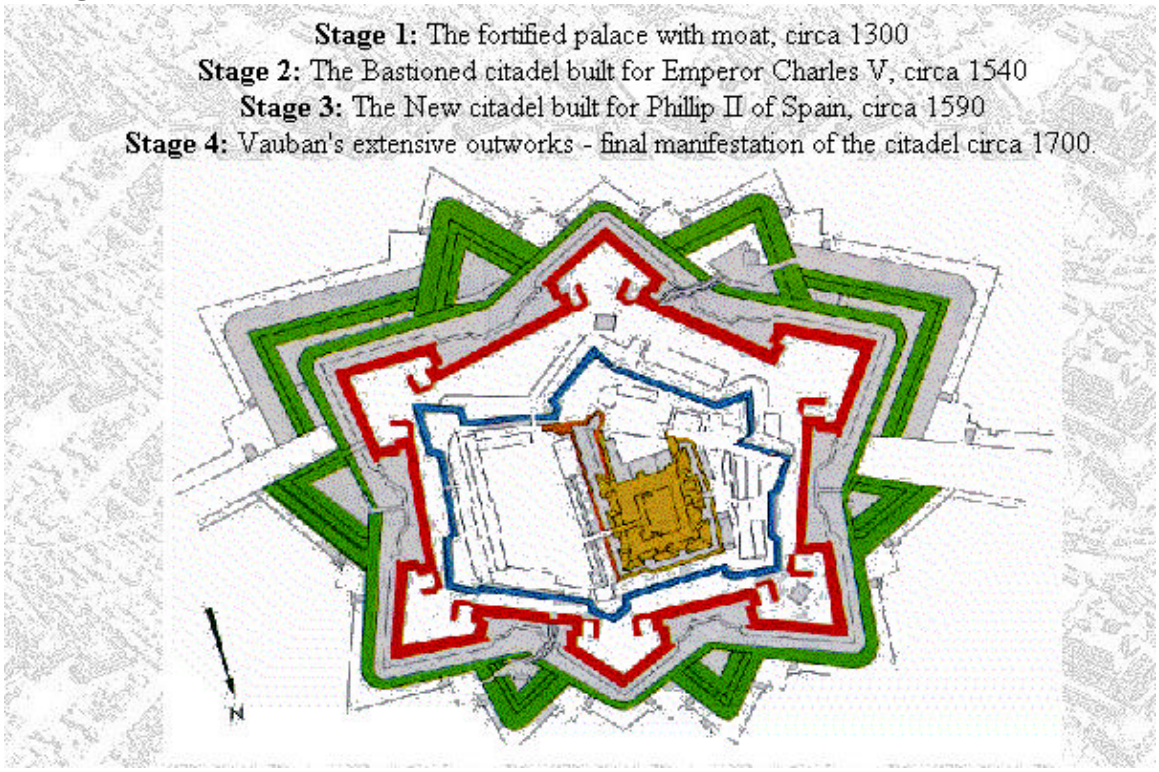
One could cite numerous tributes to Vauban's greatness, but we'll confine ourselves here to the succinct yet comprehensive testimony that comes from the pen of the respected English military historian, Christopher Duffy **.....**

"What remains beyond dispute is that Vauban survives as one of the most complete mortals whom history has to show. Hard-headed but warm-hearted, he was able to reconcile success in warfare, an inherently bloody trade, with the demands of common humanity."
The Fortress in the Age of Vauban & Frederick the Great, 1660-1789 - page 97.

On 28 May 1808 the Emperor Napoleon I honoured Vauban by arranging to have his heart placed within a grand monument erected under the dome of the Invalides church in Paris. Here Vauban's heart still rests today - now only a few yards from the Emperor's

Finally in 1867, in accordance with an Imperial Decree signed by Napoleon III [Great-nephew of Napoleon Bonaparte], Saint-Léger-de-Foucheret, the town in which Vauban was born, was renamed Saint-Léger-Vauban in his honour.

Perpignan - Capital of Rousillon:



http://www.geocities.com/Pentagon/6750/vauban_frame.htm

Appendix TWO
Fortifications in the American Civil War

FIELD FORTIFICATIONS DEFINED

Defined in their best nineteenth century sense, field fortifications were temporary works of all kinds employed to fortify points of more or less transient importance to the conduct of an army's operations, necessary to provide security for its lines of communication, and required for the protection of its base of operations and other significant strategic or tactical points not otherwise covered by fortifications of a more permanent character. Field fortifications were generally constructed using local and immediately available non-durable materials, such as earth and wood, that could be manipulated easily and rapidly with a minimum of technical expertise and specialized tools. This definition necessarily encompasses a wide sweep of very divergent forms of fortification that range from simple loop-holes hacked roughly through house walls to magnificently elaborate semi-permanent fortifications. Fortifications forms are just the beginning; the subject also includes all of the skills necessary for the design and construction of effective fortifications along with the manner in which basic forms were adapted to fulfill the fortification requirements of specific sites.

BASIC APPLICATIONS OF FIELD FORTIFICATIONS

Field Fortifications were used to accomplish a number of significant objectives necessary to the operations of an army in the field. First, and perhaps foremost, field fortifications were employed to strengthen tactical positions and provide the means necessary to allow an inferior army to withstand and repel an attack by a stronger or more numerous enemy force. A position could be fortified prior to its occupation by an army or the army could throw up lines of hastily constructed entrenchments after assuming its position. As the Civil War dragged on attacking armies tended to fortify their positions either to maintain close contact with the defending army or gain some measure of security against unexpected counter attacks. Prepared tactical positions could be fortified using both major field works intended as both cover and obstacle and minor field works; those fortified by an army after assuming a position were generally composed of **minor field works** such as field batteries, **skirmish pits**, and rifle trenches that

could be constructed in a very short time and were primarily designed to provide cover. If a position was occupied for a prolonged period of time these hasty entrenchments could be developed into very strong substantial lines of major field works.

As the Civil War progressed and Federal armies penetrated deeper into the Southern States they found it necessary to cover important points along their lines of communications using a variety of both major and minor field works. An important point along an army's line of communication could be defined as any location where traffic back and forth from the base of operations could be disrupted or any point intermediate point where an army's supplies were collected prior to shipment to the army. This included trestles, bridges, towns, and defiles along railroads, commanding points overlooking watercourses and fords, and population centers that required occupation to intimidate hostile local civilians into submission. **Blockhouses** and stockades were generally used to protect railroad bridges, trestles, and river fords. Larger redoubts and other enclosed major field works were employed as garrison citadels or rallying points for blockhouse garrisons at occupied towns and villages.

Bases of operations or significant strategic points were generally covered by extensive systems of detached semi-permanent fortifications connected by prepared lines of rifle trenches and field batteries or any of the various types of **fortified lines**. For the most part these were some of the most elaborate and highly developed field works constructed during the war. Many of the forts constructed to protect Washington, D. C. were redesigned, remodeled, or rebuilt several times during the course of the war until some approached a standard of physical adaptation little short of permanent fortifications. Detached forts were generally designed specifically for an armament of heavy artillery; collateral works could support each other with their fire and defend distant approaches that an enemy would use to reach the defended perimeter. Some, like Fort Negley at Nashville, Tennessee, became so elaborate that they were never really quite finished. Normally held by garrisons just large enough to secure the main works against raids and surprises, a defeated field army could retire within the defended barrier to recover its strength and reinforce the perimeter defenses by occupying previous prepared trenches and batteries connecting the detached forts.

A particular species of field fortifications, called **siege works**, was also used in the attack of well developed fortifications. One of the objectives of a protective barrier of field works was to compel an attacker to settle down to the long process of reducing the fortified place using an attack by regular approaches. Sieges generally followed a set pattern of activity that involved the use of particular types of siege works to approach the fortification and dismantle the defenses. Once the defenses were dismantled, the defender's artillery silenced, and the work breached, it was generally assumed the the defender would capitulate. This may have applied well enough to the small **masonry castles** that dotted the sea coasts of the Southern States, but sieges against lines of field works were usually terminated either by an assault that determined final possession of the place or the garrison was more or less starved into surrender.

TRADITIONAL RECEIVED FORMS AND PERIOD ADAPTIONS

By the middle of the nineteenth field fortifications had been under more or less persistent and systematic development for a period of several centuries. Most, if not all, of the basic fortification forms used during the Civil War were products of the seventeenth and eighteenth centuries; parapets of major field works and the various accessory defenses built by soldiers and slaves during the Civil War differed very little from those constructed by the soldiers of Louis XIV 150 years before. There was, of course, one basic reason for this apparent stagnation in the art: traditional designs and methods worked, and worked well. This was particularly true since weapons development up to the 1840's had taken place by way of refinement rather than invention; cannon and muskets used in 1840 did pretty much the same thing in pretty much the same way as those used in 1700. More recent weapons were more effective, but they still shot round cannon balls and round muskets out of smoothbore tubes. Finally, the 1840's saw a bit of inventive movement. Both columbiad cannons, which could fire hallow shells, and rifled muskets were developed and refined through the 1850. During the early 1850's rifled artillery was developed.

Engineers' response to these developments was given in volumes of tamped earth. Columbiads, rifled artillery, and rifled muskets could penetrate more deeply into packed soil than older smoothbores. But the ammunition, though delivered with more force and accuracy than that of old smoothbores, still did pretty much the same things; solid shot still tore solidly into solid objects; shells still exploded with a sudden burst in the air, canister still spread its lethal bullets, and spherical case was just as dangerous as it had been during the Napoleonic wars. Ammunition of newer weapons fell with greater force and burrowed more deeply than that of smoothbores, but with no new method of breaking packed soil, thicker parapets designed according to traditional standards could still absorb their impact and reduce the risk of catastrophic penetrations.

STRUCTURAL FUNCTION OF MAJOR FIELD WORKS

All fortifications have the fundamental purpose of protecting their garrisons against enemy fire and assault. While reducing the effectiveness of an enemy's fire, a well arranged fortification would permit its garrison to use its own defensive fire in the most efficacious manner possible to repel an attack. If the defenders' fire failed to stop an assault, a major field work was designed to assist the garrison's defense by breaking up the orderliness of an attacking body of troops and wearing away the attacking troops' will and ability to scale the scarp and mount the superior to drive the defenders from the parapet. Major field works were designed to serve as both cover for its garrison and as an obstacle that an enemy would find difficult to surmount. Minor field works, on the other hand, such as rifle pits, rifle trenches, and batteries, were designed primarily to provide cover and will be dealt with separately.

THE TRACE OF MAJOR FIELD WORKS

The quality and intensity of defensive fire that a garrison could lay on the ground immediately in front of a work to resist an attack was primarily a product of a work's **trace**. A trace was the shape formed by the lines and angles of a field work's parapet, more specifically, by the lines and angles formed by the **crest of the interior** slope. Tradition provided an array of standard traces that could be employed to produce specific effects; field works were generally classified and described by their traces rather than the strength of their profile. Redans, lunettes, priest caps, star forts, bastioned forts, cremaillere lines, and

other such references describe field works by the general characteristics and arrangement of faces and flanks of their traces. A redan, for instance, was a simple field work that was traced with two faces joined to form a central salient angle while a lunette had two faces and two flanks.

Each traditional trace produced areas in front of a work that were covered by the defenders' fire and areas that were not well covered by their fire. It was generally assumed that an individual firing from a work's parapet would fire in a more or less straight line perpendicular to the line followed by the crest of the interior slope. A group of individuals firing from a parapet would produce a **column of fire** that was as long as the range of rifles and as wide as the section of parapet they happened to be manning. Troops lining the faces of a redan would produce two columns of fire that diverged from the salient along lines perpendicular to the two faces. This left a wide area directly in front of the salient angle without any fire at all, called the sector without fire. Sectors without fire could be covered by placing one or two pieces of artillery at the salient and arranging them to fire into the sector without fire.

A direct column of fire produced by the face of a field work could stop an attack, if the work was well covered by accessory defenses that could hold an attacking body of troops under fire before they reached the ditch in front of the parapet, but once they did reach the ditch, the defenders could not fire down on the attackers from the work's parapet. Once the attackers were in the ditch and secure from the defenders' fire the working party leading the attack could begin to tear down obstacles or undermine the parapet while the storming party reorganized to climb out of the ditch and rush over the parapet. There were, of course, ways to prevent all of this from happening and to make sure that a major field work's ditch served the garrison's defense better than the attackers' assault. **Sally ports** and sally port brdiges that spanned the ditch were also weak points in the trace of major field works that broke the continuity of the parapet and offered assaulting columns ready made breaches that could be used to avoid the double obstacles presented by the scarp and parapet. Caution usually compelled sally ports to be placed on the least accessible face of unflanked enclosed field works, within re-entrant angles of flanked works, or on curtains, where they could be protected by crossing columns of fire.

Well designed major field works were well flanked. This means that a trace was used that produced crossing columns of fire over ground immediately in front of the work and allowed the defenders to fire into the ditch in front of one part of the work from another part of the work. Bastioned traces and cremaillere lines were particularly useful in producing a flanked disposition; traces (such as redans and lunettes) that were not capable of mutual defense from with the work itself could be flanked by other nearby works or by the addition of auxiliary flanks that jutted outward from the main flanks. If a fortification was sufficiently important to warrant an intense degree of extra labor, its otherwise unflanked ditch could be flanked by a caponniere or counterscarp gallery. A major field work's ditch was supposed to be an obstacle, but the only way to turn it into an effective obstacle was to cover its full length and all of its angles with defensive fire.

It is of some importance to note that the various traditional traces were primarily used as theoretical models to understand the inherent characteristics produced by certain combinations of faces and flanks. They were not applied with textbook regularity to any and all situations and locations. Rather, the engineer's art was based on an ability to adapt received forms to meet the fortification requirements of specific positions to produce a field work that worked well within the context of its site and the ground immediately surrounding its site.

ELEMENTS OF THE PROFILE OF MAJOR FIELD WORKS

A **profile** is a vertical section of a field work's parapet and ditch that shows the altitude, thickness, and attitude of the various elements that make up the parapet and ditch. A major field work's profile contained two basic elements: a raised embankment of tamped earth that provided cover and an exterior ditch that provided soil to construct the embankment and served as an obstacle to an assault. This double purpose of cover and obstacle produced by excavated and packed earth is the thing that distinguishes a major field work from any of the minor and accessory forms of field fortifications. Profiles used to design and construct major field works throughout the American Civil War were based on traditional and received forms; their elements and **proportions** had been worked out by experience over the preceding 200 years.

A good defense of a major field work required a strong profile. A strong profile was one that raised troops lining the parapet higher than an attacking body of troops coming at the work, prevented an enemy's fire from passing through the body of the parapet, and created an obstacle immediately in front of the parapet that an enemy could not easily pass over to get on top of the parapet. Expressed more formally, the three elements of an effective profile were its command, thickness of the parapet, and its relief. All of these elements were proportional to each other; when one element was adjusted in height or thickness, the other elements had to be correspondingly adjusted to maintain the overall stability of the earth embankment and allow the garrison to use it without undue inconvenience.

An effective profile provided a command that both raised the defenders above the level of an attacking body of troops advancing to assault the work and intercepted both the enemy's view of the interior of a work and his direct fire into the work. A command of eight feet was considered sufficient for a major field work on a level site and unencumbered by surrounding heights; on irregular sites or when the site was itself commanded by nearby hills the height of a parapet (and therefore its command) was determined by a process known as defilading. Defilading was accomplished by taking simple levels from the ground to be fortified to surrounding hills and raising the parapet high enough (but no more than 12 feet) or locating traverses with the work to intercept fire from those heights. This was a practical operation that had to be performed on site after a work's trace had been laid out on the ground.

Thickness of a parapet was determined by the weight of projectiles that the parapet would reasonably be expected to withstand. Heavier shot and shells **penetrated** more deeply into a mass of packed earth than lighter shot and shells; those fired by rifled guns penetrated more deeply than those fired by smoothbores. A parapet that would only have to withstand the fire of light artillery could be made thinner than one that would have to absorb the fire of heavier siege artillery or naval ordnance. Overall thickness could be reduced by employing stout revetments that supported the weight of the interior slopes and put a final stop to shot and shells that penetrated into and were already slowed down in passing through packed mass of the parapet.

Relief of a major field work was measured on a vertical line from the bottom of the ditch to the altitude of the crest of the interior slope. A parapet with a command of eight feet, without a ditch would have a relief of eight feet, which was hardly enough to give an adequate check to an attacking body of troops. The lower part of the relief, measured on a vertical line from the bottom to the top of the ditch was the most important element that produced the profile's effect of as serious obstacle. The ditch itself had to do two things: serve as an effective obstacle and produce sufficient soil to construct the parapet. To be a serious obstacle a ditch had to be at least 12 feet wide at the top and no less than 6 feet deep. This width allowed the defenders to deliver sufficient flanking fire through the ditch to effectively disrupt the serenity of attacking troops attempting to use it as cover. A depth of 6 feet produce an overall relief, when combined with a parapet command of 8 feet, of 14 feet which was quite sufficient to give an attacking body of troops pause before attempting to climb out of the ditch to reach the top of the parapet.

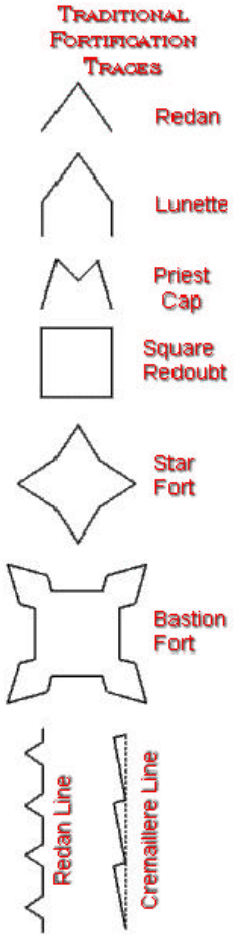
For these three elements of a major field work's profile to be effective, they had to be supported by all of the other elements of the profile. All of the slopes had to proportioned to produce a stable mass that the defenders could actually fire over effectively. The exterior slope had to be given a grade that allowed it to carry the weight of the embankment and prevent the mass of the parapet from sliding into the ditch; the upper slope, called the superior slope had to given an inclination toward the exterior slope that allowed the defenders to point their guns downward to fire along a line just above the outside edge of the ditch (called the crest of the counterscarp). The interior slope had to have a sharp inclination so that the defenders could lean against the parapet to deliver their fire, which usually meant that the interior had to **revetted** or supported to keep its angle. When the command was over 4 feet a banquette had to be added to raise the defenders high enough to fire over the parapet. A slope was added to the rear of the banquette that allowed the defenders easy access to the banquette from the rear without having to run the full length of the parapet to deploy along it.

ACCESSORY DEFENSES AND ARTILLERY

Accessory defenses were adjuncts to the trace and profile that were not absolutely necessary, but were quite useful to the conduct of a successful defense. **Obstacles** positioned in the ditch and immediately in front of the ditch were quite useful in breaking up the orderliness and ensemble of an attacking body of troops. Obstacles such as inclined palisadings, belts of small pickets, and abatis were designed to check the momentum of an attacking body of troops and hold them under a close and destructive fire delivered from the parapet. The longer an attacker was under fire, the less likely he was to be able to reach the ditch and be able to reorganize for an attempt on the parapet. This was the point where many assaults on major field works met their decided ends: attacking formations were broken by obstacles and shredded by the defenders' fire. Some few assaulting troops were almost always able to reach the ditch where they again came under fire that prevented them from reorganizing for attempt to scale the scarp and enter the work as body. Some few heroic souls were almost always able to claw their out of the ditch and mount the parapet, where they were almost always shot down. For an attack to have any chance of success at all the attacking troops had to work together and mount the parapet in one leap as a body to overwhelm the defenders lining the parapet; more often then not obstacles in front of the ditch combined with the defenders' direct and flanking fire prevented the attackers from maintaining the ensemble necessary for a successful attack.

Artillery in field fortifications served both defensive and offensive purposes that ranged from close defense of the work itself to projecting fire to prevent the enemy from occupying an area near the fortification or passing a point on a river or harbor channel, and battering enemy defensive fortifications. Some field fortifications, such as the forts composing the defenses of Washington, D. C., were primarily designed to protect a powerful artillery armament. A few special arrangements were necessary to render an artillery armament effective. First, gun positions had to be sited at suitable points along the interior crest and the work had to be prepared to receive its artillery armament. There were two basic ways to mount artillery in a field work; either by raising the armament high enough to fire over the parapet or cutting an opening in the parapet so that the artillery armament could fire through the parapet. The first, called **barbette mountings**, required the construction of an earthen platform that joined the interior slope.

These were useful when a gun or howitzer required a wide field of fire and were primarily positioned in salient angles to cover a field work's sectors without fire. The second, called an **embrasure mounting**, required a well proportioned and revetted cut through a parapet. While embrasures provided better protection for gun crews than barbette mountings, they also disrupted a parapet's overall effectiveness as a shield against enemy fire and presented so many little breaches that attacking troops could use to enter the work and avoid having to mount the superior slope. In either case artillery had to be placed on wooden gun **platforms** to stabilize the piece and prevent it from tearing up its mounting. An artillery armament also required a secure structure, a **magazine**, where its ammunition and powder supplies could be stored without being turned to mush by moisture or exploded by enemy fire. In many cases a separate type of field work, called a **battery**, was used to protect an artillery armament



Appendix Three
The Maginot Line

"If you entrench yourself behind
strong fortifications, you compel the enemy
to seek a solution elsewhere."
CLAUSEWITZ

The Maginot Line was built between 1929 and 1940. It was built to protect France from her longtime enemy, Germany, and to defend the traditional invasion routes across her eastern frontier. The Maginot Line was built to provide time for the French army to mobilize and to make up for a potentially disastrous shortfall of manpower predicted for the late 1930s. Most of all, it was built to provide a place behind which the French army could hide, a so-called "Great Wall" of France where the nation could feel secure in its doctrine which would become known as the "Maginot" mentality.The line was named in honor of André Maginot, war hero, beloved Minister of Veteran's Affairs, and Minister of War from 1928 to 1932. It could just as easily have been called the "Painlevé Line" after the Minister of War who was responsible for introducing debate on the line in Parliament, or the "Pétain Line," after the man who thought of the concept. But it was named after Maginot, whose contribution was his gift of oration which persuaded parliament, both the right and the left, to allocate the money for the project.

The Maginot Line was a powerful line of defense which stretched from Switzerland to the Ardennes in the North, and from the Alps to the Mediterranean in the South. It was a vast, dynamic, state-of-the-art, ultra-modern defensive system. Most of its components were underground, where interconnecting tunnels stretched for kilometers, and where, beneath the earth, thousands of men slept, trained, watched, and waited for a war that never came.

In the end, the Maginot Line was considered by many to be a failure. It was powerful and supposedly impregnable, yet it failed to save France from a humiliating defeat in 1940. But was it truly a failure? The truth is that the Maginot Line served the exact purpose for which it was built. It dissuaded the Germans from attacking across France's eastern frontier; it gave the French Army time to fully mobilize and deploy; and, if properly used, it could have made up for France's anticipated manpower shortage. The greatest defect of the line itself was that it was too short. In May 1940 Hitler simply chose to ignore it.

The Maginot Line did not fail France, but the "Maginot mentality" did cause her defeat, as did the refusal of her leaders to acknowledge the coming of modern warfare- -mobile battles that would be fought with tanks and aircraft. Thus, while France built a modern version of the First World War's Hindenburg Line, Hitler built Panzers and Stuka dive bombers.

The idea behind the construction of the Maginot Line came from France's success in holding a trench line along 400 miles of territory against a powerful German army, and the failure of her pre-war doctrine of "the offensive." If France could hold off the Kaiser's armies for four years with barbed wire and ditches, why not adapt that theory in a permanent system of defenses along the border?

When World War I ended and the Versailles Treaty began its devestation of Germany, the debate on the future of France's defenses began in earnest, for no one believed that Germany would stay down for long. Verdun was the heroic symbol of powerful fortifications. Joffre, its spokesman, favored a line of fortifications along France's eastern frontier with Germany, a series of defended concentration areas from which troops could counter any attack which attempted to penetrate between the defenses. Opposing him was Pétain, the hero of Verdun, who argued for defense in depth (like the Hindenburg Line). A third school, joined by the likes of Paul Reynaud and Charles de Gaulle, argued for a buildup of tanks and planes. But this meant mobility and attack, and France had no stomach for that.

However, the first war was a defensive war, and the hero of the defensive was Pétain. He believed that all new military inventions had been of greater benefit to the defense, and his words and beliefs were accepted as gospel. Plus, the French High Command was sickened by the bloodshed of 1914-1918 and another loss of manpower such as this would mean the end for France.

Fortifications would compensate for numerical weakness, the eventual loss of the Rhineland buffer zone, and the absolute imperativeness of holding the northern industrial regions. They would also provide at least two weeks "couverture" - time to mobilize and deploy reserves. Since Belgium was an ally, forts could not be built along the Belgian border. Pétain insisted instead of "[going] into Belgium." The Ardennes, he claimed, were not considered to be a problem since they could be rendered "impenetrable."

In January 1930, André Maginot convinced the French parliament to fund the massive project. Construction began and the Maginot mentality of false security set in. Construction continued in five phases throughout the 1930s. After Belgium revoked the Franco-Belgian alliance of 1920 and declared

neutrality, the Maginot Line was extended along the Belgian frontier, but nowhere was it as strong as the original line. In northwest France, the "line" was simply a series of poured concrete blockhouses and pillboxes with little, if any depth.

In May 1940, Hitler attacked through the "impenetrable" Ardennes Forest in neutral Belgium. By mid-June, the Wehrmacht had completely surrounded the French army in Alsace, yet, only one Maginot fort, Villy la Ferté, had fallen and the line was still intact, and still lethal. Many fortress commanders wanted to hold out in a fortified redoubt, but the French army's impotent leadership, led by Maxime Weygand, called for an armistice. Some of the forts fought on, but by the end of June it was over and the proud fortress garrisons marched into captivitThe line saw little action until 1944, although the Germans used it for storage and spare parts. The Allies fought through a small portion of the line around Metz in the fall of 1944 and in northern Alsace in December.

A typical large fortress (gros ouvrage) consisted of: casemates, cupolas, turrets, underground rail, power plants, munitions storage, and barracks. Casemates contained loopholes for infantry arms, or embrasures for artillery. Where artillery fired out of an embrasure, rather than from a roof turret, it was said to be "in casemate." Casemates provided mainly flanking fire in a 45-degree horizontal arc. The façade was protected against artillery shots by an orillon, or overhang, on the enemy side. A deep ditch protected the embrasures and loopholes from explosive attacks and assured that the debris from the shelling did not obstruct the field of fire. There were machine-gun casemates, 75mm casemates with 2 to 3 guns each, and, more rarely, casemates for 135mm bomb throwers and 81mm mortars.

Fixed cupolas were domes made of molded steel, pierced by loopholes and sealed in the concrete roof of the casemate. The majority were used for signalling, or for riflemen and were known as GFM cupolas for Guetteur-Fusil-Mitrailleur (spotter-automatic rifleman). They permitted surveillance and observation with periscopes and diascopes, the defense of the top of casemates and the rear area, and to fire flare guns. It was customary for each block to have an observation cupola. Finally, there were small ventilation cupolas called mushrooms.

Turrets revolved 360 degrees and rose up or down to a height of about 1 foot above the roof surface of the block. A steel collar surrounded the turret and provided further protection. The armament itself was encased in a special steel dome to protect the gunners (2-4) and the guns underneath. Artillery turrets

were built in one piece and were extremely elaborate. Each turret structure was about three stories high. Protruding from the roof of the concrete block was a round, low-angled dome about 4 feet in diameter. This was surrounded by a steel collar, which was fixed into the concrete. If the turret were raised, an observer could see two horizontal holes, about 2 feet apart, half-way up the outer surface. These were the gun barrels and there were two guns per turret. Underneath the steel dome was the firing chamber. The machinery that operated the turret was below the firing chamber. The turret was controlled either electrically, or manually using a series of wheels and levers. From this level the turret could be raised or lowered, pointed in a specific direction, or the guns could be raised or lowered to the correct firing angle. Just below the firing chamber floor, at head height and fixed to the circular outer wall, was a metal band about 3 inches wide,.and etched with numbers that indicated zero to 360 degrees. This served as the direction finder. A small pointer attached to the turret would spin on the inside of this band and would be turned until the turret was facing in the proper direction.

A typical fortress, like Simserhof, near Bitche, had two entrances, one for the troops, called the Entrée d'Hommes (Men's Entrance), and the Entrée de Munitions (Munitions Entrance). These were located to the rear of the combat blocks, deep in a wooded ravine on the reverse slope of the hill. The men's entrance was actually only used for ventilation purposes. All other movement was into the munitions entrance. Each entrance was well-protected by anti-tank weapons and anti-tank cannons pointed at the access road.

Entering through the munitions entrance, one encounters a long concrete gallery which could accomodate a truck. The exterior was protected by a ditch approximately 12 feet deep, which ran along the facade of the outer wall. A bridge ran across the ditch to the entryway. Firing chambers on the left and right of the entryway guarded the entrance and the approaches. From the outside, the only thing that showed were gun embrasures, and the barrel of the anti-tank cannon or machine-gun. The interior entryway had several defensive features: an iron gate, a ditch covered by a rolling bridge that could be rolled away into a chamber on the other side of the interior wall, leaving a large ditch over which a vehicle could not pass, armored doors a foot thick, and interior blockhouses sited on the entrance, about 35m back. Beyond the first blockhouse the concrete is replaced with masonry, as the natural protection of the earth was sufficient at this depth.

Beyond the entrance gallery, the main gallery was equipped with a 60cm electrified traitrack. To the left, the main gallery branched off to the men's entrance. This part of the fort was known as the caserne and contained the infirmary with showers for poison gas decontamination, sleeping chambers, lavatories, and police station, kitchens and storerooms. This area also housed the heart of the fort, the electric powerhouse, as well as the gas neutralization chambers. All of this was 35m underground.

Electrical current from the powerhouse was needed for heating and lighting, ventilation, elevators, turrets, radio stations, electric kitchens, and munitions ramps. The current normally came from the rear of the fort, from the national grid, and was connected by underground cables to a nearby concrete-protected transformer station, then through high-tension cables to the fort. A generating station inside the fortress provided power in case of rupture from the outside, consisting of four electrogenerator groups of Sulzer diesel motors, each 290 horsepower and 250 kilowatts. They were powered by diesel fuel stored in six reservoirs which would last two to three months, plus a reservoir for lubricant. Chambers adjacent to the powerhouse held eight reservoirs which could hold a total of 400 cubic meters of fresh water, auxilliary generators to assure lighting in the powerhouse, ventilators and pumps for fresh air, transformers to power the substations in the combat blocks, and a substation to power the train tracks wth continuous current.

The fort was provided with a ventilation and gas protection system in case of a World War I-style gas attack. In case of such an attack, ventilators would cause air overpressure to blow the air out of the fort. Ventilators also cleaned the air of gunpowder smoke and exhaust from the diesel engines. To prevent the total depletion of the air supply, air would be pumped from the outside, through round air filters about the size of a washing machine.

After the left branch to the caserne, the gallery continued to the combat blocks and the command post, the brain of the fortress. The gallery widened at certain places to permit two trains to pass each other. The front part of the fort was protected by a second armored door and by mines on each side of the gallery which could be detonated to close off the tunnel. In this manner, if the enemy were to penetrate past the entrance defenses into the galleries, the tunnel leading to the combat blocks could be destroyed, preventing the enemy from reaching the nerve center of the fort, and at the same time, allowing the combat blocks to continue fighting. Past the second armored door, the gallery branches off to the different

combat blocks. The length of the gallery from Simserhof's entrance to the furthest combat blocks was 2.2km.

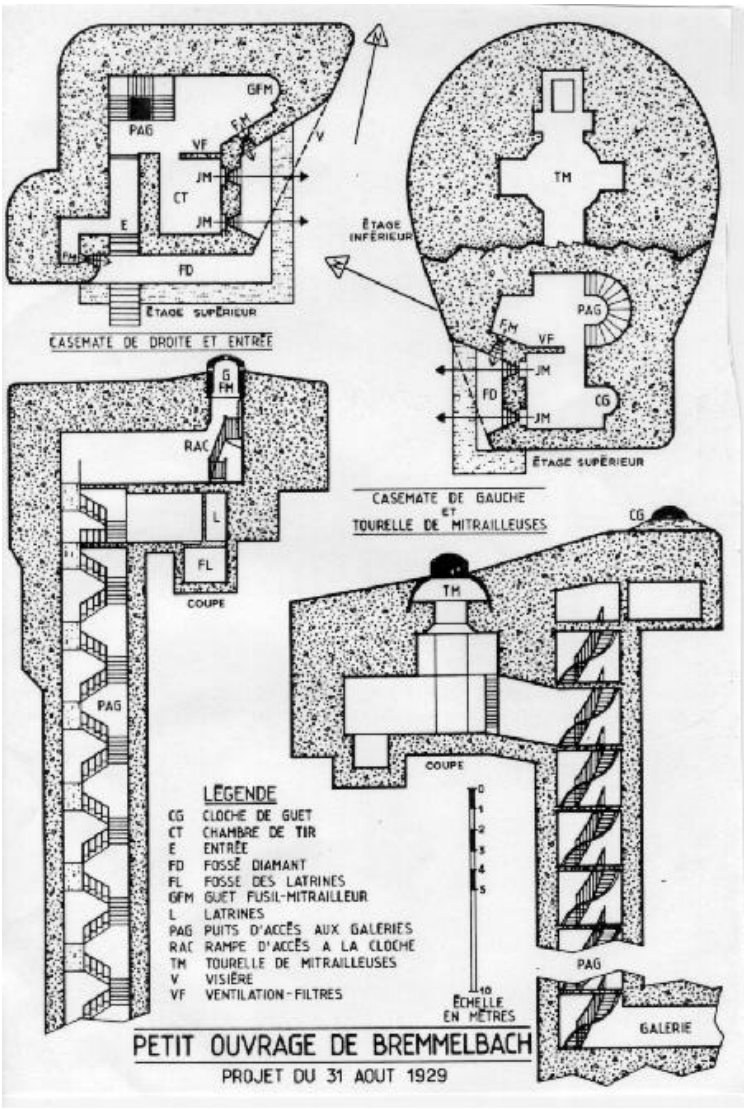
Simserhof could fire three tons of shells per minute. An elaborate transportation system was necessary to keep the guns replenished. Because of the destruction of the magazine of Liege's Fort Loncin in August 1914, the designers decided to maintain three types of munitions storage areas rather than one central magazine. By the munitions entrance was the main storage area between the outside and the blocks, known as M1. It had seven chambers, each 5 by 25 meters, which were isolated from the men's entrance and the caserne area. At the foot of each combat block, 20m below ground, was M2, with stores enough for two days of battle. In the block itself, near the weapons, was M3. For one 75mm cannon, M1 held 3,000 shells, M2 2,800, and M3 600. They were transported by locomotives of 5.5 tons along the 600-volt railways. Simserhof had four Vetra locomotives and 57 wagonettes, commonly called the "metro."

Shells were transported in containers called chassis from the munitions depots on 60cm railway systems. A chassis was a metal box that held around 100 75mm shells in racks and was the size of a small refrigerator. The train from the depot entered the munitions entrance and travelled along the gallery to a location known as the gare, or train station. The chassis was moved to another wagonette pulled by a small locomotive and transported to M1 or to the combat block's M2 magazine. Chains connected to pulleys on overhead rails were hooked to the top of the chassis, which was hoisted out of the wagonette, and pushed by hand along the rails into M2. To replenish the gun, the chassis was again pushed along a rail and transferred to a rail in the roof of the elevator leading up to the combat block. The elevator rose to the gun level, the door was opened, and the chassis moved onto rails in the ceiling of the surface block to the M3 storage area near the base of the gun.

Telephone communications throughout the fort were handled by a telephone switchboard located in the command post near the combat blocks. This switchboard was connected to the outside system by underground cable. All the combat blocks were connected to each other and to the command post, storage depots behind the lines, and to reinforcements, as well as to all observation posts. This system allowed the guns to fire just three minutes after spotting a target by an observer. The fort was equipped with a transmitter-receiver and an outside antenna if the telephone service was cut.

In time of war, the garrison was manned by 812 men: 27 officers, 97 NCOs, 107 Corporals, and 587 soldiers, plus 161 engineers. Beds were available for those who were off duty. The fortress was set up like a ship, where the number of beds was less than the number of occupants. In Simserhof there were 509 beds for 812 men. There was plenty of water and chemicals for the toilets. Although conditions were not great, they were better than the trenches, or the forts of Verdun and Liège.

Operations inside the forts were an exact science. Three fortresses were linked to form an artillery group under the control of a sub-sector artillery commander. This would enable one fort to support the other and for massed battery fire to be easily coordinated.



Appendix Four
The Marine - Mobile Armored Cavalry Regiment

An excerpt from the author's AR-30 thesis "Whither Armor"

As mentioned above the Squadron is divided into three Cavalry Troops, one Fire Support Troop and the Headquarters troop. The Cavalry Troops each have three Platoons and a headquarters details. Each Platoon has 3 Guderians, 3 Smith-Webbers for the assigned Infantry Platoon, and a command Smith-Webber variant the "Shandar" named after the Andorian Armor genius of two centuries hence, General Shandar ch'Mhmery. With these 7 vehicles, 14 crew, 36 infantrymen, and a headquarters detail of 6, makes a very heavy Platoon of 56 marines.

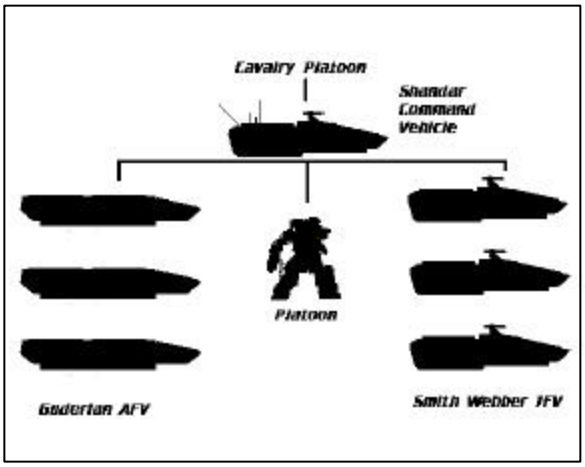


Figure One

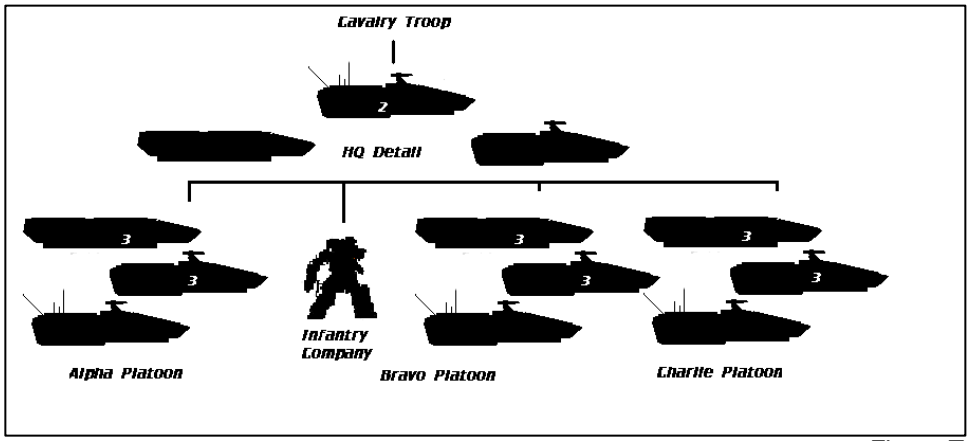


Figure Two

Each Troop would then have 21 line vehicles and a headquarters detail on one Guderian, one Smith-Webber and two Shandar's with 8 crew, 12 infantrymen security detail and 12 headquarters staff, for a combination of 25 vehicles, and 200 marines, thus about 50% more weight of fire then a standard Armor Company/Troop. Finally the Squadron will have three of these troops, a Fire Support Troop with 8 Artillery Moduled Pattons, 3 Smith Webbers, and 4 Shandar's. The Squadron Headquarters troop will have 3 Guderians, 3 Smith-Webbers, and 6 Shandar's as well as 4 Ambulance versions of the Smith-Webbers.

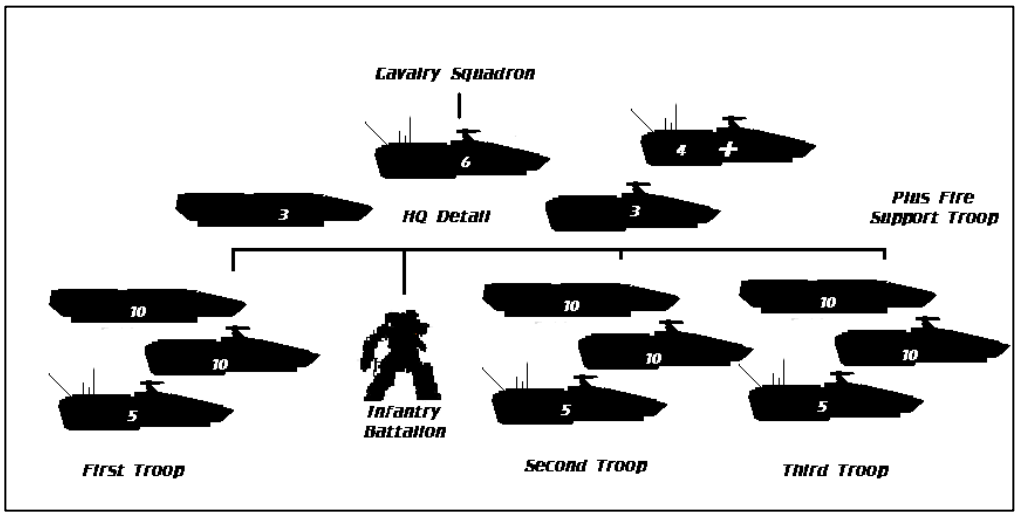
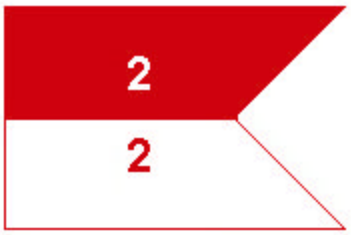


Figure Three

While the squadron is heavy on firepower and speed, it is light on support and logistics. This is to be provided by follow-up conventional marine units or Starfleet vessel support. The total compliment then of the Marine Mobile Armored Cavalry Squadron is 106 vehicles and 800 Marines.

The next administrative level is the Mobile Armored Cavalry Regimental Combat Team, or Armored Cavalry Regiment. The ACR's will be numbered and carry distinctive Regimental Heraldry representing each of the founding Federation member worlds. The Second Armored Cavalry Regiment carries heraldry from Earth, from the old America 2nd ACR, it's distinctive Swallow Tailed Pennant, is unique in the SFMC universe of flags and honors.



Each ACR has essentially the same inherent force structure. As normal for SFMC large-scale units, there is a headquarters detail, three maneuvering elements, and a support element, but at the ACR level, there is also an Aerospace element as well.

Joining the three Cavalry Squadrons is the Aerospace Cavalry Squadron (Air-Cav), the Fire and Support Squadron, and the Headquarters Squadron. Each Aerospace Squadron is equipped with an Aero-Scout Troop, three Aero-Attack Troops, an Aero-Transport Troop, and a Headquarters Troop. With 72 Aerospace craft of different configurations, the Air-Cav squadron is a welcome and powerful addition to the ACR.

In addition to the Air-Cav Squadron, the Fire & Support Squadron brings 36 Artillery Moduled Pattons, 12 Smith-Webbers, 6 Shandars, and 24 Puller variants carrying supplies and additional ammunition. The Headquarters Squadron has a security detail of 10 Guderians, 10 Smith Webbers, 5 Shandars, its own 7 Command Shandars, as well as 24 Smith-Webbers variants, including Ambulances, Military Police, Combat Engineers, and kitchen vehicles. In all the ACR has 452 vehicles, 72 Aerospace craft, and over 3600 Combat Marines.

The ACR has the tactical flexibility to combat enemy armor, infantry, aerospace, and even emplaced artillery. It's ability to move at 1200 kph, means that even aerospace assets would be hard pressed to maintain speed-superiority, and that enemy forces would never know for certain where the closed fist will land.

Appendix Five
CE-30 Thesis Submission and Approval

Proposal Submitted: 28 November, 2001
Proposal Approved: 28 November, 2001

From: terminator [hstrymjr@yahoo.com]
Sent: Wednesday, November 28, 2001 5:37 PM
To: Scott A. Akers
Subject: Re: CE-30 Proposal

Project approved.
Good Luck.

--- "Scott A. Akers" <chunone@nwlink.com> wrote:
> CE-30 Thesis Submission and Approval

Fr: Scott A. Akers <chunone@nwlink.com>
Sent: Wednesday, November 28, 2001 2:05 PM
To: John Roberts, Truman Temple
cc: Jim Monroe

Subject: CE-30 thesis proposal

Colonel Roberts, and Brigadier Temple

Below is my proposed CE-30 Thesis, Introduction and Outline.

Please let me know if this will be acceptable.

LGen Scott A. Akers

Thesis Proposal proper

The marines are about combat. Marines are about maneuver, firepower, tenacity, and combat. A marine unit is at all times, 24 hours day, 7 days a week, 52 weeks a year, about Combat. They live in the field, they die in the field, they are the field. A Marine never needs rest, relaxation, food and comfort, or any other luxury considered minimal by civilians, because they are … Marines. Right??!!?? In the words of an American General in the late 20th century, that is so much "Bovine Scatology". Starfleet Marines are the finest combat warriors in the galaxy. They have stood up to Romulan Centurions, Klingon Bezerkers, Jem'Hadar, and Borg. But they are humanoids, and like the machines and power armor suits they will wear out, break down, and fail, unless the Corps provides proper maintenance to its finest combat weapon and tool. The Marine.

During peacetime, the bulk of the Starfleet Marine Corps is in Garrison waiting its turn to cycle out into Fleet Marine Force units. But during combat those Garrisons must be pushed forward into the combat zones, onto the border reaches, on the other side of the disputed Border. These "Forts" are build by the SFMC Combat Engineers, often under fire, and provide much needed centers for Marines to rest, recuperate, recover, and reorganize. These Forts are the focal point for reinforcements and replacements to join up to line units, and new vehicles and supplies to be distributed to the troops.

This thesis will detail the construction of one such fort, Fort Lakota, from its design, construction under fire, and final tear down. The thesis will further detail how a modern SFMC Fort can be both garrison and a hinge point in the war of maneuver that is the trademark of the SFMC.

Proposal Outline

OPENING
- A. Introduction
  1. Anecdote
  2. Suggestion
  3. Thesis
- B. Reference to Previous Works
  1. IN-30
  2. AR-30
  3. SU-30
- C. Layout of Paper
  1. Design
  2. Logistics
  3. Constructions
  4. Usage

I. Design
- A. Layout
  1. Outer Wall and Lines of Fire
  2. Inner Wall
  3. Keep
- B. Defense
  1. Forward Defense
  2. Defense in Depth
  3. Anti-Air
- C. Offense
  1. Patrols
  2. Counter-Offense
  3. Using the Fort, as a hinge for Attacks

II. Logistics
- A. How much contents
  1. Manpower
  2. Vehicles
  3. Supplies
  4. Support
- B. How large volume
  1. Manpower
  2. Vehicles
  3. Supplies
  4. Support
- C. How much material
  1. Raw Material
  2. Fabricated Materials
  3. Finished Equipment
  4. Weapons

III. Constructions
- A. Landing the Construction Team
  1. Advance Team
  2. Landing Under Fire
  3. Initial Perimeter
- B. Defense while Building
  1. The Initial Perimeter
  2. Fire bases outside the Keep
  3. The Inner Wall
  4. The Outer Wall
- C. Actual Erection of the Fort
  1. Barracks and Offices
  2. Support Facilities
  3. Weapons Emplacements
  4. Airfield / Spaceport
  5. Docks when applicable

IV. Usage
- A. Combat
  1. Retaking / Taking a planet
  2. Planetary Defense
  3. Staging Point
- B. Peace Time
  1. Garrison
  2. Recruit Depot & Training Facility
- C. Tear Down
  1. Turn over to Civilian Authorities
  2. Dismantle and move
  3. Dismantle and destroy

CLOSING
- A. Review of Paper
  1. Design
  2. Logistics
  3. Constructions
  4. Usage
- B. Refer to Future Research
  1. MD-30
  2. PD-30
  3. PD-40
- C. Conclusion
  1. Thesis-Decision
  2. Thesis-Suggestion
  3. Anecdote

APPENDICES
1. Vauban
2. Civil War
3. Maginot Line
4. The Modern M-MAC