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## **System Control Points**

**by**

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Thought is the basis of theory. Theory is the basis for doctrine. Doctrine is the basis for operational practice. Operational practice refines our thought. Today we'll continue our journey through thought and theory by looking at system control points.

OK. What are system control points? And why would I be interested in them anyway? Good questions. I suppose though as with any discussion, we should begin by defining at least a couple of terms.

### **System**

The first thing we need to understand is what a system is. I know, I know. There are at least eight different dictionary definitions of what the word system means. But for our purposes, we're going to be using it in terms of spatial orientation. Thus a system is an area, physical or otherwise, containing inter-related features. Physical/geographical or technological features may create natural boundaries for systems. However, the exact size, shape, or nature of a system may differ depending upon definitions based on other considerations and requirements. Confused? Well lets look at it from another perspective.

### **Physical Systems**

A physical system is one that has geographically or physically defined boundaries. One example of a geographically defined system would be the Atlantic Ocean. The Atlantic Ocean is a system naturally bounded by land and artificially bounded by our definition of other bodies of water such as the Pacific Ocean, the North Sea, and the Mediterranean Sea. The Atlantic has no natural dividing line that separates it from these other bodies of water. Mapmakers just defined it as ending at a certain location with the other bodies of water beginning by definition at those locations. Likewise, Europe is a geographical system bounded by water and by an artificially defined land boundary to the east. Exactly where that eastern land boundary lies has changed over time depending upon the political realities of the time period. Both the Atlantic and Europe as systems are composed of inter-related physical features (water, undersea valleys, plains, mountain chains, etc.) which one must pass through, on, or over to arrive at any particular point within that system. Example of physically defined systems would be a building or a ship. They have self-contained areas with clearly defined boundaries, with inter-related features (corridors, decks, electrical systems, etc.). A physically defined system (such as a room) may be a subsystem in a larger system. In fact, any system may, depending on how you define it, be part of another, larger system.

## **Technological Systems**

A technological system is not defined by geographical boundaries. Rather it is defined by the components that comprise it. A power system, for example, is made up of the plants, generators, transmission lines, transformer stations, and even the locations where the power is used. An automated system is composed of the computers, data, folders, files, routers, transmission media, and, in some instances, even the end users of the information contained in the system. A technological system is also composed of inter-related features even though they may not be defined in terms of geographic or physical boundaries. For the most part, the boundaries and the inter-related features of a technological system can be seen as its equipment, hardware, and software components.

## **System Space**

OK. We've defined what a system is. It can be either physical or technological in nature. Where do we go from there? We look at systems so we may better understand, utilize, exploit, destroy, or protect some aspect of that system to achieve our operational objective. To do that effectively, we must think in terms of system space and then those points that control access to that space.

System space is that area and features comprising the entire system. One must physically or virtually pass through this space to arrive at a location within a system. In Europe, one must pass through or over the Alps, for example, to get to Switzerland. In a building, one must pass through entryways, stairways, and hallways to get to the desired room. In a computer, one must virtually pass through software and hardware connections to arrive at the desired program or data location. Earlier we talked about how each system has inter-related features be they geographically or physically defined, or technological in nature. Certain of these features may by their nature be used to control access to the rest of the system's space or area. When they are used in such fashion, they are system control points (SCPs). These SCPs can be used to exert control over or to prevent access to the rest of the system or to specific points within the system.

## **System Control Points**

OK then, every system has certain points which, when properly used, can exert control over the entire system. When looking at which points these are, we should always keep in mind the factors of

- a. Nature/Terrain of the system
- b. Mission Objective
- c. The Forces Involved

## **Nature of the System**

System control points will vary according to the nature of the system one is seeking to control. Different systems, due to different system environments and features, will have different SCPs. A building has different characteristics than an open area. An ocean has different characteristics than a land surface. Space has different characteristic than an atmospheric environment.

Cyberspace is different than any of the preceding environments. What they all have in common however is terrain.

## **Terrain**

Terrain is made up of the inter-related features of the system being considered. A flat expanse of land or ocean will have different features than a stretch of mountains with one or two passes going through them. Likewise, the terrain of a cyber system (the equipment, folders, software, etc, comprising it) is completely different than that of a planetary system (planets, moons, asteroids, etc). But in all systems, it is these features (the terrain) that present the first opportunities for determining those points that can be used to control access to the rest of the system or to a single point within the system area.

Terrain then, is the first stop we take when we begin our selection of potential SCPs. Some terrain just seems more defensible than others at first glance. How about those mountain passes we mentioned earlier? Surely it would be easier to defend at them than on the open plains of a steppes environment. However, a series of man-made features, like forts or trenchworks, might make that flatland less inviting than it seemed at first. Terrain incorporates ALL the features of the system, natural or man-made.

## **Mission Objective**

The second stop to make when considering potential system control points is the objective of the mission being undertaken. Let's say we are examining the Mediterranean Sea as a system. Although there are many points in the Mediterranean that could be potentially used to control access, it is the objective of the mission at hand that makes them relevant or not. If, for example, our objective is to stop all naval shipping from leaving the Mediterranean, three locations become natural SCPs. The Straits of Gibraltar, the Dardenelles, and the Suez Canal are three points that could be used to prevent shipping from leaving the Mediterranean. Because they can be used to achieve our objective, these terrain features become relevant to what our mission requirements are. Other features, such as the islands of Sardinia or Corsica, might contribute to the control of specific locations inside the Mediterranean but are not relevant to achieving the objective of stopping shipping from leaving the system. Thus the value of specific terrain features of a system is situationally dependent upon the mission objective being pursued.

## **The Forces Involved**

The third stop we make when considering potential system control points is the nature of the forces involved. Let's use the following examples to explain.

### **Example 1:**

Our system is our home country. The geographical terrain of our country features a series of mountain chains that form a natural border with our neighbor to the east with a smallish sea marked by rugged inaccessible coastline. The interior of our country consists of a series of large

fertile valleys separated by mountainous terrain but linked by easily traveled roads carved through the mountains.

Our eastern neighbor has expansionist designs on our territory. There are two possible routes for any eastern invading force to travel by. The quickest, most direct route to invade our territory is through a single pass through rugged mountainous terrain. The second route is a longer journey, over a stretch of sea that separates our two countries to a narrow coastal beach on an otherwise rocky coastline. Both of the two locations, the pass and the coastal beach, are potential system control points. Both could be used to control or prevent access into the system of our home territory.

Our objective is to prevent the enemy forces from successfully invading without having our forces leave our home territory. Only by looking at what forces can be brought to bear will we be able to determine which of these potential SCPs are relevant to our defense.

Force mix 1: Let's say our opponent has a strong land army but no navy or commercial transport capability. We have an army roughly equivalent in strength. In this linear environment, since our opponent has no ability to transport forces across the sea, the coastal beach loses its relevance as a system control point. The mountain pass, on the other hand, now stands as the sole point for the opposing force to attempt to gain entry into our territory. As such, defending the pass could prevent the enemy from doing so. The pass becomes the relevant SCP.

Force mix 2: Same situation but different forces. Now the enemy has both a strong army and a strong navy with a good transport capability. We still only have the army. We still have a linear environment, however, with this force mix, since the enemy is now able to transport troops to the coastal beach, it becomes a relevant SCP. The mountain pass does not lose its importance, but now we must focus our efforts in two locations to prevent invasion of our nation.

Force mix 3: Same situation but still different forces. Add an air force with a good mix of attack and transport capability to the forces our foe possesses. Our forces remain the same. Our enemy is now capable of operating in a geo-spatial environment while we remain bound by our linear force capabilities. The enemy may still invade by sea or through the mountain pass. The beach and the pass retain their importance as SCPs. However, now the enemy has the ability to bypass these points altogether by flying over the mountains or another part of the previously inaccessible coastline. Now, because this capability makes the interior space of our country (the system) accessible, we must now look for those features inside our country that can be used to contain any enemy force that enters in this fashion. These features would also become relevant as SCPs in this situation.

Thus the types and capabilities of the forces involved will be an important factor in determining which features of a physical system will be relevant as system control points. This is also true of technological systems. Remember, a technological system is not defined by geographical or physical boundaries. Rather it is defined by the components that comprise it.

### **Example 2:**

Our system is the telephone system we use every day. The technological terrain of the telephone system consists of the phone instruments, the wires that connect the phones, the switching centers, the buildings that hold the phone equipment, and even the people who use the phones to accomplish their day to day business. To some extent, the entire telephone system is vulnerable to physical destruction. Fortunately, our neighboring country doesn't seek to physically destroy the system but rather wants to obtain access to the military information carried everyday across it.

Our objectives are to:

1. control access to the system and, failing that, at a minimum to
2. deny access to the information carried by the system to all but authorized recipients.

So how do we go about determining what are relevant SCPs for this technological system? The process we use is the same as for a geographical system. It's just that the nature of the system (technological) and its terrain (component parts) force us to think along different lines. Our telephone system is vast, serving commercial, private, governmental, and military users. How do you control access to a system that is composed of widely distributed switching stations with millions of miles of telephone wire stretching across the countryside? Well, just as with our geographical example above, you need to identify the relevant system control points. There may be only a few key locations in the system that are relevant for controlling access to the system and/or the information on it. As before, to meet our objectives, which components of the system will be relevant as SCPs will depend upon the forces involved.

Force mix 1: Neither our opponent nor we are very technologically advanced. Although we both have developed telephone systems, for some reason neither of us have yet developed the means to wiretap the system or electronically pick up telephone emissions. Our opponent however, has developed remote audio detection gear (a super ear as it were) that allows them to listen to conversations as they take place provided they are within 60 feet of the conversation and the building is of normal construction or has normal single pane windows.

Since the enemy has no wiretap or remote electronic eavesdropping capability, the miles of wires and the switching centers although exposed, cannot be accessed and thus are not relevant to protecting the information carried on the system. With their current capabilities, in order for them to access the system and its information, they would have to gain access to the immediate area where phones were being used, to the people using them, or to an area close enough to be able to use their remote audio device.

Therefore the locations controlling access to the area the phones are being used (office areas) and the area immediate around it (out to 60 feet) become the relevant SCPs in this situation. Entry control points could be constructed at these points and fencing could be put up to limit access to the areas where the phones were being used. And don't forget to put at least double pane glass in those windows and to soundproof the walls.

Surely we've solved the problem now that we've taken the measures described above. Of course, once people left their work locations they might choose to discuss what they had talked about while using the phones during the course of the day. Interesting dilemma you say. How do you control access to the information on a system when the people using it are themselves a source for the information you seek to protect? You could sequester everyone in a housing area with tightly controlled access. Although that might work for specific projects, the prospect of maintaining that kind of tight control over a large number of people is anathema in a democratic society. Other more practical means of maintaining control of the information should be used. In this instance, each individual with access to information, our neighbor might want access to, becomes a SCP unto themselves. Operational security (OPSEC) and other programs may be used to obtain an imperfect level of control over these individual system points (read human beings).

Force mix 2: The same situation, however we've just discovered that our neighboring country has developed a means of tapping into the telephone lines to monitor calls being made and the information being passed in this fashion. The SCPs identified previously continue to be valid here as well. After all, they still have that audio device and access to our people after they leave the office. We must continue to control access (as best we can) to the information available from those system points. However, now we have a new problem. Remember those widely distributed switching centers and those millions of miles of telephone wires stretching across the countryside? The newly developed wiretap capability of our neighbor now gives them access to all of it. How can we prevent access to a system that is that vast? In addition to those already identified, what points in it are now relevant as SCPs?

It is impractical to try and restrict access to the phone lines themselves. There are far too many miles of lines to do so effectively. We could identify those lines that carry what we consider to be crucial information and restrict access to them through hardening, creating inspectable secure wirepaths (in buried pipes), or through some other means. However, unless the lines were strictly point-to-point in nature, this also may prove impractical when using a domestic, commercial phone system. Instead let's look at the challenge from a different perspective. Remember our objectives?

1. control access to the system and, failing that, at a minimum to
2. deny access to the information carried by the system to all but authorized recipients.

Facing this new threat from our neighbor, we can no longer effectively control access to the system. Thus we must attempt to achieve objective number 2 and deny access to the information to all but authorized recipients. We've already established control of the working area. Now we need to achieve control of the information itself. Since we cannot do so by control of the wires or switching centers, control must be obtained before or as it leaves the working location. Thus the relevant SCP, in this instance, again becomes the place from or the means by which the information is transmitted. The traditional solution to achieving control at these points is to use code (The red hen is at the blue door.) or to encrypt the information in some fashion before it is transmitted. This renders the access our neighbor has to our telephone lines moot since they are unable to understand what they hear.

## **Momentary Pause**

Still with me? Let's pause for just a moment and review where we've been thus far. We've looked at what a system is, described different types of systems (physical and technological), each with their own types of inter-related features/terrain. We've defined what system space is and looked at how certain points can be used to control access to and from the system or points within it. We've examined the selection of relevant system control points in light of the system terrain, our objectives, and the force mix available and faced. All well and good, but where do we go from here? There is one more additional step we need to take.

## **Application**

Let's take what we've looked at thus far in regards to systems and SCPs and apply it to what we know about the five dimensions of warfare. Remember, those are

1. Point
2. Linear
3. Geo-spatial/globular
4. Time
5. Virtual/cyberspace.

Let's review them quickly.

Point: One dimensional – single target - the building block of warfare.

Linear: Two-dimensional – traditional conventional warfare - limited to the surface of the land or water.

Geo-spatial: Three-dimensional points in space upon the globe – surface, subsurface, and aerial components all come into play.

Globular: Three dimensional - globe-like in shape – subsurface, surface, air, and space – governed by X, Y, and Z-axes.

Time: Timing, deconfliction, delay, hold, suppress - control of any point for only the time necessary for an objective to be achieved.

Virtual/cyberspace: Control of and over automated processes.

Got it. Good. Now let's look at SCPs in relationship to these five dimensions.

## **Point**

One-dimensional: We're talking a single target here; a dot on the map, a single location, a file, a building, a room, but you get the idea. But that single point doesn't exist in a vacuum. Although we may seek to gain access to or to protect this single point, we must still understand that it

exists inside a three dimensional or virtual environment as part of a physical or technological system. In order to gain access to that point we must first successfully traverse the system terrain to put ourselves in a position to achieve our objective. How we do that again depends upon the nature of the terrain, our objective, and the nature/capabilities of the forces we have at our disposal and of those opposing us. Well gee, that's easy you say. In the world of high technology you just crank up that old cruise missile and voila, that munitions factory you wanted destroyed is history. It might be just that simple although your opponent may have correctly chosen SCPs and put forces there that could prevent your cruise missile from reaching the target. Of course if your objective is to capture and hold the factory for a certain amount of time to deny enemy use of it, the dynamics of the situation become considerably different. Now you must successfully bypass or negate whatever SCPs exist to protect that plant. Any forces deployed at those SCPs must also somehow be successfully dealt with. How you achieve your objective or sometimes if you can achieve it depends upon the capabilities of the force available to you. Perhaps sending troops in isn't the only or necessarily the best means available to you. Perhaps you may "capture" the plant by gaining control of or disrupting its automated processes. The terrain faced and the SCPs encountered would be completely different between the two types of force employment.

Protecting a point location or target presents a different set of challenges. How do you restrict access to a specific location? As we've just discussed above, each point exists within a greater system and is surrounded by system space (i.e.: a building in the system of Manhattan). Hey the rest is easy, right? We just control access to the point by controlling those points that give access to it. We select appropriate SCPs, place appropriate forces at those locations, and presto, we've protected the location! Not so fast there. You may chose to protect a specific system point (building, computer file, office, etc.) by controlling the appropriate terrain features that give access to it (street, log-on password, building front door, etc.). However, public policy concerns, limited assets, or incorrect assumptions may limit your ability to completely do so. It may be impractical or impossible to secure/protect all of the system's points against a point attack. Therefore it is important to prioritize what points in the system are of most value to your objectives and control access to them as effectively as possible given the system terrain and available forces.

As we pointed out above, you chose to protect a specific location in a system because of its value to you. However, an opponent, (such as a terrorist), may have a completely different value system and objective. You may have controlled entrance to the building (objective: prevent access to the federal office on the third floor) while they aren't interested in getting into the building at all but rather in destroying it. This mismatch of objectives can lead to unfortunate results. Also, your forces and measures may appear to be adequate to protect the location in a point environment (fences, entryway controls, sound proofing, and double pane glass) but are completely ineffective against an opponent with more advanced capabilities (such as that cruise missile or wiretapping). Successfully preventing a point attack against a valued location will depend on your successful anticipation of an opponent's objective as well as your possession of appropriate forces adequate to prevent access through the system to the protected location.

## **Linear**



Traditional two-dimensional battlefield: We've really already examined this area earlier in the article in "The Forces Involved" section. For those of you who'd rather not go back and re-read it, let's give a synopsis here. On the two dimensional conventional battlefield, limited to the surface of the land or water, there will be geographical features (such as an isthmus, mountain pass, fortifications, etc.) that will tend to be better suited for use in achieving your objective. Which of these features are appropriate to be SCPs will depend upon what that objective is (i.e.: prevent the enemy from entering our homeland, stop them from advancing past this location on a map, or deter them from taking any action whatsoever), as well as what the force mix is. A smaller less capable force may be sufficient to hold a mountain pass against superior numbers where they might be restricted to unconventional warfare action in a flat but heavily forested area. However, when facing an opponent with more dimensional capabilities (geo-spatial versus linear) the choice of SCPs will become more complex as you seek to negate their superior capability through use of terrain features and the forces available to you.

### **Geo-spatial/Globular**

Geo-spatial:

Points in space upon the globe: Change in the force mix available to us and/or our opponent may move us into a new warfare dimension. The geo-spatial three-dimensional battlespace involves surface, subsurface, and aerial components. As we add a new dimensional level, we also add a degree of complexity as we look at what might be appropriate SCPs for this environment. In the linear battlefield environment, we chose SCPs based on our objectives, terrain features, and our force capability. As we move into the geo-spatial battlespace, these selection criteria remain valid. However, provided we have achieved a geo-spatial force capability, we now have, for the first time, the ability to choose SCPs on the basis of technological capabilities rather than on the inter-related terrain features of the system.

In example 1 in "The Forces Involved" section, in the linear environment, we chose the mountain pass and the beach as SCPs because they restricted access to our country. True, our artillery might be able to reach beyond these SCPs but they were the key terrain features that would permit our forces to obtain our objective of preventing our enemy from invading our country. In force mix 3 of that example, our opponent possessed an air force where we had none. The difference in our capabilities enabled our opponent to bypass to some extent our previous two SCPs. This forced us to look for terrain features inside the system (our country) that would enable us to negate to the maximum extent possible any advantage gained by their ability to fly at will across the border. Had we also possessed a geo-spatial capability (i.e.: fighter aircraft, radar, surface to air missiles (SAMs), etc.) the SCP considerations would again change.

Radar gives us the ability to see in a geo-spatial sense, but doesn't by itself change the manner in which we face the opponent. It gives us a tactical advantage in that we can see enemy movement more clearly, but we must still fight them on a linear basis. The introduction of SAMs into the force mix changes things dramatically. We can now project force into three dimensions. Our opponent is no longer free to fly at will over our country provided we choose as SCPs those terrain features that most enhance that capability. Those mountains that mark our border now have greater significance than just their impassability to ground troops. Now they may be used as

locations to position our radar and SAM units to protect our airspace. Interior positions in the country may be selected for the same reason. However, the positions of the SAMs and radars are not SCPs as we have seen before. In a sense they are man-made additions to the terrain. They are critical to achieving the objective of defending the country. But they are so because of our new ability to project force into a third battlespace dimension (airspace), allowing us to establish a non-physical terrain based SCP predicated solely on the technological capability of the weapon system involved.

Let's say the range of the SAM is 100 miles to effectively track and kill aircraft. Provided we can see that far (radar assisted or otherwise), that allows us to establish an SCP somewhere in the atmosphere of between zero and 100 miles away from the SAM location. Let's say we establish a positional SCP at fifty miles out from our border. Any aircraft flying closer than that to our border is subject to destruction at our discretion. Airspace is a terrain feature. But its physical attributes are completely different from the mountains. It is the SAM technology, not the air itself, which permits us to control access to the system of our country. In a sense, we have chosen a non-fixed, arbitrary SCP. We certainly can't change the mountains' location or the position of the mountain pass. But we can change our positional SCP any time we like up to the limits of the available technology. In fact, we chose above to establish positional SCPs outside the limits of our defined system (our country). Possessing aircraft allows us to extend that ability even further.

In much the same fashion as SAMs, aircraft can be used to create positional SCPs to achieve control over a particular area or portion of airspace. Depending upon their range and capabilities, they can be used to establish these anywhere we'd like, including over the territory (their system) of our opponent. Aircraft technology frees us largely from the constraints of our previous terrain based SCP selection. It allows us to attempt to deny our opponent use of their geo-spatial abilities and permits us to establish positional SCPs on a temporary basis anywhere our aircraft can fly. Additionally, we can now use terrain features beyond our borders (outside our system) to contain, delay, or destroy enemy ground forces before they ever reach our fabled mountain pass. We can now impose temporary system control points wherever it suits us based upon our objectives. All previous SCP considerations continue to be valid, but our selection criteria have been considerably broadened.

Submarines bring much the same capability to bear in the maritime arena. Their subsurface capability brings us into the geo-spatial dimension for naval warfare and allows for the establishment of positional SCPs on a temporary basis anywhere within the limits of their range and armament capability. Terrain features such as straits, bays, harbors, may be chosen for their ability to enhance the capability of the vessel but the submarine may establish a SCP at any location in the range of its weapons within the body of water in which it is operating.

Globular:

Globe-like or spherical in shape governed by X, Y, and Z-axes: All distances anywhere in the sphere are determined from a selected center point and an X, Y, and Z-axis measurement. Pick a point. Use that as your center point. Now picture a transparent globe or sphere around it. That is

a globular environment. The environment will have various types of natural and man-made terrain in it depending upon its size. To picture this better, let's go straight to some examples.

Take an aircraft carrier in the middle of the ocean. Use that as your center point. Now picture a transparent globe or sphere around that carrier. That carrier is operating in a globular or spherical environment. The environment has surface, sub-surface, air, and possibly space components to it depending on how big you make the sphere. The sphere will have terrain in it (air, water, ships, and some ocean bottom features). Given the objective of protecting the carrier, what do you select as SCPs? Ruling out the bottom features for the moment, there are no physical terrain features we can consider for use as natural SCPs. Thus the carrier must depend upon the establishment of positional SCPs (PSCPs) for its defense. Based upon the capabilities of the force mix on and with the carrier, PSCPs should be selected within the sphere to ensure, to the maximum extent possible, the protection of the carrier. However, we're not talking about selecting only one or two positions at selected locations in the sphere. True, points might be selected for force deployment to enhance possible use of force in defense of the carrier, but here we see the continued movement away from SCPs tied to a single terrain feature. In the geo-spatial section, we talked about how with a SAM capability we could establish a PSCP somewhere in the atmosphere of between zero and 100 miles (the SAM range) away from the SAM location. That didn't mean we necessarily selected a single point in the atmosphere. Rather we selected an arc, a half-globe as it were, with the SAM location as the point from which that half-globe is measured. If we so chose, any aircraft passing into the area defined by that half-globe could be engaged. In the same fashion, what we have really done in the example of the aircraft carrier is to select, based upon our force mix capabilities, a positional globe or sphere with the carrier as its originating point. That sphere has no fixed SCPs on it but rather every point upon it essentially becomes designated as a SCP. If we so choose, any aircraft, surface vessel, or submarine passing into the area defined by that globe could be engaged. This SCP sphere moves as the carrier moves and is defined by the position of the carrier rather than by any fixed physical feature. This is of course the simplest view. Physical terrain features (islands, peninsulas, shallow seas, waterways, or smallish seas bordered by land) or lessened force capabilities may present us with additional challenges that impact SCP selection and may negate to some extent our ability to effectively control the system area around the carrier.

Now let's substitute an Airborne Warning And Control System (AWACS) aircraft for the carrier. The principle remains the same. Bearing in mind our objective of protecting the AWACS, a SCP sphere could be established around that aircraft. The aircraft is then the center of a globe or sphere that may be composed of air, space, land, and sea terrain features depending upon the location of the AWACS. If an aircraft, ship, submersible, or other potential threat should seek to penetrate that SCP sphere, the AWACS could call upon available forces to engage the threat. As with the carrier, the SCP sphere moves with the AWACS and is defined by its position rather than by a fixed physical location. Again as with the carrier, physical terrain features or insufficient support force capability could impact our ability to effectively control the system area around the AWACS. If no forces are allocated for AWACS protection, the edge of the SCP sphere essentially becomes a warning zone and should be far enough out from the AWACS to permit an appropriate and timely reaction to any perceived threat.

OK. Pretty straightforward stuff. Now let's go the next step and expand our view of the three dimensional globular environment to space systems.

### The Globular Environment in Space:

The nature of planetary environments leads to thinking in linear and limited three-dimensional terms. Space by its very nature demands a more open dimensional view. Space systems are classically globular or spherical in nature but they are still systems as we understand them. The context and scope of the system may have changed but all the things we've discussed so far continue to apply.

Just as within the confines of a planet, space systems will vary. The number of objects, such as planets and moons or asteroids, within a given system will constitute the physical terrain of the system. As before, the size and nature of the system will in some measure be determined by how we define it. The Solar System has terrain composed of the sun, planetary bodies, asteroids, comets, etc., and the area occupied by, and around these terrain features. The earth - moon system, on the other hand, can be viewed as composed of the earth and its moon and the area occupied and around them. The number and position of SCPs relevant for effective control of any given system will vary, as with on-planet systems, depending upon the terrain, the objective, and the nature of the forces involved. Let's look at a few examples. All examples presume a sophisticated sensor capability for detection, tracking, and, as necessary, targeting.

Example: System Space Control: For simplicity's sake, let's define our system as a single planetary body. The objective is to control access to or from that planet. Our force mix consists of a number of moveable space platforms with a complement of fighter craft. These craft are limited to space and extreme upper level atmospheric operations only. Thus our force mix imposes on us the requirement to achieve our objective without placing forces on the planet itself. The terrain of the system, as defined, consists of the planet and the area around it. There are no moons or other objects that might provide natural terrain locations either to use as SCPs or to use to establish PSCPs. However, the availability of space platforms allows us to change the system terrain by adding these man-made features.

Our challenge here, based upon the objective, is to arrange the man-made terrain in such a fashion that we may position our forces to allow creation of a SCP sphere around the planet. Such a sphere would permit us, within the capabilities of our available forces, to control access to or from the planet. The more platforms available, the smaller the area each must control within the designated SCP sphere. The deployment pattern of the platforms (and their complement of fighter craft) would depend upon the numbers available combined with a careful examination of both the planet and the area outside the system to determine the most likely departure and approach points based on known technology. Then based upon that assessment, the man-made terrain (platforms) should be positioned to permit effective control of the SCP sphere area.

Example: Planetary Support: Our system is still a single planet. Our objective is to control all space, air, and sea traffic between continent A and continent B. These are the only two continents on the planet, separated by two oceans. Our force mix consists of two space platforms with a complement of space and atmosphere capable fighters and transports, a complement of

marines on each platform, some limited beam and rail-gun weapons, and a space and atmospheric missile capability for both defensive and potentially offensive use. The terrain of our system now encompasses the continents and the oceans on the planet as well as the atmospheric and space area around the planet. The challenge here is to create a SCP sphere around the planet in such a fashion as to allow available forces to effectively control the specified traffic between the continents.

The availability of the space platforms, permits us to alter the terrain by choosing where to position these man-made features. Logically, we would position them separated to provide maximum coverage of the planet's surface while still permitting effective space control. With the forces available, we could choose to station some of our assets (fighters, transports, missiles, and marines) at appropriate locations on each of the continents. This would allow the establishment of SCPs, PSCPs, and half-globe SCPs within the sphere based on the capabilities of the forces at these locations. Careful placement of these forces, based upon examination of the system terrain and their capabilities should enable the platforms to act in concert with forces deployed on planet to detect, monitor, and control the specified space, air and sea traffic.

Example: Deep Space: Again for simplicity's sake, let's take that aircraft carrier we talked about earlier, transform it into a space carrier, and place it in deep space (that area outside or between whatever we've defined as our space system or systems). The terrain our carrier is in, is the vacuum of space, away from all planetary bodies. As in our earlier carrier example, there are no physical terrain features upon which to base selection of SCPs or PSCPs. Thus as before, to achieve the objective of protecting our space carrier, we are faced with the challenge of establishing a SCP sphere around the carrier using whatever force capabilities the ship carries aboard it. Again, the SCP sphere moves with the ship. Also, as before, as the ship travels, the terrain it passes through may change (asteroids, comets, dust clouds, even planetary systems) impacting SCP selection.

Thus on-planet or off, the same principles for selection and use of SCPs continue to hold true. Terrain, objective, and force mix influence what features, if any, are relevant for use as SCPs. Force capabilities will influence the warfare dimension one operates in and thus will impact on the nature of the SCP type (fixed physical terrain SCP, PSCP, half-globe SCPs, SCP sphere) appropriate to the situation.

## **Time**

Control of any point for only the time necessary for an objective to be achieved. It is not always necessary to maintain permanent control over an area to achieve the objective. If we seek to strike a point target inside the enemy's home territory (system), we may need to achieve only temporary control over a portion of that territory to do so. Temporarily negating the enemy's ability to control the area, thus allowing us access to the target, may achieve the same end. Whether we talk in terms of physical or technological systems, the approach is the same. Achieve or negate control, gain access to the target, destroy, modify, copy, acquire, or sabotage the target, egress from the target, and release or return control of the area.

All of the things we've talked about thus far come to play here. All the variations of SCP types, the force capabilities, and the other dimensions of warfare, all are compressed to achieving control over a specific location for a specific period of time. Let's say that we have an inferior naval force overall to that of our opponent. But we must ensure that a submarine bearing the commander of our Pacific forces successfully transits an enemy held area. Depending upon available force capabilities, we may establish PSCPs, terrain SCPs, and perhaps a half-globe or SCP sphere to establish control over a crucial waterway for the amount of time needed for the submarine to transit the area. Once the submarine has departed, the SCPs would be abandoned and/or moved in the interests of force conservation. Temporary control to achieve the objective.

## **Virtual/Cyberspace**

Control of and over automated processes. Virtually (pun intended) everywhere you look today you run smack dab into some sort of automated process. It's an entirely new dimension that in a way bypasses previous physical limitations. Need to get a book from the library but don't have time or don't want to get in the car and drive 15 minutes to town? Easy, turn on the computer, access the Internet, eat the sandwich you made earlier, and download the book. Great. But what does that have to do with SCPs? You know, system control points? Actually everything.

Remember that aircraft carrier in the middle of the ocean? It was physically well protected inside its mobile SCP sphere by all the forces it had at its command. But when we enter the cyber world, all the physical terrain, natural and man-made, and the SCP sphere based on it and the physical force mix disappear. They simply are not relevant any longer. Anyone with the right equipment, the right training, and a little time, can obtain access to an unprotected automated system. Once inside the system, they are then free to read, copy, modify, or destroy any data resident or flowing through that system. So unless the automated systems of the carrier are either isolated or protected by controlling access to the system and/or the data in it, the automated systems of the carrier are at risk in this cyber dimension.

Automated systems upon our carrier are not unique in this. Any automated system is capable of being compromised, attacked as it were, unless appropriate SCPs are used to control access. Don't think small here. Remember, someone who breaks into your office at night and downloads your hard drive has just successfully made a cyber point attack against your automated system. We are not just talking about virtual or cyber techniques. Physical access to or destruction of all or part of an automated system can be just as effective as gaining automated access depending upon the attacker's objective. All the physical aspects of SCPs continue to apply to prevent physical access to the automated system. Additionally however, we now have an entirely new set of terrain and force mix considerations to factor in when assessing how best to meet our objective.

Automated systems are inherently technological in nature. They are seldom confined by geographic considerations. They may stretch across millions of miles (as in the Internet) with access being possible from innumerable locations. These systems are composed of hardware/equipment, buildings, software, folders, files, individual bits of data, and transformers, power systems, and wiring. Each area essential to the operation of the system must be protected. A power outage will deny use of a computer system as effectively as a virus although the time

required to fix either may vary on the seriousness of the damage done. Thus when one thinks in terms of system terrain, one must take into account both the physical and virtual terrain features of the system.

You must have then both physical and virtual SCPs for an automated system in order to control access to it. Firewalls, black holes, passwords, and guard devices are virtual tools to establish cyberspace SCPs. However, the lobby guard desk, and office access points are equally important. Remember when we talked about the possible disconnect between what we value (and thus protect) and the objective of a potential adversary? We may establish virtual SCPs that prevent automated access to our LAN and thus our files. Our adversaries simply want to destroy the information. Thus they burn down the building. We must be prepared for both eventualities.

Thus, in the cyberspace dimensional environment, our force mix now contains a new virtual component. The operational effectiveness of both our forces and those we face may be augmented or reduced by successfully gaining cyber access to automated systems. Indeed, cyber attacks are already occurring everyday across the Internet and are a fact of life just as potentially dangerous as a cruise missile although the effects will be felt differently and be perhaps less immediately apparent to the casual observer.

### **Territory Covered**

We've covered a lot of territory in this article. We've defined what a system is, described physical and technological systems, looked at terrain features of each, discussed various types of system control points, looked at relevant selection criteria, and applied the concepts to the five dimensions of warfare. Across those dimensions we find the common factors of terrain, objective, and force mix. Although we haven't dwelt on it, each governs to some extent the others. If you don't have favorable terrain and/or you possess insufficient or inappropriate forces then your objective may have to be modified to suit current realities. If you have favorable terrain but insufficient forces then SCPs suited to the force mix you have should be chosen to permit accomplishment of the objective. If you have sufficient forces to meet the objective but no favorable terrain, you should create that terrain, where possible, to permit accomplishment of the objective. Remember, the three go hand in hand. Even the best SCPs are nothing but terrain features without forces (physical or technological) deployed at that location. And objectives are merely wishes without appropriate natural or man-made SCPs and appropriate forces deployed there.

System control points: Those locations, physical or otherwise, which, when properly used, allow you to control access to or exert control over a system.

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