C2 Through Space: The Key To Effects Based Aerospace Operations

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Abstract

A difficult task a Commander must accomplish relates to the types of information required to effectively engage the enemy in order to achieve the desired outcome with minimal expenditure of assets. In today's environment, the Commander is rapidly approaching, if not already achieved, information overload. The "heart of the problem" is to determine exactly what types of information the Commander really requires in order to reach a desired outcome. The types of information most useful to a Commander is based on the desired "effects" the Commander wishes to achieve and not just a fusion of the sensor data. This paper discusses a new Air Force Research Laboratory (AFRL) paradigm regarding information collection, fusion, exploitation and dissemination, namely "Effects Based Aerospace Operations (EBO)" and how it relates to another AFRL initiative, called the Joint Battlespace Infosphere. Additionally, this paper will discuss appropriate observable indicators of effects to collect, fuse and present to a Commander. Areas such as advanced sensor exploitation capabilities (e.g., hyperspectral and ultraspectral), on-board spacecraft fusion of effects information, and the ability to integrate many aspects of an on-going battle engagement to determine the best coarse of action to achieve the desired "effect" will be discussed. Using these examples, EBO, its potential, and its challenges will be examined. Furthermore, this paper will examine the difficulties and benefits of, and techniques for, integrating key observable indicators that a Commander needs to effectively engage the enemy and why the command and control through space is the key to effects based operations.

Introduction

Today, the military services increasingly engage in activities other than war. A few examples being Kosovo, Bosnia and Haiti. Additionally, increasing levels of outside influences are being imposed on Commanders -- most notably risk, collateral damage and casualty aversion. Consequently, Commanders are much more constrained in an OOTW situation or even a MTW than in the past. Figure 1 illustrates the Spectrum of Operations that today's military commander must operate.

To help mitigate the issues cited, timely/relevant information is required. However, today's information systems are a labor-intensive collection of individual systems that are difficult to integrate. They consist of stove-piped systems that are hard to use in building a recognized, consistent operational picture. These systems are brittle, inflexible, and time-intensive, which creates a disjointed process flow. There is very little interoperability among the Services for joint operations, and even less with U.S. allies for coalition operations. This was clearly evident in both the Bosnian and Kosovo operations. Today's systems give scattered, inconsistent snapshots of the battlespace, with different times, views or aspect angles, and parameter names.

Today only a fraction of the information gathered is used and a plethora of additional valuable information, available from non-DOD sources, is not being tapped. Information users periodically experience significant data overload (too much information is pushed to them as well as pulled from them) and – at the same time – information starvation, because users cannot find what they need in the morass of available data.

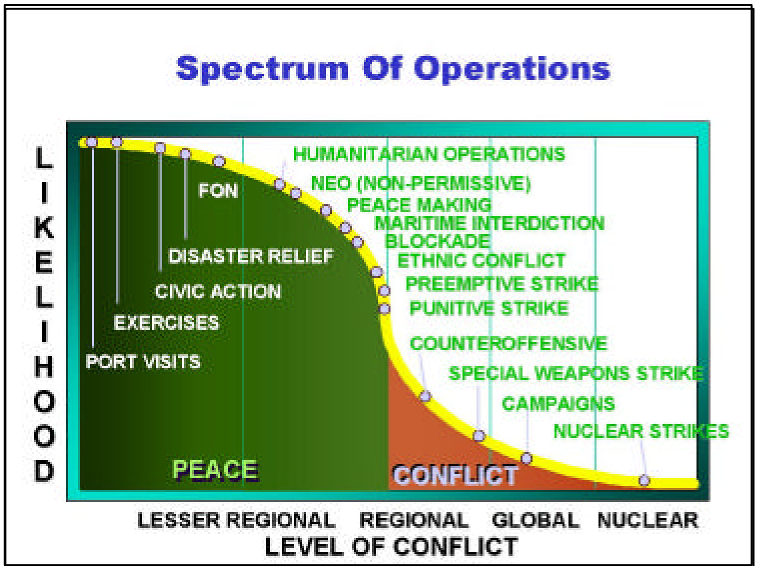

Figure 1: Spectrum of Operations

To meet this challenge, AFRL's Information Directorate, located in Rome NY, has embarked on a new initiative, called the Joint Battlespace InfoSphere (JBI) (see Figure 2). The JBI can be thought of as a system-of-systems that integrates, aggregates, and distributes information to users at all echelons, from the command center to the battlefield. This initiative attempts to integrate the vast amounts of spaceborne and airborne sensor data with other relevant information into the total aerospace picture, as illustrated in Figure 3. For example, in assessing the impact or success of a given air campaign, a number of uncertain information components arise, such as the impact of a given target on enemy movement, morale, etc. In addition, planners need to assess how prosecuting this target truly achieves the desired outcome set forth in both the national and tactical strategy. By allowing the user to assign some threshold for handling uncertain or missing information, planners can improve on their intelligence collection requirements, and speed up the process of re-planning or adjusting their campaign by having the system help fill in some of the missing information gaps. This picture, the Joint Battlespace InfoSphere, provides the Commander the required data/information to execute his/her mission in the total spectrum of conflict (refer to Figure 1).

Finally, today's dynamic and ever-changing battlespace demands an effects-based model that is predicated on a comprehensive, coherent, and integrated C2 system of organizations, processes, and technical means that ensures unity of effort. Aerospace power has the potential to create effects concurrently at all levels of war and throughout the entire depth and breadth of the theater. The inherent flexibility of aerospace power makes it possible to employ the whole weight of available airpower against selected areas in turn; such concentrated use of an aerospace force is a battle-winning factor of the first importance. Central to this vision is an integrated information infrastructure that sparks shared situational awareness and joint strategy and campaign plan development, thus providing future commanders the ability to determine what effects will best achieve operational objectives, and to systematically link those effects to actions taken across the n-dimensional battlespace.

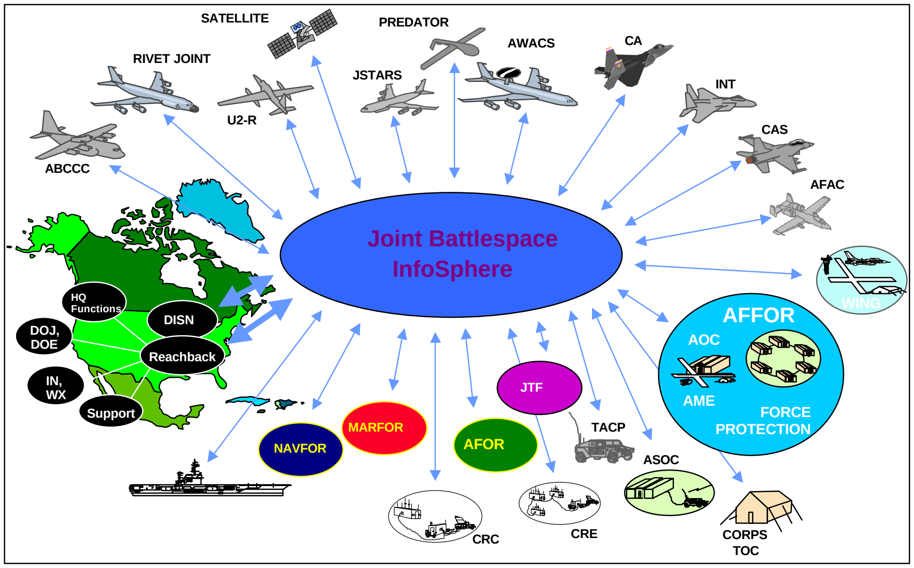

Figure 2: Key Players in the Joint Battlespace Infosphere

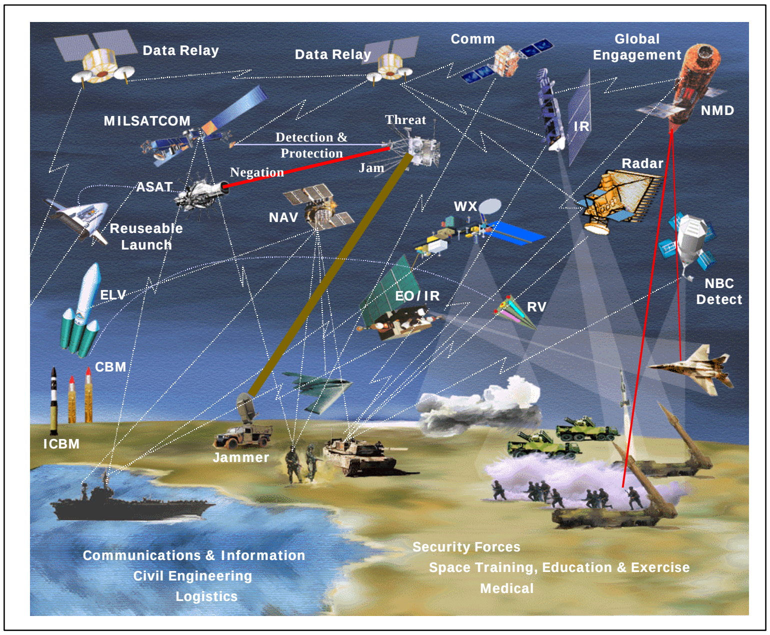

Figure 3: Space Assets are Key to Effects Based Aerospace Operations

What is Effects Based Aerospace Operations?

Effects Based Operations (EBO) is a method of planning, conducting, assessing and sustaining operations based upon desired effects not targets or even merely objectives. EBO connects effects, targets and objectives to be sure, but in a uniquely different manner than in the past where either "objectives drove targeting" (an ideal rarely achieved) or "targeting drove objectives" (the most common form). The AFRL EBO project is looking at what technologies can be brought to bear to assist commanders and their staffs on connecting effects, objectives, and targets into purposeful and meaningful actions then assessing the results of those activities to see whether the effects desired were indeed achieved. And if not, why not. And if not, what's the next step for the commander. In essence, effects-based operations demand effects-based analysis that continually determines the efficacy of the aerospace strategy in terms of achieving the desired tactical, operational, or strategic effects, and recommend improvements to the aerospace strategy, or suggest phase changes or branch development/initiation to the aerospace commander.

So what is an effect? As used in nascent Air Force doctrine, an *effect* is an outcome that results from (is caused by) some action taken. A direct effect is one that results immediately from the action taken. Air Force doctrine does not clearly define an indirect effect. However, it can be inferred that they consist of the impact that direct effects have on other elements, and the outcome(s) produced from that impact. One image might be striking (the cause) the cue ball that strikes another ball (the direct effect) that in turn strikes a third ball (the indirect effect).[1] Several concepts implied here are very important for effects-based operations. The first is that all direct effects have indirect effects. Second, there is an implied time lag between when the action taken causes the direct effect and when the indirect effect is felt. The time may be very short, but there is a finite lag time. The third implied concept is that what constitutes a direct or indirect effect depends upon the observer's point of view. From the point of view of the cue stick, the direct effect is the force applied to move it. From the point of view of the cue ball, the cue stick striking it, not the application of force causes the direct effect of its movement. Indeed, *from the point of view of the object (agent or target) it does not generally matter whether the cause is a direct or indirect effect*. Finally, except in a very simple system (say, for example, only a cue ball and one other on a frictionless, infinitely sized pool table with no sides), direct and indirect effects interact. Indeed a postulate that will become much more important later is that *interactions are more important in any attempt to impact (or even understand) a complex system than are actions*. One should note that a "complex system" is not defined by the number of contained entities, but rather by the heterogeneity (or diversity) of those entities (or objects or agents or targets).

What is not explicit enough yet is the connection between direct and indirect effects. To do that requires reforming effects into first, second, third, *n*-order effects (see Figure 4). Note here the diagram starts from the point of view of a target, a railroad marshalling yard, then proceeds to

[1] Another point not elaborated on is how aggregated the effect depends upon one's need. This simple example shows this. Another way of viewing it is the cue ball's *movement* is the direct effect while the cue ball's striking another is an indirect effect just as the second ball's movement is also an indirect effect and so on. Confusing? In the real world of military operations, a better image is the break in pool where the single act of striking the cue ball causes multiple strikes and re-strikes among the other balls causing some to fall in pockets. Add to this the friction of the cloth, the tilt of the table, the force of the cue stick's strike (and where it struck the cue ball) and all the other variables and one begins to appreciate why it's called "complex."

trace effects up to a target set (railroads). Using this perspective, a third order effect would be that on the target system (transportation); the fourth order on the infrastructure Center-of-Gravity (COG)[2]; and the final (n^{th}-order) indirect effect of an attack on the marshalling yard would be felt at the strategic leadership level.

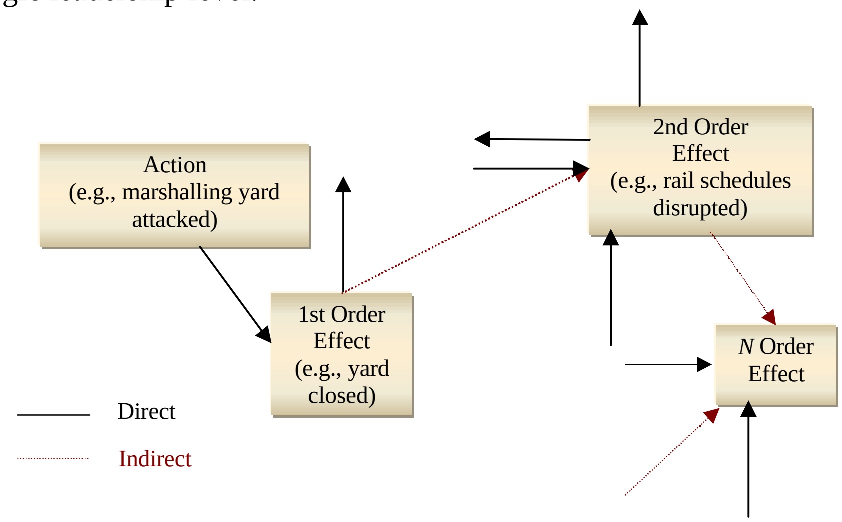

Figure 4: Interaction between "Orders" of Effects

The simple part is that first order effects, from the perspective of the entity being affected, are the same as direct effects and all subsequent numerical effects are indirect effects. A good way to view this is that direct effects are those resulting from direct action. What effect is caused is a first order effect. Here is where things get complicated. A second order effect is an indirect effect but one felt in a place other than where the first, direct action takes place, recalling that what constitutes "first action" can only be seen from the perspective of an agent. The cue stick hitting the cue ball is direct action causing a direct effect of the cue ball moving. The cue ball hitting the eight ball causes an indirect effect on the eight ball from the cue stick's direct action but it's also the direct effect of the cue ball's direct action hitting the eight ball. The complicated part is that the total effect on any identifiable entity is generally some combination of direct/first order effect taken from a direct action against the entity and indirect effects resulting from some set of actions taken other than directly against the entity. This can be a highly mediated and complex result. More complicating factors arise. The total effect on an entity (or alternatively, exhibited by an entity, agent or target) consists of direct/first order and indirect/*n*-order effects. The total effect, furthermore, is an aggregation of effects over a finite time span. This aggregation can lead to a vicious cycle, generally referred to as cascading effects. What this means (using cascading effect as an example because in a war this is most likely what will happen) is that when something bad happens it effects other parts of the system that then causes something bad to happen which in turn causes something bad to happen somewhere else, etc. It is Mother Goose's "For want of a nail, the shoe was lost. For want of a shoe the horse was

[2] The use of infrastructure examples, especially dealing with transportation systems, is quite intentional. For both US forces and those they encounter, this COG—and the closely related one of power generation and distribution—is perhaps the most essential outside of leadership. And given reluctance to attack leadership directly, perhaps the most viable COG. See Martin Blumenson, "The Emergence of Infrastructure as a Decisive Strategic Concept," *Parameters*, Winter 1999, 39-45. To see how vital it is to US military operations, see Dana Priest, "Risks and Restraint: Why the Apaches Never Flew in Kosovo," *The Washington Post*, December 29, 1999, A1.

lost…" For example, bombing railroad marshalling yards will close the yards at least for some time causing some trains to be diverted to other yards, which cause a change in planned work flows, but that causes other trains to have to stop along sidings. Those stopped become subject to withering air attack. A recent example was the so-called "Highway of Death" coming out of Kuwait City towards Basra, Iraq in late February 1991. There the leading vehicles were stopped by an air attack causing the following ones to jam up making them even more vulnerable to air attack. The end result was graphically displayed on CNN.

Unless otherwise specified, this paper uses "total effect," "*n*-order effect," and "effect" interchangeably. The key remembrance is that within this aggregation lies a complex cocktail of direct, indirect, behaviorally, spatially and temporally-bounded phenomena.

Two other concepts are only introduced here but will become very important during the discussion on applying complex adaptive systems theory to the problem of planning, conducting and assessing effects-based operations. The first is that generally as one moves from direct/first order effects towards indirect/*n*-order effects one moves from physically oriented effects to behaviorally oriented effects. For example, using the common listing of effects "D^6" (destroy, damage, disrupt, delay, deny (or isolate) or defend), it is clear the first two deal mainly with physical effects while the last four deal mainly with behavior effects. Behavior effects are much harder to model and hence are hard to predict or identify useful indicators. Therefore a combination of effects are generally planned. For example, in the transportation plan of spring 1944, Allied air forces attacked (the strategy) railroad marshalling yards (the target set) in order to destroy or damage them (the direct/first order effect desired) as much as possible in order to delay the arrival of reinforcements to northwest France (the indirect/second order effect desired). But the trains were also attacked as were the rail bridges leading into the Cotentin peninsula. It was the total effect on German reinforcements, in this case trips that took three days for troops from Poland to reach western Germany now took three weeks to get from western Germany to the front—that resulted from the combination of these direct and indirect effects. The second idea worth noting is that effects, either direct/first order or indirect/*n*-order, have variable degrees of persistence and accumulation. This means any usable model must include, at a minimum, temporal and capacity aspects.

Finally, one last issue needs to be discussed regarding effects based operations, that is--What *caused* the effect? This problem increases among higher order effects but is not absent in first order effects (though it is much easier to answer at that level). The second problem is establishing agency, namely--*What* caused the effect? The third problem is shared with the agency problem, the causality problem, and the basic identity, or indicator, problem of an effect, i.e., what does it "*look*" like? The causality problem breaks down to eliminating the direct causality from any intervening variables. Start at the basic level. Bomb hits bridge, span collapses. Much of weapons testing involves establishing just this causality so will not discuss further in this paper. Take one step up. Collapsed span, rail traffic tied up. This second order effect, however, could be caused by many other things such as poor scheduling (putting two trains on the same track at the same time in the same place), environmental problems (e.g., flooding, erosion) or even purposeful action on the enemy's part. Which was most important? Which did not matter at all? Which was the "hair that broke the camel's back?"

With the difficulty of determining what causes were responsible for what effects comes the difficulty of determining what action accounted for the cause. Back to the rail system illustration. With the first order effect, it seems fairly clear the bomb was the agent, all else being equal. Unfortunately, nothing is ever equal. In the Gulf War, it was "attack power plants, lights go out." But what if the Iraqi's turned the lights out? If the objective was "lights out," who cares how this was accomplished? The caring comes from determining which action caused the effect so we know what similar actions might accomplish in the future. This is a very crucial point that will be addressed later.

Finally, indicators are important for two reasons. One, they point out the only means of an assessment mechanism. That is the reasoning that led us to believe that dropping a bomb on a bridge would hinder the rail system. What is our indication of "hinder?" The second reason they (actions) are important is for managing scarce intelligence, surveillance and reconnaissance (ISR) assets. We can see photos of backed up trains illustrating "hinder." Commanders can intercept communications complaining about the traffic or the failure of supplies to arrive on time, further evidence of "hinder." With multiple modes, a Commander can more efficiently make tradeoff decisions between which ISR asset to use against all their other competing demands such as providing situation awareness. Figure 4 is a schema that shows targets, objectives, effects and indicators in a simple example.

Having clearly identified effects based operations and the associated issues; an operational model defining these inter-relationships has to be defined. Dr. McCrabb has developed a meta-model which combines John Warden's "enemy as a system" model, Jason Barlow's "national elements of value" model, and an "agent adaptation space" model.

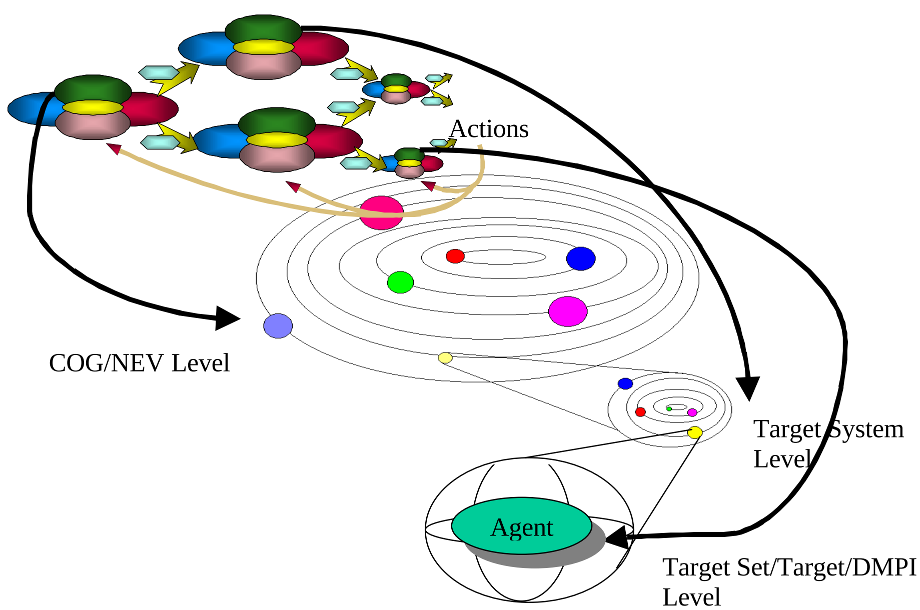

Figure 5: Interactions between "Layers" of "Effects"

The first step is the combination of Warden and Barlow's operational models (Figure 5 shows the resulting model.) The number of elements is not important.[3] To show this, one could choose to use the seven NEVs (leadership, industry, armed forces, population, transportation, communications and alliances) and yet postulate that each consists of five elements (leadership, organic essentials, infrastructure, population and armed forces). What is important is that each element must be found within the Warden model. This is because, from a top-down perspective, we use Barlow's NEVs as outlining the horizontal landscape with Warden's rings providing the vertical and crisscross dimensions of that landscape. This retains the weighting function from Barlow and the heritable and interdependency functions from Warden. Recall previously we used the definition of function—assigned activities or roles that are closely related to others such that they depend upon them—and tasks (work to be done) to connect objectives and functions so we could connect Warden's model with strategies-to-task. Now, extend that vertically to encompass Barlow's NEVs.

The second step in the modification scheme is to add agent adaptation space (see Figure 5). One might think we would first need to specify the number of "levels" in our model. This is incorrect. Recall the point that attributes of agents might actually consist of a meta-agent that is itself composed of more discrete agents. This is the property of aggregation. We use this property to allow a virtually unlimited layering of the model (hence the range "105-525" in total elements mentioned above). For instance, using only the three attributes of internal models, library and sensor for each agent[4] times the seven NEVs each consisting of five rings, we get—at one level—105 separate entities. An example: the library function of the infrastructure sub-element found within the communications NEV. What would this be? Remembering the library consist of a pre-existing set of adaptations, it might be the emergency checklist used to handle downed telephone lines. As a practical matter, it seems possible that experimentation would show that three layers (center-of-gravity, target system, and target set) are sufficient. The last step is to express this meta-model in terms of effects. This is what the Effects Based Aerospace Operations program is trying to accomplish.

What are the key observable indicators a Commander needs to effectively engage the enemy?

One of the hardest nuts to crack is determining observable indicators of effects. This is a multi-dimensional problem as discussed earlier. Given the exceedingly large amounts of data/information that must be assembled, this can (and has) rapidly becomes an unmanageable situation. The Joint Battlespace Infosphere (JBI) has been proposed as a solution to this issue and is briefly discussed here.

Key observables will be information based. The information systems gathering apparatus will include open sources and traditional intelligence, surveillance and reconnaissance systems, and architectures. Collected data becomes information when processed into usable forms such as

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[3] For example, Draft AFDD 2-1 adds a sixth ring—connectivity—to Warden's five.

[4] Holland looks at a common representation of an agent as consisting of three different attributes. First its capabilities. Next its ability to assess its performance (both effectiveness and efficiency) in utilizing those capabilities. And finally, the agent's ability to make changes in its capabilities based upon the performance assessment. *Hidden Order*, chapter 2. It is believed the representation of an agent's internal model, library and sensory function adds to Holland's representation scheme in meaningful terms.

reports or images. This information is transformed into knowledge by purposeful analysis, interpretation, and collation with related information and background to meet the specific need of the user. When the warrior's judgement is applied to this knowledge, understanding of the battlespace is achieved.

Fundamentally, the choice of information should be with the commander or warrior who wants or needs it. Therefore, a fused all-source solution must incorporate a sophisticated and effective combination of "push" and "pull" (also referred to as "publish" and "subscribe" in other literature) information. As the volume of available information rapidly increases in the future, users can easily be inundated. Therefore the future "push" systems must be scalable and tailorable to their needs. The same can occur when users are "pulling" information. If their requests for information are broad in scope, they may once again be swamped unless they are provided the tools to assist in focusing the requests.

The JBI will provide an environment that enhances information storage and information flows among people and processes engaged in conducting a military operation. It will provide an improved ability to sift and distill information rapidly; a key capability for effects based operations. The JBI will provide the infrastructure to store or provide access to sensor information, intermediate results, and ultimate knowledge in a repository so that it can be shared throughout the mission (subject to proper access authorization). The JBI will also route information to the right destinations, alerting the people and processes that should respond to new data. The chain of alerts constitutes a workflow process, designed and adapted to process the mission's information. These JBI mechanisms ensure that the information provided is an asset and not a detriment to the mission. Based on the operational model we have proposed, these capabilities are essential in making our vision a reality.

Why C2 through the Space medium will be the key to Effects Based Aerospace Operations

In order for the Commander to efficiently determine whether or not the desired "effects" are/are not being realized, he/she must have the following:

a) a consistent digitized database representing the n-dimensional battlespace. Views into this database would be available to all echelons, however, it needs to have the ability of being tailored to the respective echelon. For example, the President does not necessarily want to see the same data as the Squadron Commander but does need to know the strategic status that would contain the same information a Squadron Commander would be using;
b) a method of fusing massive amounts of data and information into a simpler, coherent form;
c) a way to visualize the information so that rapid and informed decisions can be made by the Commander; and,
d) rapid Battle Damage Assessment (BDA) and Campaign Assessment (CA) in order to determine if the desired "effects" have/have not been achieved.

The best way to get a coherent digitized representation of the battlespace is via the utilization of space assets. Currently, there are a host of systems available to the Commander in the field.

Tomorrow we will add to this list of assets Hyperspectral and Ultraspectral sensors to provide a greater analysis capability as to whether or not the "effects were achieved". However, key to this analysis/exploitation capability is the representation of the "battle picture" in a consistent and coherent manner. A problem with today's "stove-piped" systems is the data (or results) comes in a variety of formats that are not compatible across platforms (or systems). Figure 6 illustrates the process of converting raw sensor data or information into a coherent, integrated information database. This would provide a consistent, coherent, digitized representation of the n-dimensional battlespace to all echelons of Command. It's from this database that knowledge can be extracted to form a comprehensive situational awareness display of the battlespace. Figure 7 depicts the sub-elements of this consistent battlespace picture and their relationship to the various echelons of Command. It is these sub-elements (terrain/cultural features, image overlays, intelligence information, logistics/utilities, coalition forces, socio-economic information, weather) that will form the basis for determining the desired "effects" of particular actions taken by the Commander and his/her staff. However, a new approach must be taken by the targeteer. Instead of determining whether or not the target was/was not "destroyed", the Battle Staff needs to determine if the desired "effect" has/has not been achieved. For example, if the desired "effect" was to "shut down a nuclear reactor without destroying it for future use" then one can use a Hyperspectral image to determine whether or not there is heat or a particular chemical waste coming from the exhaust ports. The "cause" would be inserting a virus into the nuclear plant's operating system. The "correct effect" would be no power generation (visible from a hyperspectral space system) without destroying the plant.

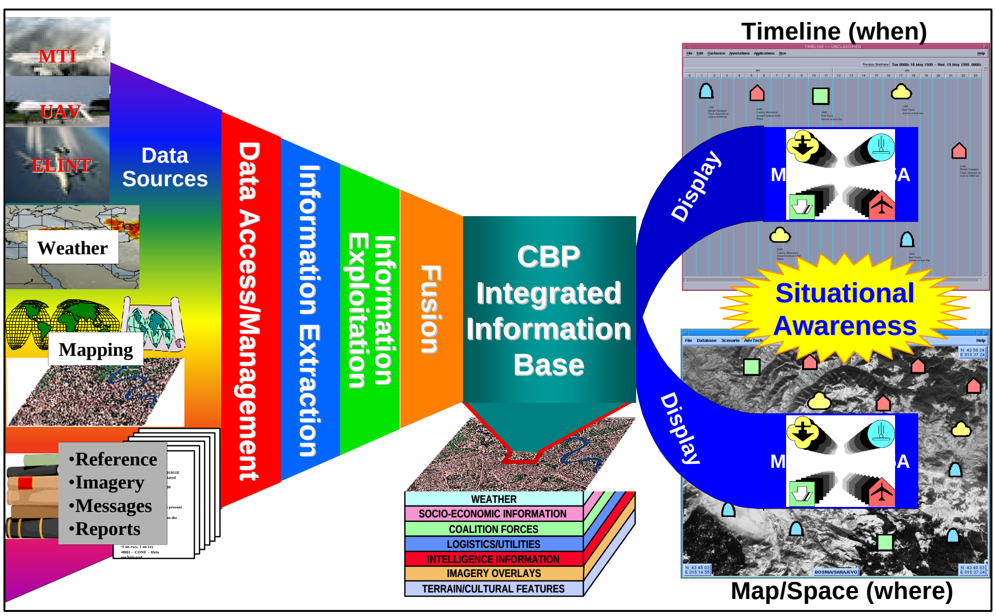

Figure 6: Integrated Information Database for Consistent Operational Picture

As discussed earlier, there is simply too much data and information available to the Commander. A major source of data/information comes from space assets. However, there are also a host of other airborne systems (e.g., AWACS, JSTARS, UAVs, U-2, CNN, etc.) that also provide data/information to the Commander. Before this can be filtered, and in order to combine the massive amounts of data and information, the process of fusion[5] must take place. The fusion of the multiple intelligence INTs (SIGINT, IMINT, and MASINT) are crucial to the Commander; and the most effective source of this information is the engagement of space assets. However, for this to be effective, the Commander must have direct control of space assets within his/her theater of operations. Today there are a host of space assets available to the Battlefield Commander as shown in Figure 3. Figure 8 illustrates the generic path the data follows from the spacecraft to the Commander's control center. There are three types of fusion: sensor, data and information. Figure 6 illustrates where each of the types of fusion takes place. Sensor fusion (upper left) is the combination of single/multiple sensors on single/multiple space platforms with the net affect as if there was a single (abet larger) sensor collecting the signals. Data fusion (middle) is the combination of processed data into a single coherent entity for further processing/exploitation. Information fusion (right) is the combination of individually processed information into a single coherent entity. The use of space assets for the sensor and data fusion will provide timely information to the Battlestaff as to the outcome of a particular engagement. However, the BDA and CA analysis will not be centered on whether or not a single target has been destroyed, but rather on "did the engagement achieve the desired effects?" Figure 9 illustrates how various types of information can be displayed to the Commander's staff on a single, coherent visual display. It is from this type of visualization that the Commander's staff can determine whether or not a desired "effect" was/was not achieved. Notice that BDA does not play a predominate role in this analysis.

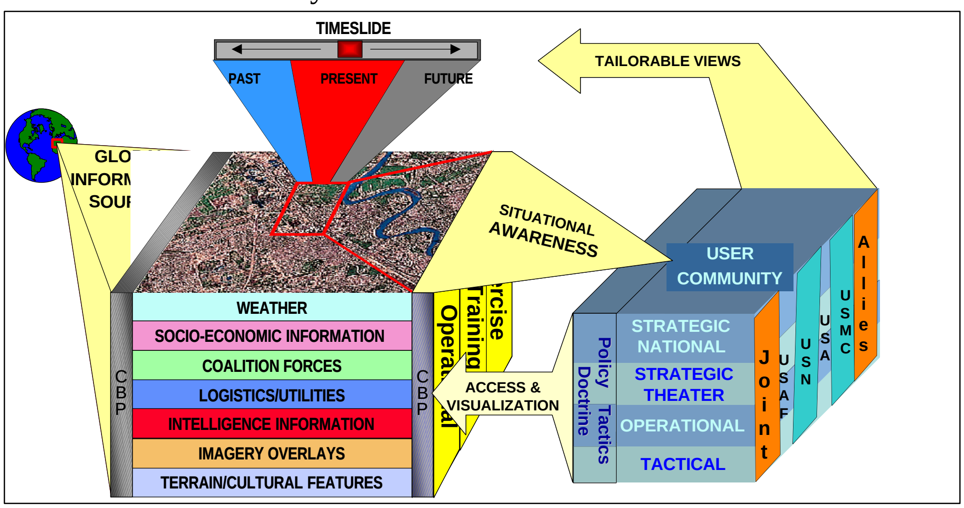

Figure 7: Consistent Operational Picture Sub-Elements

A key to presenting alternative "effects" a Commander can select is in the visualization (coupled with simulations) of the information. It is this visualization that will allow the Commander to make rapid and informed decisions as to what "effects" particular engagements could/could not have. Figure 10 illustrates a voice actuated visualization system that a Commander's staff can rapidly display information to the Commander. Displays should be geared to illustrating effects

[5] There are five levels of fusion. *Level 0: Sub-Object Data Association & Estimation*: pixel/signal level data association and characterization. *Level 1: Object Refinement*: observation-to-track association, continuous state estimation (e.g. kinematics) and discrete state estimation (e.g. target type and ID) and prediction. *Level 2: Situation Refinement*: object clustering and relational analysis, to include force structure and cross force relations, communications, physical context, etc. *Level 3: Impact Assessment:* [Threat Refinement]: threat intent estimation, [event prediction], consequence prediction, susceptibility and vulnerability assessment. *Level 4: Process Refinement:* adaptive search and processing (an element of resource management).

based results verses target destroyed/not destroyed. Naturally, target status is important, but the targeteer needs to prioritize targets as to their overall "effects" and achievement of high priority "effects" vs the classic "Blow Bridge" should be their top priority. The end goal would be a configurable aerospace command center (as shown in Figure 11) where all information from various sources can be rapidly displayed so the Commander's staff can rapidly determine what "effects" are desirable, collect the right information and then present to the Commander choices. Additionally, this will allow the rapid assessment as to reaching the desired "effects".

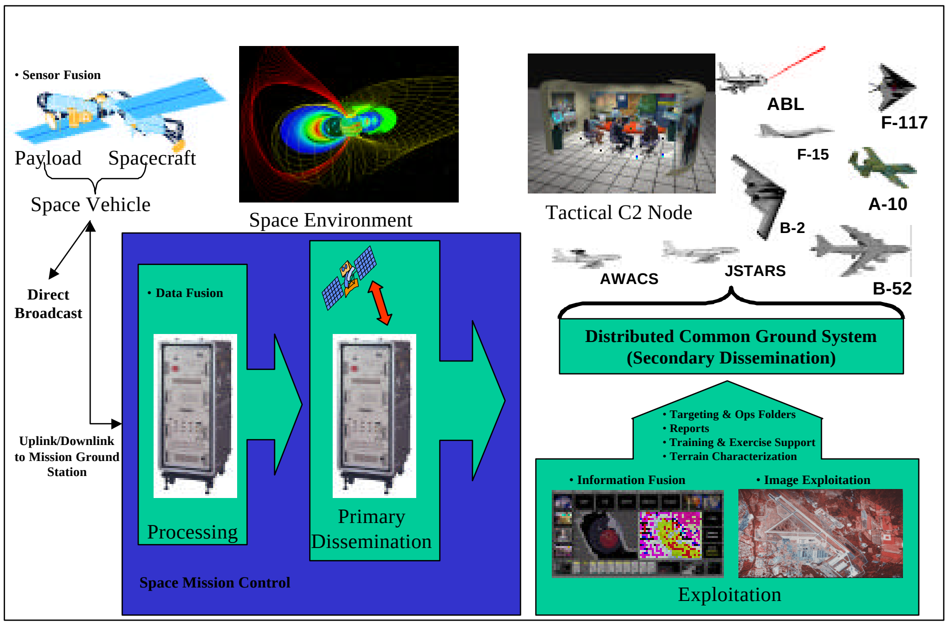

Figure 8: Generic Space Architecture

Figure 9: Voice Controlled Visualization

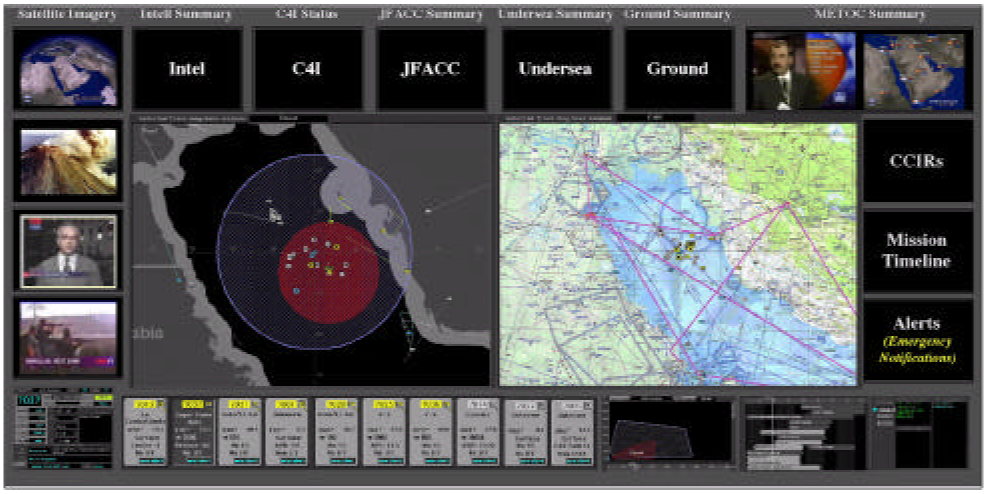

Figure 10: Fusion of Exploited Information

Figure 11: Configurable Aerospace Command Center

Summary

Effects Based Operations is a concept with the end-goal of allowing a Battlefield Commander the ability of providing the "right effect", on the "right target" at the "right time". Accomplishing this end-goal of determining what effects are required to best achieve the CINCs goals within a geopolitical confrontation is the primary thrust of Effects Based Operations.

Key to enabling this capability will be the Joint Battlespace Infosphere, advanced sensor exploitation capabilities and on-board spacecraft sensor/data fusion to provide the Commander and his/her staff with optimal situational awareness. Effects Based Operations will require in-time, relevant information provided by these systems/capabilities for determining campaign/mission effectiveness. Linking and integrating effects into a theater-wide scheme of execution and directing the execution throughout the dynamic, real-time C2 is the primary challenge of the decision-makers. Effects Based Operations concept, the Joint Battlespace Infosphere and future space systems will allow the decision-maker to provide greater effectivity of Expeditionary Aerospace Force (EAF) assets throughout the Spectrum of Conflict