



# The Omniscient Eye: Satellite Imagery, “Battlespace Awareness,” and the Structures of the Imperial Gaze.

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## Abstract

This paper explores the role of aerial and satellite imagery in the US military’s command, control, and intelligence (C4I) systems, with an historical focus on the Persian Gulf War of 1991. Using satellite imagery for military intelligence and warfare is part of an ongoing effort in the US Department of Defense to make all cartographic and topographic space, and the objects in it, totally visible and “transparent,” what the US military calls “total battlespace awareness.” It is where imagery production is attached to concrete and purposive action in the abstract realm of “battlespace,” an example of how the mundane and the monstrously violent intersect around the production of visual data and artefacts. Borrowing a metaphor from Paul Edwards, I suggest that satellite imagery can not only “open up” the world (making it transparent), but can also “close down” geographical space under a regime of surveillance and violent military control. The discursive power of aerial and satellite imagery is derived from its position as an objectifying transcendent gaze, above and beyond subjectivity (Donna Haraway’s “God Trick”), and when these images are disseminated in the mass media as testaments to military prowess, they become visual representations of geographical domination (as in Denis Cosgrove’s “Apollonian Eye”). In this sense, satellite imagery, photo reconnaissance, and imagery interpretation are rich sites and artefacts for exploring how power and national sovereignty turn on the visual.

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## Introduction

In the event of warfare and nation state conflict, modern nation states like the US have what is metaphorically called a “sensory system,” comprised of a set of socio-technical architectures that form a nexus of imagery intelligence and weapons systems. In military command and control situations, the technical requirements of surveillance and reconnaissance involve vast systems and architectures, all of which must interoperate smoothly to provide military commanders with operational and system transparency that allows for “point and shoot” command and control responses. Many of these systems are deployed during active warfare scenarios as part of tactical intelligence and targeting systems. Other larger, more strategic and global architectures are meant to react as quickly as possible to any perceived threats to US national interests concerning territory, space, valued resources, or national security.

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Military imagery intelligence systems and architectures are rich sites, often located at the center of military command structures, where surveillance, control, and organized state violence come together in a set of abstracted and routine social and technical practices. It is where surveillance is most directly attached to concrete purposive action: the precise application of force and violence for organized warfare, perhaps the ultimate act of purposive agency. In this article, I explore, in close detail and with some deep description, a specific historical instance of the use of aerial and satellite imagery in a military C4I (command, control, computers, communications, and intelligence) system during combat operations. The focus on a warfare scenario provides an extreme example of what is at stake with systems of overhead surveillance that are deployed in the larger society, systems seemingly as mundane as commercial observation satellites or Google Earth. Ultimately what is at stake is the creation of a specific kind of subjectivity, an attempt to create an omniscient or imperial gaze by connecting what Sturken and Cartwright (2001) call “practices of looking” directly to the technologies and practices of state administrative control.

Large satellite imagery and intelligence architectures are what Donald MacKenzie calls “technologies of power” (MacKenzie, 1990: 28, 34-36), deployed by nation states for the administrative control of space and territory. In warfare these systems are deployed for the precise application of force and violence. Large intelligence and weapons systems in the US military and their interoperation as system architectures provide a rich context for exploring how satellite imagery surveillance and reconnaissance systems not only *detect* objects and people, but also *produce* both objects on the ground and surveillant subjects. These ideas may have relevance to other civilian surveillance systems like closed circuit television (CCTV) systems, police command and control centers, and publicly-available satellite imagery databases like Google Earth™.<sup>2</sup> They produce objectivity, a techno-discursive distance between the observer and the observed, and a particular kind of modern surveillant subject. This subjectivity is structured by an omniscient, imperial gaze, a particular kind of subjectivity that signifies dominance over what is being observed.

In order to illustrate this process, I will discuss how violence can be rendered everyday, bureaucratic, and even mundane by the technologies and practices of imagery production. Technologically, distance is produced by layers of systems that combine surveillance with weapons control, referred to in the US military as “C4I” systems that combine the practices and technologies of “Command, Control, Communications, Computers, and Intelligence.” The targeting cycle in Operation Instant Thunder was a feedback system that transformed data into targets and then back into data, a center through which information and commands generated by the entire U.S. war effort had to pass through on their way towards the destruction of these targets. The personnel who ran this center were never actually required to be in direct proximity to the carnage of combat, but they were nevertheless central to its organization. It is where extreme forms of violence and normal bureaucratic practices are co-extensive, because we must step back from this series of mundane translations (images into data, data and images into targets, targets turned back into data, and thus back again to images), in order to see the destruction that these activities were committing. It is this distance that creates an isolated and

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<sup>2</sup> <http://www.keyhole.com>

dominant subjectivity: isolated from the violence on the ground, but interpellated in a dominant imperial gaze.

I focus on a particular historical instance of this command and control system as it was applied in the targeting cycle for Operation Desert Storm, or more specifically the air war portion of this operation, code-named Operation Instant Thunder. Of particular interest for the purpose of this study is the link between imagery intelligence architectures, including aerial and satellite imagery systems, and the command and control systems that directed this imagery intelligence to other operational systems and commands during the initial days of the air war against Iraq in early 1991. C4I had no “center” in the Persian Gulf in 1991, but was a series of related practices and operations that were scattered across different military branches and operational control centers. They comprised what Haggerty and Ericson (2000) call a “surveillant assemblage:” that is, it was a heterogeneous set of intelligence gathering and command systems whose unity depended upon their smooth and transparent interoperability. Their organizational structures were historically contingent and emerged at the intersection of particular technological advances and global political needs. National imagery intelligence systems were organized differently in the first Persian Gulf War (Operation Desert Storm) than they are now.

However, this historical instance is relevant for thinking about similar assemblages of satellite imagery surveillance that are coalescing today around commercial satellite systems and the increasing dissemination of satellite imagery data to the wider public. The assemblage of intelligence gathering practices, interoperable imagery intelligence and weapons systems, and flows of imagery and command data coalesced in the first Gulf War around a particular desire for what military engineers and strategists to this day refer to as “battlespace awareness” or “total battlespace knowledge.” This desire continues to animate technological advancement in what the military currently refers to as the “revolution in military affairs” (RMA). The details of how C4I worked in Operation Instant Thunder are also available to academic researchers in a way that similar details of post-9/11 conflicts are not, so we are able to see the shifting practices and authority relations in a way that is rendered clearer by historical hindsight.

Before going on to describe these systems and architectures in more detail, I will first give brief descriptions of interoperability, and the role of imagery as a visualization tool in military C4I systems for creating “situational awareness” and “total interoperability.” Then, I will explore the interoperation of aerial images and satellite imagery data in command and control systems and as tools for tactical and strategic battlefield intelligence. Another reason for focusing on the particular historical instance of the 1991 Persian Gulf War (Operation Desert Storm) is because it was considered a testing ground for the integration and interoperation of national imagery intelligence with command and control systems and was thus highly studied afterwards by military systems analysts. “Total system interoperability” is still a dream that animates the continuing emergence of C4I systems both in the fields of national defence engineering and in the wider commercial market for imagery-based surveillance systems.

The topics to be examined, then, include: 1. A description (by all means not exhaustive) of the systems that connected overhead imagery intelligence with the targeting process and the application of force on the ground, a description that focuses on C4I as an interoperable

“assemblage” of shifting authority, social practices, and technological systems; and 2) The processes by which places on the ground are objectified as geospatial coordinates, resulting in the creation of an omniscient, surveillant subject far removed from the violence (and in wider social contexts, the administrative control) being perpetrated on the ground. These aspects of military C4I systems work together to create the socio-technical structure of the Omniscient Eye, an imperial subjectivity or “gaze” that connects the visual with practices of global control. The structures of military “battlespace awareness” and “total interoperability” can be generalized and applied to the larger society as satellite imagery and its increasingly varied uses and applications interpellate us as participants in the visual politics of nation state administrative control.

### **Interoperability, Transparency and the “System of Systems.”**

In military discourse, interoperability is what is behind coordinated activity and smooth operation of many distinct intelligence, targeting, and weapons systems (see Cesar and US Army, 1995; Johnson and Libicki, 1995; National Research Council, 1999: 68-117; US Joint Chiefs of Staff, 1995: 1-3; Also see: US Army, 1997; US GAO and US Congress, 1992; US GAO, 1993; US GAO and US Congress, 1998; Slabodkin, 1998). In general terms, interoperability is what makes a complex set of activities appear like one single activity, what makes confusion look like perfect control. Interoperability is also about system compatibility, the ability to share data even if the two systems are being used for different reasons, for different activities. Smooth, coordinated activity between humans and C4I architectures, as with any interaction between humans and machines, requires a dense field of technical and social interoperation. The National Research Council describes C4I as “systems designed to support a commander's exercise of command and control across the range of military operations and to generate information and knowledge about an adversary and friendly forces.” (National Research Council, 1999: 1) Military analysts, possibly informed by the kinds of systems theorizing at RAND,<sup>3</sup> treat the concept of Command and Control (C2) and the operation of military intelligence architectures as feedback systems. The steps of the feedback system go from detection, to reaction, assessment, the update of command and control, which in turn informs detection, and so on. Systems theorists in the military treat this feedback system as a complex of human, machine, and organizational interaction. In the current ongoing “revolution in military affairs” (RMA) (see: Johnson and Libicki, 1995; Stanley, 1998: 4), these systems work together for a larger goal of “situational awareness” (National Research Council 1999: 29-37), the “single integrated air picture” (40), and “total system interoperability” (see: Johnson and Libicki, 1995; Cesar and US Army, 1995). All this comes from the assumption that control arises from the ability to “see,” from practices of imagery and system transparency.

In the technical discourses that surround the implementation of these systems and operations, there are distinct definitions and roles of interoperability that have relevance for understanding how a technology of control and transparency is associated with nation state power. These definitions range between the technical, the operational, and the ideological. Interoperability is a problem that is addressed in computer and network systems literature, where interoperability is

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<sup>3</sup> For an historical treatment of the role of RAND in systems theory, see Hounshell 1997.

treated by some technicians and scholars as a social organizational problem, without a pure technical solution.<sup>4</sup> Interoperability is a concept that refers to the way systems coordinate their operations and activity with other systems. If we hold the definition of “system” as something that includes both technical and human components, then interoperability is much bigger than a technical problem, and requires a reorganization of what made the separations in the first place, a reorganization of the social relations that are both ubiquitous in the system and specific to the situation. We can't just talk about database management without talking about managing the organization: organizational interoperability and technical interoperability go together.

There is a link between transparency, usually referring to a kind of unobstructed vision, and interoperability: systems have to work together seamlessly, thus making them “transparent” to the user. A National Research Council report distinguishes between “operational” and “technical” interoperability. The former seems broader and inclusive of a social element: “The ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together.” The latter is more specifically referring to the technical component: “The condition achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users,” (National Research Council, 1999: 66). Therefore, in imagery intelligence systems the concept of transparency has this dual signification of “seamlessness” and unobstructed vision.

According to technical systems engineers in the military, interoperability involves more than just two systems working together. In military C4I systems, there is a distinction between interoperability and what military systems engineers distinguish as “jointness:” it is not just two systems that depend on each other, because interoperability must be accomplished without jointness (National Research Council, 1999: 68). Interoperability is a fusion of many different elements of military operations, something that includes both social organizational and technical components. It involves a fusion of force strength, of data, and of multiple sources of information to provide a “robust, continuous, common operating picture of the battlespace,” which in turn improves “the effectiveness with which the commander directs and controls his forces,” (National Research Council, 1999: 36). Interoperability is therefore about synergy, an assembled unity whose operational goal is greater than the sum of its parts. The goal is nothing less than a form of military command omniscience, what is referred to in military parlance as “total battlespace knowledge.”

This assemblage is held together by imagery. Satellite and overhead imagery, the foundation of global surveillance and reconnaissance systems, is what connects interoperability to the ultimate goal of situational awareness. “Situational awareness” is defined by the *Department of Defense Dictionary of Military and Associated Terms* as “the knowledge of where you are, where other friendly elements are located, and the status, state, and location of the enemy,” (Joint Chiefs of Staff, 1998, cited in National Research Council, 1999: 29). Information superiority and

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<sup>4</sup> For a good description of interoperability as it is associated with computer systems and networks, from a study done in the early 1990 for *Byte* magazine, see Andersen and Sherwood (1991: 221); Donovan (1991: 184); Fetterolf (1991: 197); Hubley (1991: 229); Nance (1991: 187); Vaughan-Nichols (1991: 211).

situational awareness go together as a strategy of global military superiority. Information superiority is not just about gaining market advantage in the commercial world, although this is an important motivation. It is about “domination” of an adversary, and is implied in the very term “command and control.” Furthermore, imagery is a crucial component of the way architectures of C4I translate and communicate decisions and commands into actions.

Part of the element of control is related to the cognitive function of imagery systems. As an example, consider how imagery and graphical displays are used as communicative devices in imagery-driven command and control systems. The RAND research on this topic is mainly about graphical interfaces that allow commanders to make decisions and operate systems using condensed information. This research suggests that imagery be used as an integration tool, with icons, symbols, maps, and high resolution images combined in an information-rich command interface that can be accessed by everyone along the chain of command from strategic planners to pilots in the “battlespace.” When imagery is used as an integration tool, it tends to have a synergistic effect on the system by providing a way to visualize the operation of the system as a whole. This is the concept behind “situational awareness” and the “common operating picture” (National Research Council, 1999: 29-37).

Satellite images are more than just representations: they are cognitive devices. Imagery and graphics enhance interoperability because “graphical displays can transcend organizational and linguistic barriers” (Cesar and US Army, 1995: 42), and act as devices for communicating information. In other words, when images are integrated into military command and control systems, similar to the fire control systems discussed by Edwards (1985; 1997) and Mindell (2000), they enhance system interoperation by providing a “visualization” factor that aids in centralized decision-making. Take, for instance, an orthophoto, which is a photograph of the earth’s surface in which geographic distortion caused by camera tilt and relief displacement has been removed. In effect, it is an image that can take the place of a map, where ground geometry is re-created as it would appear from directly above each and every point. “Orthophotos also enhance the communication of spatial data, since data users can often relate better to an orthophoto than a conventional line and symbol map or display,” (Lillesand and Kiefer, 2000: 150-168). RAND research has underscored the relationship between imagery and the agility or mobility of tactical forces in the field. They concluded that commanders preferred imagery to other textual forms of intelligence because of the benefits provided by visualization, and because it allowed for the simultaneous broadcast of information to all units rather than being relayed serially through the chain of command (Bondanella *et al.*, 1993, cited in Cesar and US Army, 1995: 6). An important recommendation of US Army studies was that imagery may be required to fulfil various informational and physical needs for C4I architectures that relate to the commander’s control of the “decision space,” (Cesar and US Army, 1995: 14-15). This would require a dense field of complex interoperations between imagery systems and many other systems that are part of C4I architectures.

Rather than being simply a concern with data compatibility or bandwidth, although these are important technical requirements of system interoperation, military intellectuals and commanders see interoperability as being the foundation, or at least a fundamental component of an anticipated “revolution in military affairs” that is transforming the nature of global power (see

Stanley, 1998; Johnson and Libicki, 1995; US Joint Chiefs of Staff, 1995). In this debate, the continued expansion of U.S. global hegemony is condensed into a technological mission. Systems interoperability becomes increasingly important as the operational area of U.S. military activities increases and changes. Such a mission is to have the entire nation's technical means of intelligence collection interoperate with the command and control functions of the defence system, thus achieving a kind of seamless interoperation, or *total interoperability* (Johnson and Libicki, 1995). Aerial and satellite imagery and the architectures for its exploitation and dissemination play a large role in this achievement of omniscience and control.

The imagined endpoint of making all the military's socio-technical systems interoperable is a concept called the "system of systems." This concept refers to a complex arrangement of technologies and social organization that when fully automatic and interoperable, will achieve, become, or produce what is generally called "total system interoperability." It is partly fact and partly fiction, discussed in both the present and future tenses in the military engineering literature. In some contexts, the "system of systems" refers to C4I as it currently exists, as "large, complex, and distributed across organizational, program, and geographical boundaries" (National Research Council, 1999: 6), its components operating somewhat in tandem but operationally separated by conflicting protocols and system architectures. At other times, the "system of systems" is a term used to refer to what C4I should be: a highly integrated set of operations that belong to a single large technical architecture, the ultimate goal if the services were to overcome operational boundaries and achieve a high level of interoperability amongst all its C4I structures and operations. In the latter respect, as a fully integrated use of resources, the "system of systems" has largely remained unachieved (105-17).

The "systems of systems" and how it can achieve "total interoperability" is an illustration of Haggerty and Ericson's (2000) "surveillant assemblage," a key concept for understanding the dynamics in the operation of reconnaissance and control systems in the US military. The systems are always in the process of emerging, never complete, but organized around the desire for "total system interoperability" and "battlespace knowledge." Comprised of a multiplicity of heterogeneous intelligence and command systems, their unity comes from continuous and never-ending attempts at total system interoperability, something that is more an emerging process than any kind of stable achievement. It is both something that exists in the present, and is a potential that is always/already on the verge of "total" accomplishment.<sup>5</sup>

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<sup>5</sup> As the National Research Council report stated: "DOD efforts to construct a single Joint Operational Architecture are tantamount to specifying the information needs and requirements for all operations that the DOD believes it will have to conduct in the future. It would also have to cover an evolving set of C4I components and systems. *Understanding the possible information exchanges between systems and components is at least an  $N(N-1)/2$  problem (i.e., the number of possible pairs among  $N$  components).* Because a single Joint Operating Architecture would require understanding how every part of a C4I system could be used in combination with every other part of any C4I system or component that is fielded, the unavoidable conclusion is that the ability to understand the entire system of systems does not scale well as components are added, and is clearly impractical" (National Research Council, 1999: 114).

## The Targeting Cycle and Shifts in the Authority of the Image

### *Two Plans*

The three-day targeting cycle used for bombing operations in the first “air war” phase of Operation Desert Storm is a type of informational feedback loop that is designed to turn data into target lists and attack plans for aircraft and weapons systems. It is a conglomeration of systems and processes that has no physical center and is disaggregated. It is imagined by designers and military commanders as a potentially fully automated feedback system, similar to how SAGE (Semi-Automatic Ground Environment), a Cold-War era fully automated C3 device designed as an early warning system, was designed (see Edwards, 1985; 1997). In order to make the operation of the entire system architecture integrated and coordinated, and thus transparent and seamless, all the different system components, literally scattered around and above the globe, must be interoperable. It is also a system that is physically and operationally isolated from the actual violence it is designed to perpetrate, creating layers of distance between operators in the targeting centers and human targets on the ground.

The way imagery intelligence information was distributed in the C4I systems for Operation Desert Storm was partly structured by the complex political and diplomatic events that surrounded the first months of the U.S. military build-up. During the months of Desert Shield between August 4<sup>th</sup>, 1990 and around January 25<sup>th</sup>, 1991 political and military elites in the United States and Saudi Arabia were uncertain whether the Iraqi army would continue its advance across the Kuwait-Saudi border. The imagery from national systems was unclear on this point (Atkinson, 1993: 222). This situation led to an initial duplication of attack plans and organizational efforts for the air war planning process, and contributed to a basic confusion about the production and distribution of imagery intelligence in the Persian Gulf and Washington DC. Eventually this led to a shift in authority away from commanders and intelligence operators in the Persian Gulf theater (called Central Command, or CENTCOM) to imagery interpreters in Washington DC.

A comparison of these two plans is important for understanding the shift in authority that occurred, and how this affected the authority of the images. From this point on, I will refer to the two plans as the “official” plan and the “Checkmate” plan. The first official plan for an engagement with Iraq, drafted under US Central Command (USCENTCOM) several months before Iraq invaded Kuwait (April 1990), was a response to a potential “regional threat” from Iraq. The official plan (OPLAN 1002-90) centered on the use of air power as a fully integrated component of overall U.S. military forces (Mandales *et al.*, 1996: 94, 121-22).<sup>6</sup> It would integrate the air force into a joint operation of all the military components (Naval, Ground, Marine Amphibious) in the interests of joint operation and centralized command. The plan assumed an unprecedented amount of cooperation and interoperation between the four military branches, as well as between different nations in the coalition force aligned against Iraq. The organization of the air campaign was designed to reflect this goal of joint operation, and called for the formation of a “Tactical Air Control Center” (TACC), jointly operated by both Saudi and

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<sup>6</sup> Air Force officers of the Central Command (CENTAF) had a target “catalog” of 183 Iraqi and 35 Kuwaiti targets by June 15 1990, six weeks before Iraq invaded Kuwait.

U.S. commands. It was designed as a strategic theater command center where all the day to day planning for the air war against Iraq was to take place.

But this was not the only plan being drafted for the air war against Iraq. Back in Washington DC, a rather discreet office existed, unofficially called "Checkmate," that was organized around advanced "warfighting concepts." Its deputy director was Col. John A. Warden III, and it was essentially an ad-hoc, in-house Air Force think tank. Checkmate was composed of an elite Air Force staff dedicated to the formulation of advanced strategic air power theory. Around August 5, 1990 Checkmate began planning its own version of a strategic air campaign against Iraq. Rather than a way to support ground operations, as the official plan stipulated, Checkmate's plan focused more on the use of air power as the central pillar of a force to eject the Iraqi army from Kuwait. Warden believed that air power alone could ensure a strategic victory over Iraq (Atkinson, 1993: 56-57; Mandeles *et al.*, 1996: 122-123). In Warden's "Checkmate" plan, the operation was to be centrally directed in Washington DC, rather than from CENTCOM in Riyadh, and would depend much more on what are called "national technical means" of overhead surveillance, namely military reconnaissance satellites.

Once the deadline approached for the air war in January 1991, these two plans were eventually integrated. Warden's "Checkmate" plan, due to his proximity to Washington DC and the Pentagon, received the ear of the Joint Chiefs of Staff, along with its chairman, Gen. Colin Powell, who gave it the JCS seal of approval. The integration of the official plan and the "Checkmate" plan created considerable confusion and was the source of many technical and human interoperation problems (Mandeles *et al.*, 1996: 122-36) once Operation Instant Thunder was underway. They reflected two different doctrines about the use of air power in warfare; the official plan was based on the traditional doctrine of "air-land" battle, while the "Checkmate" plan emphasized a more central role for the Air Force and air power in general. This led to different approaches in planning the operation (Mandeles *et al.*, 14-15), which in turn led to dissimilar types and classes of target emphasis by both groups. The lingering effect of separating different functions like target planning, intelligence collection, and the creation of Air Tasking Orders, as well as the problems with target notations, led to problems with system interoperation. The compartmentalization of operations was still confused long after the executive phase of the invasion had been worked out, which affected the flow of imagery intelligence through the targeting cycle. There was a shift in planning authority from the Persian Gulf theater to Washington DC, associated with a shift in the authority of imagery intelligence from tactical systems to national, centralized systems. In effect, a shift occurred in authority between command and control in theater and centralized control in Washington DC that was mediated by the images produced in both systems.

Marine commander, Brig. Gen. Buster Glosson, who understood Warden's concept of a strategic air war to force the Iraqi army out of Kuwait, formed a special planning group associated with Checkmate, eventually called the "Black Hole." This represented the "checkmate" plan, and was an ad-hoc addition to the official theater level planning process. Once military operations commenced, the "Black Hole" was aligned under Air Force Central Command in the Gulf (see Figure 1). Their building was outside the Tactical Air Command Center in Saudi Arabia, compartmentalized (initially kept secret) and insulated from the rest of

the Air Force Command planning staff (Mandales *et al.*, 1996: 9-23). It was designed to implement the “checkmate” plan for using Saudi Arabia as a launching pad for a broader invasion of Iraq. The “checkmate” plan, because of the reliance of Air Force operations on interoperable systems, necessarily entailed far more emphasis on imagery and its use in surveillance, navigation, and weapons systems. It required a much more centralized military intelligence gathering effort and interpretation process.

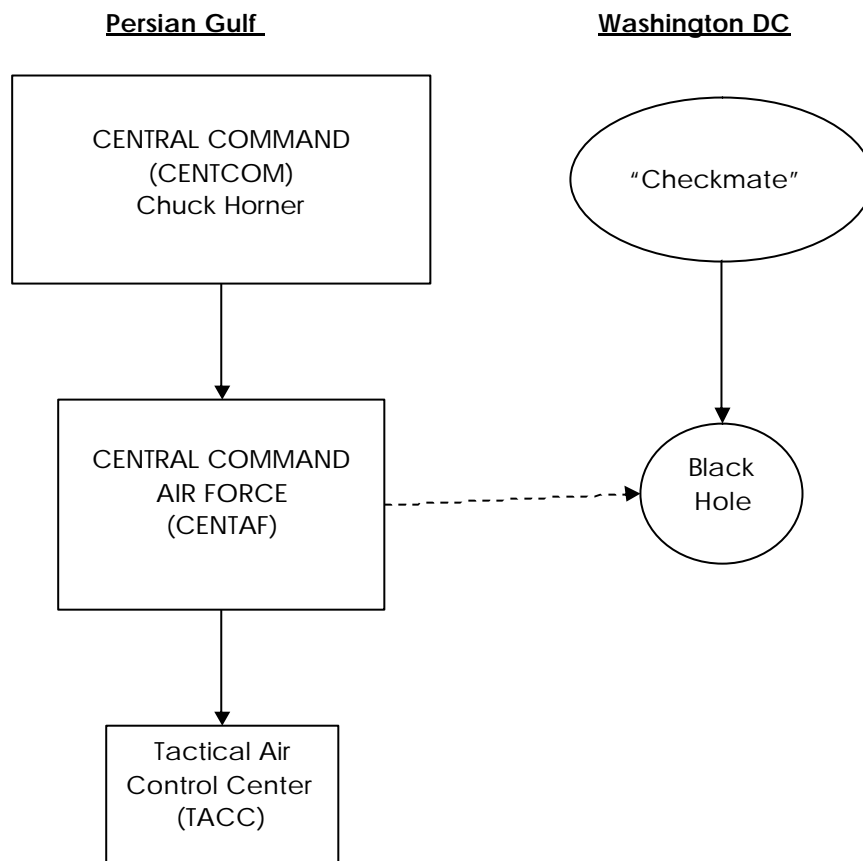


Figure 1: Command Organization for Desert Shield

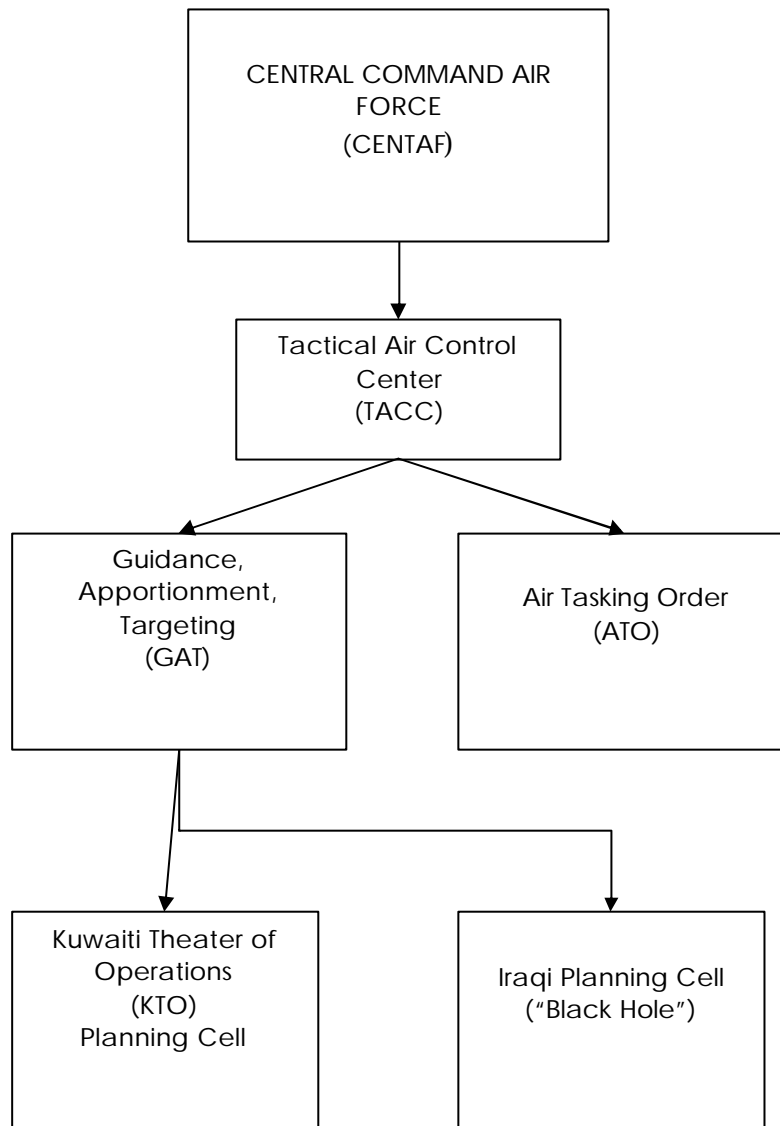
*Reorganization and Interoperation*

By December 1990, Operation Desert Shield had turned from a plan to defend Saudi Arabia into a plan to eject the Iraqi army from Kuwait. This change in political strategy made the campaign a joint operation, requiring a reorganization of planning and targeting, and thus a reshuffling of the tensions between plans and operational bureaucracies. In effect, the combination of the official and Checkmate plans became Operation Instant Thunder. The Tactical Air Control Center (TACC) in Riyadh was reorganized to reflect the priorities outlined in the plan. A similar reorganization of the Air Force's Central Command in Riyadh (CENTAF)

reflected the political shift from defence of Saudi Arabia to offensive operations against the Iraqi army in Kuwait and strategic targets deep within Iraq (Mandales *et al.*, 1996: 23-51).

After reorganization, the parallel planning efforts mentioned above were combined in the Tactical Air Control Center in Riyadh under a single targeting division (called Guidance, Apportionment, and Targeting, or GAT) (see Figure 2). However, this combined effort was still divided bureaucratically into two separate planning “cells” under the targeting division: one representing the “black hole” (Iraqi cell) and the other representing the “official” plan (Mandales *et al.*, 1996: 26-28, 136). In theory, they had all become part of the same operation, but in fact there remained some serious differences in terms of strategy and authority between planners in each cell. Officers in the “black hole” cell, under Brigadier General Buster Glosson of the Marine Corp, did not have to answer to the Air Force chain of command, but answered directly to Central Command and to Chuck Horner (the Joint Force Air Component Commander, or JFACC). The existence of the Black Hole initially created some tension because it divided campaign planners into two camps, “the first team and the bench,” (Mandales *et al.*, 1996: 30-33, 136), representing a shift in authority towards the center of military strategic planning. The flow of imagery intelligence was further complicated and fragmented by these reorganizations and the conflicts of interest that resulted.

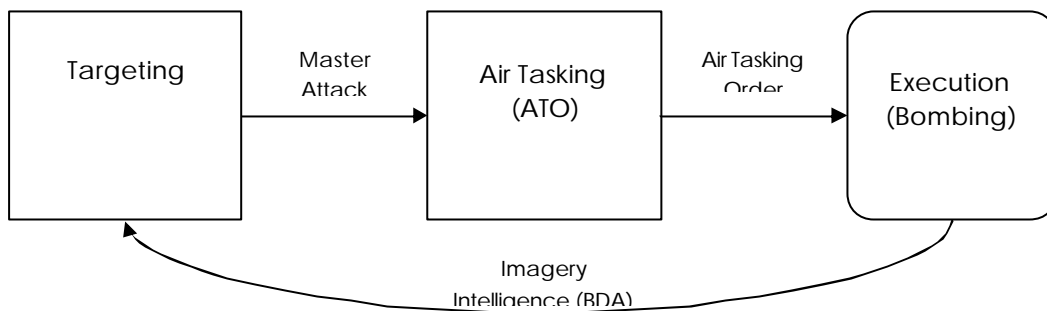
Although the isolation of the Black Hole provided independence, it also meant that they were dependent on ad hoc strategic intelligence channels between them and Washington DC, rather than established pipelines in Central Command. This was specific to Operation Desert Storm in 1991 and its overall organization and mission was expedient for the immediate situation. However, due to substantial architectural limitations, such as the revisit frequency of imagery satellites and their often substantial data download times, it was simply too hard to get imagery intelligence on targets from these more centralized sources quickly enough to form “the big picture.” Black Hole planners were forced to rely on informal personal connections within the various national intelligence establishments like the Defense Intelligence Agency or the CIA in Washington for their imagery intelligence (Mandales *et al.*, 1996: 23), while regular targeteers, planners, and intelligence staff in the wider CENTAF chain of command were still using their formal channels for imagery intelligence.



**Figure 2:** Command Organization for *Desert Storm*

*The Targeting Cycle*

Figure 3 is a diagram of the targeting cycle. The targeting cycle is an informational feedback system that turns intelligence imagery and data into targets, which are then integrated into a battle plan and target list. Once targets are bombed, they are turned back into intelligence data and fed back into the cycle, and so on. The selection of targets for the daily operation of the air war took place in two main steps and proceeded along a 3-day planning cycle once the war began.



**Figure 3:** The Three Day Targeting Cycle, Illustrating flow of imagery

The process required feedback from imagery intelligence in the form of Bomb Damage Assessment (BDA) to complete the cycle. Ultimately, although several different technical architectures were combined and new ones were created ad hoc, the collection and dissemination of tactical imagery intelligence in the Persian Gulf area was never part of a single, interoperable system architecture. Although an ad hoc imagery collection system was in place (described further below), “[target] planners and their counterparts in the wings had to perform extraordinary feats of informal coordination each night,” (Mandales *et al.*, 1996: 114). The main problems included low quality images, a general lack of comprehensive training for intelligence imagery interpreters in the Air Force, a lack of trust and communication between intelligence and planning personnel, incompatible target notation systems (Mandales *et al.*, 1996: 97; Smith, 1993: 7), and physical separation between intelligence personnel and tactical campaign planners.<sup>7</sup>

On the first day of the three day target planning cycle, target planners would produce what was called a Master Attack Plan (MAP). It was an in-theater planning innovation that ranked targets according to importance to the overall plan. In the words of strategists, it helped focus “planning efforts on simultaneous and relentless attack against targets critical to supporting the Iraqi war machine, relationships among targets to be attacked, and operational-level effects,” (Mandales *et al.*, 1996: 28-35).

<sup>7</sup> So for BDA to be conducted at CENTAF/IN in Riyadh, data from national systems and the CAFMS had to be translated into ASCII format on floppy disks and used to build a separate database, which was then combined with the original BDA database that CENTAF/IN had attempted to put together to coordinate all its BDA intelligence amongst the different cells. In effect, “databases from three different systems had to be combined if a total target picture were to exist.” This was a rather cumbersome “system,” more like a series of ad hoc work-arounds, that ended up adding confusion to the construction of the daily ATO because there was not a consistent set of shared database terminologies and notations for targets and spatial data.

Second, once a list of targets had been made, and targets had been matched with the appropriate aircraft and ordinance in the Master Attack Plan, the process was to actually assign the targets to specific and appropriate aircraft in the wings. This is the second stage of the target cycle, and is called the Air Tasking Order (ATO). The daily task of the ATO division was to construct an Air Tasking Order and direct which aircraft were to carry specific kinds of ordinance to specific targets. Bombing would occur on the third day of the planning cycle, when the Master Attack Plan was actually implemented into a days worth of bombing sorties. Mission reports completed by the pilots, including the videotapes from their weapons guidance systems, would be collected and sent back to the target planning division, thus completing the three day cycle. As an ad-hoc process, videotapes from guidance systems were an important source of tactical imagery intelligence during Operation Instant Thunder, described in more detail below (Mandales *et al.*, 1996: 35-49).

So what does all this mean in terms of abstracting the real world? The targeting cycle described above is essentially a technical and bureaucratic feedback system, sitting at the center of a massive military operation. This system had a 3-day cycle of operation, with three separate divisions structured by their own socio-technical networks, each in turn translating data into targets that were then re-translated into data for bomb damage assessment, then back into targets, and so on. This system constituted a central location through which information and commands generated by the entire U.S. war effort had to pass through on its way towards the destruction of these targets. The personnel who ran this center, located in a few different rooms scattered about one of the main Royal Saudi Air Force bases in Riyadh, were never required to be in contact with the carnage of combat, but they were nevertheless central to its organization. It is a remarkable example of how the mundane and the monstrously violent were co-extensive. We must step back from this series of abstracted translations (images into data, data and images into targets, targets turned back into data, and thus back again to images), in order to see the destruction that these activities were committing. In fact, the very nature of this cascading series of translations worked to obscure the violence that occurred on the ground from those at the center of organizing it. The violence itself was turned into more data for the system to consume, and so on until all targets are “neutralized.” The destruction of buildings and people in the real world was translated into another source of data to be fed into the targeting cycle to create more targets, and so on until the “targets” no longer produced new data.

#### *National Imagery Systems vs. Tactical In-Theater Systems*

Since the implementation of imagery reconnaissance satellites, Air Force doctrine increasingly stipulates that large "national" imagery intelligence architectures should provide timely tactical intelligence to planners in the combat theater, and this doctrine applied to the targeting cycle of Operation Instant Thunder. The collection of overhead imagery intelligence in the Persian Gulf was the responsibility of the intelligence division of Central Command, called J-2 (CENTCOM J-2). The plan called for J-2's collection management office to fulfil requests for imagery intelligence and system tasking from the different branches of the military. The intelligence division for the Air Force was responsible for its own required theater intelligence, but if they needed more comprehensive coverage and data, they would pass their requests up the chain of command to CENTCOM J-2. From Central Command such requests were forwarded to the

national imagery collection systems run by the National Reconnaissance Office (NRO) in Washington (Mandales *et al.*, 1996: 97-99; Asker, 1993: 57).

National imagery architectures, or “national technical means” for intelligence and verification, are in layman’s terms reconnaissance satellites. They belong to a series of imagery satellites designated with the code name “Keyhole,” and the most advanced imagery platform during the 1991 Gulf War was a giant Hubble-style orbiting telescopic camera called the “KH-11.” During the Gulf War, the United States used up to six different KH-11 platforms to observe the Persian Gulf region (Mandales *et al.*, 1996: 101-105. Also see: Covault, 1998, 1999; Manuel, 1992). Strategic imagery reconnaissance systems like the highly classified KH-11<sup>8</sup> and the U-2 were run exclusively by the National Reconnaissance Office (NRO) in Washington. However, sources suggest that interpretation and dissemination of this satellite imagery intelligence in Washington was slow due to the difficulties in processing the huge amounts of data that were routinely produced by the KH-11 (Mandales *et al.*, 1996: 100. Also see: Smith, 1993). According to imagery interpreters and at least one policy analyst who had experience using satellite images to help in the SALT and ABM treaty monitoring process, increases in image resolution lead to geometric increases in the amount of data that an image contains.<sup>9</sup> In terms of technological achievement, collection of data from these kinds of systems far outpaces the processing of this data, and turning these images into useful information and intelligence still requires several hours of work for just one image. So the problem is not with the amount of images and imagery data, but with real time processing and dissemination in a format that can be translated across several different system architectures, database protocols, and target notation systems. The interpretation cycle of imagery assets at the national level has not historically been time-critical, since high resolution satellite photoreconnaissance systems produce immense amounts of digital data that must be processed. However, tactical needs during heated battle require imagery in a timely manner to feed the targeting cycle described above. The cumbersome process of translating large datasets into useable information contributed to the ad hoc interpretation of armament delivery recordings (the famous “surgical strike” images from media coverage in the US) as a “work around” for this process (see: Smith, 1993; National Research Council, 1999).

Early in the military build-up, Marine Brig. Gen. Buster Glosson had ordered that all F-117 and F-111F aircraft units prepare videotape summaries of all the aircraft videotape recordings from their weapon guidance systems. Aircraft videotape recordings (AVTR’s), sometimes called armament delivery recordings (ADR’s), were created by attaching videotape recorders to gun cameras and radar targeting systems built into the aircraft. These videotapes were collected during pilot debriefings after each mission and used to construct mission reports (misreps) that would be fed back into the targeting cycle. Although the ordnance videos were supposed to be forwarded to planners, “initially so that Air Force command would have evidence of the accuracy of attacks in Baghdad,” this arrangement was more than just intelligence for the

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<sup>8</sup> The KH-11 is a highly classified satellite reconnaissance system that may have a real-time daylight resolution capability of six inches. This capability is really only suggested (see Johnson and Libicki, 1995), and must be assumed by how military elites talk about it, because at the time of this writing the military did not officially acknowledge its existence.

<sup>9</sup> From interviews with Herbert York, November 2001, and John Pike, June 2001.

targeting cycle. “The intention was to allay speculation on the part of the news media that the attacks on Baghdad were killing civilians,” (Mandales *et al.*, 1996: 32, 111). This effort was in accordance with military doctrine in the early 1990’s, namely the Weinberger Doctrine, wherein public relations became a central component of operational command (see Weinberger 1991). The collection of ordinance videos was fully integrated into strategic operations as a public relations tool to demonstrate the “surgical accuracy” of precision guided weapons (Smith, 1993: 5, 41-45; Atkinson, 1993: 122-125).

Target planners quickly found these images were useful as tactical intelligence because they were received several hours before other forms of imagery intelligence were distributed in the Persian Gulf. They became useful as tactical intelligence for campaign planners because of their relative timeliness compared with national systems that were being implemented for this task (Smith, 1993:13).

Bomb Damage Assessment (BDA) was initially standardized as routine intelligence practice in WWII, and was based on the systematic analysis of photographic reconnaissance (see: Brugioni, 1993; Coe, 1988; Stanley, 1981). Aircraft-mounted imagery systems specifically designed for tactical imagery intelligence were also part of standard operations during the Vietnam War (Smith, 1993:23-25). Systems designed specifically for tactical imagery intelligence quickly disappeared shortly after the U.S. left Vietnam, as photo interpretation personnel were removed from individual combat units, but aircraft weapons systems were still producing imagery inside the aircraft as components of a new generation of precision guided weapons (PGM's). Air Force F-16's were equipped with 8-mm video tape recorders to record the heads-up displays (HUD's) attached to their weapons systems, mainly for training purposes on bombing ranges. In the 1980's, military planners began to suggest that HUD's could be used as a secondary source for tactical imagery intelligence. However, the imagery could potentially have a dramatic effect when translated into other systems and contexts. An example occurred during the U.S. bombing of Libya in 1983, when recordings of aircraft HUD's were used both for tactical intelligence and media distribution to counter Libyan propaganda, very similar to how they were later used in the Persian Gulf War of 1991 (Mandales *et al.*, 1996:92-93; Smith, 1993:19-34).

There was no “master system” designed to produce tactical imagery intelligence on a strategic level in Operation Instant Thunder, at least not one that worked properly. Tactical imagery came from a few different sources, in different formats and from different platforms (either from aircraft targeting systems or from PGM's with video guidance systems), none of which were specifically designed to provide bomb damage assessment. Images were instead collected ad hoc from the imagery interfaces and displays that are built into a variety of weapons systems and aircraft. These include infrared and radar imagery from missiles like the Maverick anti-tank system, the attack radar from the F-15E and the F-117 Stealth weapons systems (point-aim-fire imagery interfaces), and the Forward Looking Infrared (FLIR) system in the F-111 aircraft, among a few others. These imaging systems are designed to provide pilots and/or computerized weapons systems with the ability to “see” targets in a way that allows for precision aiming and guidance.

Tactical intelligence from bomb damage assessment often has problems moving up the information chain that had been formalized to connect theater intelligence with the national level in Washington. One reason is that in the traditional economy of power in military command, tactical imagery from pilots does not carry the same kind of authority that national imagery intelligence does with strategic planners and commanders in Washington DC. In Operation Instant Thunder, top military and intelligence planners, both in Washington and in the Persian Gulf, simply did not trust the word of pilots as much as they trusted their national satellite and aerial imagery architectures (Mandales *et al.*, 1996: 103-05).

This bias towards national sources, that is, centrally processed satellite imagery, reflects a wider cultural bias toward scientific images as a source of evidence. As Sturken and Cartwright suggest, “scientific looking is always caught up in culturally influenced forms of looking (2000: 280), and military commanders in Operation Desert Storm were certainly not exempt from the forms of “looking” that satellite imagery mediates. Satellite imagery is produced with much greater geospatial precision and resolution, and with much more highly advanced imagery systems, than is imagery from virtually any other source. Therefore satellite images, like any mechanically produced image, bear the legacy of positivist concepts of science and a positivist narrative that assumes that scientifically produced imagery provides the most unobstructed and bias-free window on the “real” world. What we saw happening in the Gulf War imagery intelligence cycle was the formation of a hierarchy of increasingly precise mechanical production, a hierarchy of authority that allowed the satellite images to speak louder than the reports from the pilots themselves. This economy of authority mediated by satellite imagery speaks volumes about how and why satellite imagery is increasingly the source of cultural fascination beyond the military, as commercial satellite imagery of increasing resolution is becoming more widely available to the civilian public.

Brig. Gen. Buster Glosson, one of the commanders in the targeting cycle described above, did not hold this bias towards national sources (satellite imagery), and neither did Schwartzkopf, who after the war expressed his desire for more equipment that would permit commanders in the field to collect detailed intelligence, including imagery (Smith, 1993: 52-62). The ad hoc sources of imagery intelligence described above provided a “work around,” giving target planners greater independence and greater timeliness to influence the three day planning cycle. In essence, the images allowed them to circumvent the 72-hour planning cycle and change the Master Attack plan to reflect new information on targets that needed, in their own immediate assessment, to be re-targeted. Horner’s ability to centrally control the air war as the Joint Force Air Component Commander (JFACC) was questionable because of these ad hoc arrangements that circumvented his authority and control (Mandales *et al.*, 1996: 33, 122-130). So shifts in authority went both ways, as the imagery acted as mediator between shifts in military command authority from the tactical level to the more central and strategic level, and then back again as work-arounds in the system proliferated. In this particular instance, the authority of commanders was mediated by the tension between the resolution accuracy and the timeliness of the reconnaissance imagery.

## Conclusion

In this paper I have described in close but selective detail how aerial and satellite imagery systems in military combat situations represent Haggerty and Ericson's concept of a "surveillant assemblage." That is, a set of heterogeneous imagery, intelligence, and command systems and architectures whose unity is derived from their transparently smooth interoperation. Rather than being a stable system, shifts in authority and the proliferation of work-arounds made the architecture contingent on particular historical and political conditions, always in a state of continuous emergence as a series of both institutional and ad-hoc structures.

Surveillance systems and imagery intelligence architectures seem to have a constant turnover in the military as new capabilities are added to existing architectures. Something like an "integrated air picture" or a "common operating picture," or anything that introduces imagery as a new way of organizing systems and formalizing knowledge, causes an alteration in all the other systems in the architecture. Image making in this so-called image-saturated war did not take place within a single, integrated master system and could not provide perfect transparency for military commanders. Things like formats, bandwidth, and other aspects of data exchange had to be constantly reworked as new and evolving systems not only introduced new data standards and bandwidth, but also entirely new kinds of operations, requiring that the entire system architecture be rearranged. New systems not only introduced compatibility issues, but also altered the nature of the entire system itself and all its components. This is what makes any notion of system or administrative transparency an unstable entity, not only as a concept but also in actual socio-technical experience.

The kinds of human-machine-organization systems that the military's C4I architectures require has interesting parallels with Donna Haraway's metaphor of the cyborg (Haraway, 1991). Hidden behind the apparent smooth inter-operation of human and machine is the complex technical minutiae of interoperability that is necessary for the cyborg to work. Take, for example, the First Persian Gulf War and the translation of aircraft ordinance video tapes into images of "surgical precision" that were disseminated in the mass media (Atkinson, 1993: 232; Engelhardt, 1994). Mainstream U.S. television media organizations quickly turned these video images into different kinds of representations of what was discursively labelled "surgical" accuracy, a discourse that was continually substantiated by the rhetoric of military elites during press briefings in Saudi Arabia. The concept of "surgical precision" was a mass media construct, implying that the smooth interoperation between humans and machinery was both seamless and natural. How this seamlessness is accomplished and some of the problems this translation work entails, is made more obvious by critically scrutinizing the socio-technical practices of image making and carefully tracking the feedback of imagery and information through the system.

Large intelligence and weapons systems in the US military and their interoperation as system architectures provide a rich context for exploring how satellite imagery surveillance and reconnaissance systems not only *detect* objects and people, but also *produce* both objects on the ground and surveillant subjects. In terms of control, we can expand this notion to include other forms of bureaucratic and administrative control beyond military and police power.

Consider Google Earth, which allows users outside the military to appropriate a form of control through visual transcendence, a dominating subjectivity formerly only available to military and intelligence elites at the center of state administrative control. The perspective is one of a totalizing, objectifying transcendent gaze, and allows one to transcend the subjective world – what Donna Haraway calls the "God Trick" (Haraway, 1998), or what Denis Cosgrove has called the "Apollonian Eye" (Cosgrove, 2001) – that has been an essential ideological component of global control and conquest since antiquity. Its power as knowledge is derived from its position above and beyond subjectivity, and as Cosgrove asserts, it is "implicitly imperial," (15). In this sense, satellite imagery, photo reconnaissance, and imagery interpretation centers and practices are rich locations for exploring the power of surveillance technologies to define what counts as objective knowledge. They produce objectivity, a techno-discursive distance between the observer and the observed, and a particular kind of modern surveillant subject. This subjectivity is structured by an omniscient, imperial gaze, a particular kind of subjectivity that signifies dominance over what is being observed.

Because of their implicit connection to state sovereignty and democratic scrutiny on the one hand and their association with military reconnaissance and state administrative control on the other, satellite imagery systems provide a techno-discursive link between technology, the production of knowledge, and the maintenance of the modern nation state. Satellite imagery systems and architectures, as well as the locations and practices of imagery interpretation and dissemination, are rich sites that can be used to demonstrate that the study of technology has broad implications for understanding political power and the administrative control of both the material and the social structures of human existence. The increased proliferation of satellite imagery to the wider public has engendered discussions about how the imagery creates "global transparency." Transparency is a complex achievement that cannot reside within the technologies of satellite image making themselves, but is a discursive marker, or clue if you will, of how power and ideology become enfolded and "durable" (Latour, 1991) within large technological architectures.

This analysis sits within a wider project that seeks to describe all the ways that satellite imagery mediates and communicates power and authority in the wider culture. I touch on this briefly above in the discussion about how aerial and satellite imagery sat within hierarchies of scientific accuracy and mediated shifts in authority between images and pilots, and between strategists in Washington DC and battle planners in the Persian Gulf theater. More research needs to be done, specifically ethnographic research that examines in more detail how imagery, which carries the authoritative weight of geospatial accuracy, functions to mediate relationships of authority both within military command structures and in wider political and cultural contexts like the mass media or nuclear non-proliferation negotiations. This work is accomplished by applying concepts from visual studies and the sociological study of scientific imagery to satellite images. In other words, we have to see aerial and satellite images as artefacts of visual culture, that signify power and authority as they are translated from one socio-cultural context to another. As with other scientifically produced images, satellite images and how they are interpreted are equally dependent on cultural ways of seeing. All the various aspects of satellite imagery systems described in this paper work together to create the socio-technical structure of the Omniscient Eye, an imperial subjectivity or "gaze" that connects the visual with practices of global control.

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