REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED

2. Security Classification Authority:

3. Declassification/Downgrading Schedule:

4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

5. Name of Performing Organization:
JOINT MILITARY OPERATIONS DEPARTMENT

6. Office Symbol: C	**7. Address**: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207

8. Title (Include Security Classification): IN PURSUIT OF FOOLS GOLD-THEATER DOWNLINK AT THE OPERATIONAL LEVEL OF WAR (UNCLASSIFIED)

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10.Type of Report: FINAL	**11. Date of Report**: 3 February 2003

12.Page Count:26 **12A Paper Advisor (if any):NONE**

13.Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.

14. Ten key words that relate to your paper: THEATER DOWNLINK, TDL, OPERATIONAL, SATELLITE RELAY, COMMAND AND CONTROL, OPERATIONAL LOGISTICS, OPERATIONAL INTELLIGENCE, VULNERABILITIES, WARP, ETP

15.Abstract:

In the past ten years, U.S. military service chiefs, combatant commanders, and task force commanders have pursued their requirement for the capability to transmit data from intelligence, surveillance, and reconnaissance platforms directly into the theater operations-theater downlink (TDL)

The research highlighted certain themes: commander's desire for access to analyzed and unanalyzed data; commander's desire for data availability in a timely manner; maturity of a theater of operations impacts the use of TDL. The vulnerabilities of TDL and the impacts on operational intelligence, operational logistics, and command and control all lead to the same conclusion. TDL is no longer required. Instead, the transmission of data over satellite relays from ISR sensors has proven itself over the skies of Afghanistan in support of Operation Enduring Freedom. Continued pursuit of TDL is pursuit of Fools Gold.

16.Distribution / Availability of Abstract:	**Unclassified** X	**Same As Rpt**	**DTIC Users**

17.Abstract Security Classification: UNCLASSIFIED

18.Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT

19.Telephone: 841-3556	**20.Office Symbol:** C

Security Classification of This Page Unclassified

NAVAL WAR COLLEGE
Newport, R.I.

IN PURSUIT OF FOOLS GOLD—THEATER DOWNLINK AT THE OPERATIONAL LEVEL OF WAR

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Maritime Operations.

The contents of this paper reflect my own personnel views and are not necessarily endorsed by the Naval War College, the Department of the Navy, or the Department of the Air Force.

Signature:_____

3 February 2003

Introduction

It was a hot and dusty day in the heart of the Arabian Desert. The crew of the relay ground station is busy dutifully executing their mission—processing the incoming stream of data collected by the U-2.[1] Quickly, the data then passes to another antenna where it is relayed to another ground station somewhere in the United States—all in a matter of minutes. Suddenly the shrill sounds of sirens blare out their warning…incoming missiles! Shaken and nervous, the crew passes the warning information to their stateside counterparts and quickly takes cover. The stateside counterparts reply with a cautious good luck…and hope. One minute later, the worried voice from Saudi Arabia is cut off…the voice line goes dead. A fraction of a second later, the incoming stream of data also drops out. "Are you still there? Is anyone on the line? Are you all right?" There is no response…only silence. The theater commander is now partially blind.[2]

Along with the loss of life, goes an intelligence, surveillance, and reconnaissance (ISR) asset controlled by the theater.[3] The commander is also critically lacking in near-realtime ISR capability.[4] How did a commander get to this point?

There is a belief among commanders, combatant commanders (COCOM), and validated by the Joint Chiefs of Staff for the transmission of data from an ISR platform (airborne or space) directly into the theater.[5] This is known as theater downlink or TDL. Is the movement toward TDL taking to long? Some think so. One only need look to General Richard B. Meyers, when as the Vice Chairman of the Joint Chiefs of Staff he stated, "In my view, that's just bureaucratic slow rolling. It's just a cultural reluctance to move forward out of a stubborn wish to defend home turf. And it's getting in the way of a very sound vision for the future."[6]

In the example above, the commander could only gain control of the ISR process by ensuring a ground station presence in theater. The strong belief that theater commanders have found that gold nugget (TDL) is not true…what looks like gold is only Fools Gold.

At the *operational* level of war, commanders must consider the possibilities of different actions and tradeoffs in planning and executing a major operation. Past articles and papers have centered on the benefits and tradeoffs associated with the deployment of forces and TDL—i.e. don't move forces into theater that don't need to be there. This has been the siren call of "Reachback"—the "electronic ability to exploit organic and non-organic resources, capabilities and expertise…not located in theater."[7] Instead, the author analyzes TDL with respect to intelligence, logistics, command and control (C2), and vulnerabilities. Significant in practicing operational art is understanding the impacts that capabilities have with respect to functions at the operational level of war.[8] Analyzing characteristics and processes of ISR systems allows an analysis of TDL in a language commanders and their staffs understand. These factors are fundamental in assessing the value of TDL upon the operational level of war.

Throughout this paper, specific themes will be evident: access to data, timeliness of intelligence, and maturity of theaters of operation. During the research process, the author identified "access" and "timeliness" as key reasons why commanders have pushed for TDL. *The author argues the true pursuit should not be TDL. Instead, the ability to transmit data from an ISR sensor to a satellite and on to a CONUS ground station should be the true goal.*

At the operational level of war, TDL is not the gold nugget commanders believe it to be. Instead, the pursuit of TDL has become the pursuit of Fools Gold.

Operational Intelligence

At the operational level, intelligence "…is aimed to support planning, preparation, and execution of a major operation or campaign."[9] This process is accomplished through the Joint Intelligence Preparation of the Battlefield (JIPB) and Battle Damage Assessment (BDA).[10] Neither is accomplished without access to data in a timely manner.

Access to data. In remarks made by a former Vice Chairman of the Joint Chiefs of Staff (VCJCS), the joint force commanders require access to two types of data—analyzed and unanalyzed.[11] Analyzed data are reports created from unanalyzed data by intelligence analysts made available via "push" or "pull" architectures to the theater.[12] These architectures rely on reachback communication systems from CONUS or other out-of-theater intelligence centers. The reports (associated graphics, text, or voice) are made available to the responsible HQ who in turn makes it available to the theater; therefore, the in-theater analysts only get access to what the HQs provide—the report and not the unanalyzed data. Commanders should expect analysis of data for JIPB will require more than a couple minutes of studying. The impact depends on the detailed level of analysis required varying along a response timeline from minutes (BDA) to days (e.g. enemy traffic patterns, levels of activity). Assets back in CONUS or theater rear-areas are used to help formulate these answers. On the other hand, *unanalyzed* data is available on the order of minutes.[13]

In a quote from the same speech, the VCJCS stated, "we need access to the *unanalyzed* [emphasis added] information too."[14] This means, in certain situations, the reports take too long. Depending upon the situation, a commander must make a decision with the best data available; access to unanalyzed data is better than no data at all. For example, imagery from a U-2 (or a space asset) shows the movement of enemy forces out of garrison or an enemy submarine has left port. Commanders must give direction as soon as possible and the time spent before the analyzed data arrives could lead to the friendly forces

losing track of their adversary. The commanders want this type of access.[15] And so the argument goes, this requires TDL. In many theaters, data from airborne platforms is TDL'd to a theater ground station where it is relayed back to CONUS for analysis and dissemination. The unanalyzed data is downlinked directly into the theater and immediately transmitted to outside the theater! The data is available; the theaters are connected. So why aren't they getting the unanalyzed data? This implies access to unanalyzed data is not a TDL issue at all! Rather, it's an issue of access—not location of the downlink.

Timely. Data from ISR assets must be timely enough to be useful. Gen Richard B. Meyers, VCJCS at the time, remarked, "…I know that you understand how important it is to make sure our combatant warfighters get precisely what they need, in time for them to use it."[16] To paraphrase the general, late data is worthless to the commander. The timeliness of intelligence directly impacts the commander's ability to make decisions. Of course, "timely" is a matter of perspective. A corporal being fired upon has a much different definition of timely than targeteers pin-pointing objectives for the next day's bombing run. Again, the focus will be on the operational level of war, not the tactical level where troops need instant or near-instant information; however, timelines from OEF have matched TDL timelines experience in Operation Southern Watch.[17] Additionally, the type of data available determines how timely it can be. For example, an unanalyzed image can be made available in a matter of minutes from a U-2.[18] More than enough time to meet the JFACC's 72-hr Air Tasking Order (ATO) timeline or even the Marine Corps' 48- and 24-hr timelines.[19]

Operational Logistics

Assets have logistic support in the form of deployment, sustainment, and/or redeployment—including ISR operations.[20] In regards to operational logistics the theme of

the following paragraphs will focus on the maturity of a theater of operations and the impact of a TDL ground station on logistics planning for such a theater.[21] In a mature theater, forces are already in place, including intelligence gathering assets and ground stations. The opposite is true for an immature theater. In this analysis, the discussions of sustainment and deployment to mature theaters will not be discussed since other articles and commentaries have already done so, all in the context of "reachback." The arguments are stale because the desire for TDL and the relatively small impact in deploying and sustaining operations in a mature theater have created no great urgency. It's as if the only wars this nation will fight are the one's it plans for. Yet, for the last 10 years, most U.S. military involvement has been in locations far removed from connectivity or access.[22] And this is where the author focuses—on the impacts of operational logistics in an immature theater with respect to TDL

The significant difference between an immature theater and a mature theater is the deployment of a ground station and its associated troops and supplies…i.e. *deployment planning*.[23] For example, the movement of a Global Hawk ground station is expected to be one C-17, the Army's Tactical Exploitation System (TES) can be transported with a total of seven C-141s, and the U-2 ground station has no real plans to be moved.[24] As for a satellite ground station, expect similar numbers since collection and processing schemes are similar for air and space reconnaissance. This means more time to transport the load to an airfield in CONUS, time to airlift to a sturdy runway in theater (not all runways are capable to support C-5s, C-17s, or C-141s), time to transport to a location via trailer, time to set up the ground station, and finally, time to verify the communications links with the information grid.

An additional consideration—how quickly could a ground station get into an immature theater? An immature theater assumes a hostile theater—bullets, enemy aircraft, surface-to-air missiles, etc. After sending in troops to secure and protect an airstrip large

enough for a C-5 or C-17 (assuming it wasn't already bombed by U.S. or coalition air forces) and after convincing USTRANSCOM the airspace is secure enough to fly the national airlift assets into theater, then the commander must convince himself to use the cargo aircraft to move the ground station and personnel into place ahead of other higher priority tasks (such as moving troops, tanks, vehicles). If the commander is lucky, the Navy is off the coast and is able to provide some ISR assets to the cause. Of course, that requires a belligerent with access to the ocean.[25] Again, why is TDL the answer?

When planning for the operational level of war, time is a large factor. In this analysis, the time for deployment and its impact on timeliness of sensor data are key.[26] The time spent deploying an asset to an immature theater is time spent *not* collecting valuable data. This adds to the delivery timelines of intelligence products and the development of the commander's JIPB. The time spent deploying TDL assets to theater leave the commander with only a few options: space assets transmitting data back to CONUS where it's accessible by all who need it; or air assets with film or collection-only capability. Not very timely. The pursuit of TDL has driven the commander to plan for a mature theater, not the immature theater. Arguably, *the* topic of discussion for TDL is the C2 of ISR assets—specifically from space.

Operational Command & Control

The joint task force commander's means for fighting a war using "military and non-military sources of power to accomplish assigned strategic objectives" is *Operational Command & Control*, and "it binds together all other functions with the joint forces and assets deployed in a given theater."[27] [28] Currently, the C2 of U.S. national space ISR assets is shared among several national agencies—the National Reconnaissance Office (NRO), the

National Imagery and Mapping Agency (NIMA), and the National Security Agency (NSA). These agencies are normally associated with meeting military requirements. On the other hand, C2 of airborne ISR assets is with the task force commander. It is believed by some the geographic combatant commander should have similar command and control of the space ISR sensors as he does with the airborne ISR sensors. The argument *for* theater commander C2 of the assets is the ability to affect the decision-making cycle—specifically, controlling the ISR collection to ensure theater priorities are met.[29] The argument *against* theater C2 of the space assets—space ISR assets are not necessarily owned by the military nor is the military the only user.[30]

Nations go to war; therefore, war is a national effort. While the joint task force focuses on the warfighting aspects at the operational level, other agencies within the U.S. Government employ other instruments of national power. These additional instruments (diplomatic, economic, and informational) require use of the same national assets by organizations outside the military (e.g. Central Intelligence Agency (CIA), Department of State).[31] Even a joint publication discusses the complementary application of the instruments of national power in achieving the nation's objectives.[32] Because the space assets have many users wielding their respective instruments of national power, the assets must remain outside the theater C2 and at a level whose decisions can accommodate the best for achieving the national strategy of the nation—accomplished at the national decision-maker level—and achieve the operational objectives of the theater C2. Since the United States Special Operations Command (USSOCOM) was given the mission to fight the global war on terrorism (GWOT), the theater argument follows that USSOCOM should get C2 throughout their theater of operations. The *world* is their theater of operation!

Some would argue that without command & control of these assets, warfighter priorities will not be given the priority they deserve and impact the commander's decision-making cycle. On the contrary. In fact, it's disconcerting to hear both warfighters *and* national agencies voice the same concerns…but at each other![33] A possible answer to theater concerns is an agreement between the Director of the CIA and the Secretary of Defense called the *Transfer of Tasking Authority*, which "provides for final adjudication to transition to defense under 'wartime' conditions, or when the President so directs."[34]

Operational Vulnerabilities

What are the vulnerabilities of TDL that could impact the commander and the troops in the field? The author suggests they come from two aspects: location of the ground station and reliance on satellite relay communication links.

Location. In overseas areas, we are more vulnerable to hostile attack and political brinksmanship. As a high-value asset (both in capability and scarcity), the protection of a TDL ground station should be a high priority for the commander. Why? Ground stations in theater are more susceptible to hostile attacks than those in CONUS. Being closer to hostile territory makes it inherently unsafe—whether from an air, missile, or terrorist attack. What about overseas ground stations supporting the commander but are outside the commander's theater? For example, if the data is down-linked to Europe first and forwarded to the theater, why not send it to CONUS, instead? When did overseas locations become safer than the CONUS? *Is the speed of light faster from different parts of the world?* Of course not. Yet, it is strange how relying on our own forces in CONUS is traded away for the risk of a threat to an overseas ground station. A more likely vulnerability—will a host-nation continue to allow the U.S. use of its ground station on their soil? What if the host-nation chooses to stay out of a conflict and decides the U.S. could not use any assets on or from their soil? Those

ground stations are now useless. What about Kuwait…Saudi Arabia…South Korea?[35] These are some of our more nature areas of operations…areas the respective theater commanders have come to rely on (areas the Nation has come to rely on). The ground stations could become worthless with a stroke of a pen and a word from the host-nation's leader.

Satellite Relay. The vulnerability to communication links is common across ISR platforms.[36] Whether it's the loss of the link between the sensor and ground station (TDL), loss of the link between the sensor and satellite relay, or the loss of reachback to CONUS, the vulnerabilities are the same and have been since the commander began relying on radios and satellites to gather and disseminate information.[37] The impacts are the same—a partially-blinded commander with no real-time intelligence from the sensor. But the risk can be mitigated. The commander will continue to have use of other ISR assets depending on what is in theater or available from space—a commander rarely has only one asset available for use. But if the sensor was one of the high demand sensors, the commander will be partially blinded. The time "in the blind" could be from minutes to days.

If the issue lies with the ISR satellite or the communications relay satellite, the impacts could have longer term impacts depending on the corrective action required.[38] It will take time to correct any problems with a satellite (hours, days, or months). The issue is the same for ISR or communications satellites. The good news—built-in redundancy makes the reliability of satellites high and makes this vulnerability a low risk. If satellites were truly unreliable, why do military commanders continue to use them and want more? Why do the theater commanders use them for communication of data and C2 throughout the theater and to CONUS? So this is not an ISR-only vulnerability. The vulnerability is inherent in the way we fight wars, today; the same vulnerability exists across all the commander's networks.

These are not the ramblings of a space zealot—just the facts as proven by the continued use and reliance on the satellites by the warfighters.

Recommendations

In a short synopsis, the highlights of the above analysis are: access to unanalyzed data, timeliness of data, command & control of sensors, theater maturity, and location of the ground station. The recommendations that follow are based, in large part, on the author's experience and attempts to satisfy theater commander requirements.

First…data is data. This means analyzed data and unanalyzed data can be available via the same communications systems. The usual drawbacks are the larger size of the unanalyzed data file and the paradigm where warfighters should not see the data until the expert has analyzed it.[39] Both drawbacks are overcome through the use of NIMA's Web-based Access and Retrieval Prototype (WARP) dissemination system.[40] In use today, authorized customers at all levels of the military and national agencies can have access to unanalyzed data (national and theater airborne) through secure networks such as SIPRNET or JWICS.[41] Where ever users use SIPRNET or JWICS, they can have access to WARP. The data can be pushed to theater or pulled from CONUS or both. The key was attaching WARP to the same networks warfighters and theater intelligence analysts use on a daily basis. Additionally, the same data is available, simultaneously, to analysts in CONUS and analysts (or warfighters) in theater allowing for multiple levels of analysis at multiple levels of war.[42] This allows many users, with many different needs, to use the data as they see fit. What does this mean to the commander? The faster and wider dissemination of unanalyzed sensor data or intelligence products, a better processing backbone to allow synergistic analysis, and creation of new and different products to answer the Commander's intelligence questions for JIPB.[43] So, General Meyer's wish for access to unanalyzed data (both push and pull) is

finally here, and is working well today in supporting operations across many theaters and all the services.[44] Now that the access and timeliness issues of unanalyzed data have been addressed, how can a commander reduce his dependence on a ground station and still maintain C2 of assets?

The answer: the U.S. Air Force's Extended Tether Program (ETP). The program allows the capability for airborne ISR platforms to transmit collected data to a satellite for relay back to CONUS without having to use a ground station.[45] The first airborne ISR platform with this capability is the U-2. In this configuration, only the aircraft (and crew) must be deployed leaving the ground station element in CONUS. With this ETP configuration, the airborne asset can fly thousands of miles from a runway and is only limited by the amount of fuel on-board and the pilot's crew rest requirements.[46] This allows ready access to immature theaters of operations—no ground stations to bring along and set up. The commander still retains C2 of the airborne asset (setting all tasking priorities), and when tied into WARP, has access to unanalyzed data in the same timelines as TDL. Is this just the wishful thinking of the author? Hardly--these assets came together for the first time in support of operations in Afghanistan for Operation Enduring Freedom (OEF).[47]

OEF forced commanders to think differently. A crisis in a land-locked, immature theater disconnected from the world. The first imagery comes from the overhead space assets. But the commander requests additional assets and control over the imagery collection in the theater—he requests airborne assets. The only airborne asset capable of providing ISR—in a land-locked, immature theater disconnected from the world—was the U-2 with the extended-tether capability. In a matter of weeks, an aircraft and its crew deployed to an undisclosed location and quickly began operations.[48] Its unanalyzed data was transmitted to a satellite, relayed back to CONUS, and analyzed by intelligence personnel. Simultaneously,

the unanalyzed data was disseminated via WARP within the same timelines as TDL.[49] Access to unanalyzed data in a timely fashion, C2 of the airborne assets, access to an immature theater, and not worrying about location vulnerabilities of a TDL ground station—just what the commander needed. The continued pursuit of TDL almost left the commander in the dark.

Conclusion

Why the pursuit of TDL? Commander's have a requirement to ensure timely access to unanalyzed data from ISR platforms under their command and control. While commanders mistakenly pursue TDL in their hunt for the gold nugget, the author contends this is a pursuit in search of Fools Gold.

Throughout the paper, the author analyzed the concept of TDL as it pertains to operational intelligence, operational logistics, operational command and control, and operational vulnerabilities. Additionally, the author highlighted specific themes: access to data, timeliness of intelligence, and maturity of theaters of operation.

In developing the JIPB, the commander requires analyzed and unanalyzed data in a timely fashion. Without it, the commander's decision-making capability is severely hampered. The belief that TDL would allow theaters to get the data first instead of waiting for their headquarters to pass analyzed products to them is the prime reason behind TDL. The data was downlinked directly to the theater, and yet access was still unavailable. The timeliness of data via TDL or satellite relay is the same. Together, in-theater and CONUS analysts can develop a more complete JIPB through simultaneous analysis of the data. This can be accomplished today using WARP.

The main impact of TDL on operational logistics is the maturity of the theater. In the past ten years, the military has pursued TDL operations in mature theaters of operation even

though most separate operations have occurred outside those mature areas. The important takeaway in analyzing the maturity of a theater of operations is the deployment of a ground station to an immature theater in support of TDL. As the operation in Afghanistan has shown, a land-locked, hostile, and immature theater disconnected from the world is not accessible to the use of TDL.

With respect to operational command and control, commanders were focused on the belief they were not getting their ISR requirements fulfilled due to out-prioritization by other national agencies (CIA, Department of State, etc). From the perspective of the other national agencies, they believe the military commanders were consistently out-prioritizing them. Who's right? They both are. A critical resource shared by all makes for difficult issues, but nothing TDL will solve. Because wars are fought using all the nation's instruments of power, the military and other national agencies will always be at odds over prioritization. However, in some relief, the DCI and SECEF agreed to an ability to deconflict prioritization problems via the *Transfer of Tasking Authority* during wartime hostilities. These prioritization issues have led to discussions of C2 of space assets as they orbit within the commander's theater of operations. One only has to look at USSOCOM's area of responsibility to see the folly of such discussions.

In analyzing vulnerabilities, location of the ground station outside the CONUS and the communication links between the ISR assets and its ground station were highlighted. The location of a ground station outside the CONUS is inherently unsafe due to the closeness to hostilities. Although overseas ground stations may be sitting safely in the host-nations of allies, the ability to use them could disappear. The host-nation's leader could decide the usefulness and fate of the ground station during U.S. military operations. Common to all ISR systems are communication links. The analysis showed similar vulnerabilities and risks.

The difference between TDL and satellite relay, however, was the reliance on satellites. But this reliance was deemed acceptable due to the reliability and accepted practice of commanders to use satellite relays in every part of their theater communications. It's inherent in the way the U.S. fight wars.

What did this analysis prove? TDL is no longer required. New technologies and concepts have removed the need for TDL. Access to data is corrected, timeliness is corrected, and access to immature theaters is corrected. This was proven during Afghanistan operations in support of Operation Enduring Freedom. The use of WARP (to access and disseminate unanalyzed national and theater data) and the Extended Tether Program (to gain entry into immature theaters) is a winning combination for the commander. Even with the success of ISR assets in Afghanistan using relay satellites, the author wonders if the pursuit of TDL is finally over.

It is a hot and dusty day in the heart of the Arabian Desert. The crew of the ground station is busy dutifully executing their mission—processing the incoming stream of data collected by the U-2. Suddenly the crew gets word of an incoming missile! Calmly, the information is relayed to the pilot who looks out his window. One minute later, the pilot reports a missile hit on an area very near the old ground station relay. The crew of the ground station sighs, "Sure glad we switched over from TDL to this new ETP equipped Global Hawk. We could have been killed! CONUS is much safer. Pilot, can you flyover to the location of the missile strike? We need to get an image."

TDL is not the answer to this nation's ISR issues—satellite relay is! The reliance on TDL from space or airborne ISR is the commander's Fools Gold in the river of operational art.

NOTES

[1] The U-2 is a United States Air Force platform for collecting imagery and signals intelligence.

[2] In this example, a theater downlink from a space ISR asset is just as applicable. Also, other assets may be available via space reconnaissance platforms or airborne tactical platforms; therefore, only "partially blinded."

[3] Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Terms, Joint Pub 1-02, Joint Electronic Library CD-ROM, Washington, DC: 12 April 2001. *Intelligence* is defined as "the product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas….Information and knowledge about an adversary obtained through observations, investigation, analysis, or understanding." p. 208; *Surveillance* is defined as "the systematic observation of aerospace, surface, or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means." p. 413; *Reconnaissance* is defined as a "mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area." p. 356.

[4] "Realtime" is as the data is collected, the user sees it, like the Predator video feed; however, "near-realtime" has the connotation of the user seeing the data after it has been downlinked, processed, and forwarded to the user.

[5]"Information Edge: Imagery Intelligence and Geospatial Information in an Evolving National Security Environment, Report of the Independent Commission on the National Imagery and Mapping Agency," (approx January 2001), <http://cartome.org?nima/nima-ir.htm#11.1> [1 February 2003], p. 3. The Report states the next generation of space reconnaissance assets will not meet the JCS requirement for TDL, "as currently baselined."

[6] Richard B. Meyers, "Remarks to the USAF Scientific Advisory Board," 1 November 2000, <http://www.dtic.mil/jcs/vice_chairman/00-SAB.htm> [16 December 2002]: p.3

[7] John M. Neal, "A Look at Reachback," *Military Review* 80, no. 5 (September/October 2000): 39

[8] Milan N. Vego, Operational Warfare (Newport: Naval War College 2000), 185. "Successful employment of combat forces across the operational continuum requires the existence and an effective organization of functions in support of the employment of combat forces. These functions are theater-wide; hence, the term operational functions."

[9] Ibid. , 206.

[10] Ibid., 211, goals defined; Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Terms, Joint Pub1-02, Joint Electronic Library CD-ROM, Washington, DC: 12 April 2001, p. 224. The JIPB is defined as "the analytical process used by joint intelligence organizations to produce intelligence assessments, estimates and other intelligence products in support of the joint force commander's decision-making process….Joint intelligence preparation of the battlespace products are used by the joint force and component command staffs in preparing their estimates and are also applied during the analysis and selection of friendly courses of action."; ibid., 211, 218 endnote #29. Milan Vego takes issue with this term for describing preparation at the operation level of war. Instead, he uses the term Intelligence Preparation of the Theater (IPT). "The term 'Intelligence Preparation of the Battlefield' is essentially tactical; hence, it is not appropriate to use that term to refer to operational-level intelligence." However, for the purposes of this paper, the term used in joint publications is JIPB and will be used as such in this document; ibid., 50. BDA is defined as "the timely and accurate estimate of damage resulting from the application of military force, either lethal or non-lethal, against a predetermined objective. Battle damage assessment can be applied to the employment of all types of weapon systems (air, ground, naval, and special forces weapon systems) throughout the range of military operations. Battle damage assessment is primarily an intelligence responsibility with required inputs and coordination from the operators. Battle damage assessment is composed of physical damage assessment, functional damage assessment, and target system assessment."

[11] Richard B. Meyers, "Remarks to the USAF Scientific Advisory Board," 1 November 2000, <http://www.dtic.mil/jcs/vice_chairman/00-SAB.htm> [16 December 2002]: p. 4; Marine Corps, Marine Corps Warfare Publication 2-15.4, <http://doctrine.usmc.mil/mcwp/view/mwcp2154/ch1.pdf> [29 January 2003]: chapter 1, p. 6. *Analyzed* is defined as "…fully analyzed and evaluated…and supporting detailed intelligence text reports...." *Unanalyzed* is defined as "…raw, unevaluated…" by intelligence analysts. For example, the Marines distinguish the two types of data using an example of imagery (unanalyzed) and IMINT (analyzed). "An annotated target graphic represents IMINT while either the on-screen picture or prints from the screen of a downlinked UAV [or any other air or space platform] represent imagery in an unevaluated form."

[12] Joint Chiefs of Staff, Doctrine for Intelligence Support to Joint Operations, Joint Pub 2-0, Joint Electronic Library CD-ROM, Washington, DC: 9 March 2000, p. IV-2. The term "push" is defined as "allowing the higher echelons to push intelligence down to satisfy existing lower echelon requirements or to relay other relevant information to the lower level….updates must be based on the JFC's PIRs [priority intelligence request]…" The term "pull" is defines as involving "direct electronic access to data bases, intelligence files, or other repositories by intelligence organizations at all levels….must be available on an as-needed 'pull' basis so the joint force J-2 avoids information overload."

[13] The exact time of availability of data via airborne or space assets is classified.

[14] Richard B. Meyers, "Remarks to the USAF Scientific Advisory Board," 1 November 2000, <http://www.dtic.mil/jcs/vice_chairman/00-SAB.htm> [16 December 2002]: 4. Although the general is referring to space reconnaissance assets, it is equally applicable to airborne reconnaissance, as well.

[15] There are implications to this level of access. Decisions made without proper intelligence training and skills could lead a commander to the wrong conclusion and make a hasty decision (or so the argument goes) with deadly and legal consequences. However, General Meyers states the need for missile warning data directly to the theater--probably not an area where a commander may make the wrong decision. Any further discussion is out of scope for this paper.

[16] Richard B. Meyers, "Remarks to the USAF Scientific Advisory Board," 1 November 2000, <http://www.dtic.mil/jcs/vice_chairman/00-SAB.htm> [16 December 2002]: 1

[17] Timelines are known from author's experience. Operation Southern Watch supports the Southern No-Fly Zone in southern Iraq.

[18] For those familiar with intelligence terms, unanalyzed means unexploited and as mentioned earlier, exact times for availability of data is classified.

[19] Marine Corps, Marine Corps Warfare Publication 2-15.4, <http://doctrine.usmc.mil/mcwp/view/mwcp2154/ch1.pdf> [29 January 2003]: 13, 14. "Planning time over target (TOT) parameters for most joint force air component commander (JFACC) operations is 72 hours, with aviation combat element (ACE) mission planners generally operating on a 48-hour cycle; Marine expeditionary unit (special operations capable)…ACE and squadron level mission planners typically operate on a cycle of 24 hours or less."

[20] Joint Chiefs of Staff, Doctrine for Planning Joint Operations, Joint Pub 5-0, Joint Electronic Library CD-ROM, Washington. D.C: 13 April 1995: 1-3. The publication outlines deployment, sustainment, and redeployment planning; Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Terms, Joint Pub1-02, Joint Electronic Library CD-ROM, Washington, DC: 12 April 2001: 414. *Sustainment* is defined as "the provision of personnel, logistics, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or of the national objective."; ibid., 358. *Redeployment* is defined as "the transfer of forces and material to support another joint force commander's operational requirements, or to return personnel, equipment, and material to the home and/or the demobilization stations for reintegration and/or out-processing."

[21] Milan N. Vego, Operational Warfare, (Newport: Naval War College 2000), 260. *Operational Logistics* is described by Prof Vego as "…to ensure that one's actions are continuous through all phases of a major operation or campaign….Thus, effective operational logistics must balance current consumption with the need to build up logistics support for subsequent operations. It must provide for lengthening the lines of communications and staging logistics support forward to maintain the desired operational tempo."

[22] Barnett, Thomas P. M. "The Pentagon's New Map," *Esquire* (March 2003), 227. Mr. Barnett examines globalization through his concepts of the "Core" and the "Gap." In his article, he mentions "Bin Laden and Al Qaeda are pure products of the Gap…" and when combined with the "military intervention record of the last decade, a simple security rule set emerges: *A country's potential to warrant a U.S. military response is inversely related to its globalization connectivity*." To make his point, Mr. Barnett highlights Afghanistan, Sudan, northwestern Pakistan, Somalia, and Yemen.

[23] Joint Chiefs of Staff, Doctrine for Planning Joint Operations, Joint Pub 5-0, Joint Electronic Library CD-ROM, Washington. D.C: 13 April 1995, p 1-3. Deployment Planning is defined as "…planning to move forces and their sustainment resources from their original locations to a specific operational area to conduct joint operations outlined in a given plan."

[24] William Messer, "Getting Space-based ISR Data to Warfighters," *Military Review* 81, no. 6 (November/December 2001), p. 42-45. The Army's Tactical Exploitation System (TES) is comprised of two nodes—TES-forward and TES-main. "The TES-forward is equipped with six high-mobility, multi-purpose wheeled vehicles….TES-forward can be transported on six C-130s or three C-141s and can be driven on and off the aircraft….TES-main is housed in air-transportable, 40-foot vans. The TES-main can be transported on four C-141s, three C-17s, or one C-5 and can be driven on and off the aircraft."; Walter H. Harris, <walter.harris@langley.af.mil> "RE: GH questions." [E-mail to Bryan T. Dahle-Melsaether <bryand-m@zianet.com>] 31 January 2003.

[25] If not, then refueling will be required to get the Navy asset to the targets. They will probably require escorts to go along with them if high density threats exist.

[26] Milan N. Vego, Operational Warfare, (Newport: Naval War College 2000), 53. "The *time for deployment* of one's forces at the operational…level is much longer than at the tactical level. The longer the distance to the employment area, the longer it will take to complete the transit to the assigned areas of concentration or combat. The time needed to deploy forces to conduct a major operation or campaign will depend on many factors, but primarily on the distance from the home base or current operating area to the deployment area, the size and mobility of one's forces, and the mode of transportations used."

[27] Ibid., 187

[28] Ibid., 187

[29] Assets within the AOR (even if only temporary—such is the case with bombing missions from outside the theater) from below the sea and through space is the realm of the COCOM. While this may be the desire of the geographic and task force commanders, it does not exist today—at least not for space.

[30] U.S. government space assets are controlled by various military and national organizations (Air Force Space Command and National Reconnaissance Office, too name a few). As for U.S. commercial ISR space sensors (like IKONOS), the government does have the capability to control the dissemination of the data via shutter control. The U.S. government can task the sensor to collect an image of a target and control the information so adversaries cannot access it. This also keeps adversaries from tasking the satellite. With shutter control, one could make an argument the COCOM would then want C2 of the commercial satellite as it orbits through his battlespace. The NIMA Commission Report stated the argument by commanders is "a regional commander should be 'apportioned' the space reconnaissance assets as they are in view of this theater of operations."

[31] Joint Chiefs of Staff, National Intelligence Support to Joint Operations, Joint Pub 2-02, Joint Electronic Library CD-ROM, Washington, DC: 28 Sep 1998: III-2, figure III-2. Additional non-military organizations of

the U.S. intelligence community are the Department of Energy, the Department of the Treasury, and the Department of Justice.

[32] Joint Chiefs of Staff, Joint Warfare of the Armed Forces of the United States, Joint Pub 1, Joint Electronic Library CD-ROM. Washington, DC: 14 Nov 2000: V

[33] "Information Edge: Imagery Intelligence and Geospatial Information in an Evolving National Security Environment, Report of the Independent Commission on the National Imagery and Mapping Agency," (approx January 2001), <http://cartome.org?nima/nima-ir.htm#11.1> [1 February 2003]: 33. In an effort to support warfighter requirements, other non-military national agencies have cried foul. These agencies have voiced a "concern that NIMA's support to national customers, such as CIA, was being sacrificed in order to support the operational demands of the military customers, such as those at European and Central Command….and had a negative effect on our long-term intelligence issues—such as the development and the spread of weapons of mass destruction….While no one doubted the legitimate need for information about the threat to US Forces…many did question whether the volume of imagery collection, the details of imagery collection, or the strategy used to ensure collection was appropriate in light of other intelligence needs."

[34] ibid., 44

[35] The author is only identifying mature theaters of operation and is not predicting locations of possible TDL ground stations.

[36] Loss of communication does not necessarily have to occur due to enemy interaction. Communication problems can be caused by atmospheric or solar effects.

[37] Transmitter and receiver problems are similar across the platform—airborne, satellite, or ground station. Additionally, the type of data is not important—data is data. The change came from the amount of data and the distances it had to be transmitted. Because friendly forces are spread across the theater, the commanders have been relying on communication satellites (and other theater communications assets) to relay information (orders, intelligence, plans, etc)
Think of bandwidth as a pipe—the size of a pipe determines the amount of water one can put through it. A larger pipe will allow more water to pass through from point a to point b. In the case of moving data, a larger pipe allows more data to move from point a to point b. Data such as imagery, video feeds, or video-teleconferencing have high bandwidth requirements; voice and text have low bandwidth requirements.

[38] The corrective action could take from hours to several days (or months) depending on the severity of the problem. Unlike aircraft, maintainers cannot go to space and remove and replace broken hardware. It must be done from the ground through software changes and computer commands sent to the satellite.

[39] The process for tasking, processing, exploitation, and dissemination (TPED) is used in the collection of intelligence data from space and airborne assets. Tasking is the process for an individual or organization to request the collection of data from an ISR sensor. Processing takes the collected data and transforms it into a product (such as an image). Intelligence analysts then analyze (Exploit) the product and create an intelligence report. Finally, the intelligence report and intelligence product are made available to users through Dissemination; Richard Lardner, "DOD Bandwidth Upgrade Will Change How Info Is Distributed, Analyzed." Inside the Pentagon, 19 September 2002: 1. Mr. John Stenbit, the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASDC3I) proposes Tasking, Posting, Processing, and Use (TPPU) instead of TPED where "posting" is making the unanalyzed data available immediately after collection to all authorized.

[40] Richard Forman, Web-based Access & Retrieval Prototype Data Sheet, Harris Corporation, 2001. <http://download.harris.com/app/public_download.asp?fid=477>. WARP "is a prototype capability that has evolved from more than seven years of successfully delivering automated imagery to users. The WARP system demonstrates technologies that meet the vision of NIMA to provide imagery and imagery-based products." WARP allows users to view unanalyzed imagery from the desktop. The term "prototype" usually scares commanders; however, it has proved its worth and reliability in sustained realworld operations in the last two years—especially to the low-bandwidth users. WARP provides access to theater and national imagery systems.

Because data is data, future work is focused on providing access to other data types from the intelligence world. From the author's own experience, personnel are given passwords after their security clearances are verified.

[41] Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Terms, Joint Pub 1-02, Joint Electronic Library CD-ROM, Washington, DC: 12 April 2001: 380. Secret Internet Protocol Router NETwork (SIPRNET)—"worldwide SECRET level packet switch network that uses high-speed internet protocol routers and high-capacity Defense Information Systems Network circuitry. SIPRNET is a secure, global network operating at the "SECRET" classification level with much better access for the warfighter."; ibid., 233. Joint Worldwide Intelligence Communications System (JWICS)—The sensitive compartmented information portion of the Defense Information System Network. It incorporates advanced networking technologies that permit point-to-point or multi-point information exchange involving voice, text, graphics, data, and video teleconferencing." JWICS is a secure, global network used primarily by intelligence experts.

[42] Actual timelines are classified; however, if the timelines are equal to the timelines of TDL, then the question is why use TDL?

[43] Often out of sight and "away from the flagpole", the forces in CONUS are "virtual" assets at the fingertips of the commander: expertise, a deeper bench, global access, and raw processing power. The combination of the above will provide more products, better answers, and synergy among CONUS and theater analysts. The author does not argue CONUS analysts have a better understanding of the theater than the experts already in theater. Instead, the CONUS expertise lies in the variety of analyst specialties and exploitation tools not usually found in theater. These are exactly the resources and expertise required for the development of the JIPB at the operational level of war. In addition to the availability of expertise and the depth of the bench, CONUS has the resources to provide a robust global access to the information grid for all. These resources can be used in a "federated" manner to analyze sensor data as was done with Operation Allied Force (OAF) in Kosovo.

[44] Shared resources are inherently vulnerable and limited bandwidth in our communications is no different. Like any shared resource, many users want access and want to push/pull as much data across the communication pipes as possible. This risk can be reduced by using CONUS linked ISR assets, because the data has been processed and can either be made available via pull (reducing bandwidth by not pushing every bit of information) or push specifically requested target information to theater. This greatly reduces the need for bandwidth and allows for the heavy bandwidth applications like video-teleconferencing.

[45] Peter Pae, "U-2 goes higher-tech," Los Angeles Times, 25 April 2002. <http://www.chicagotribune.com/news/specials/911/showcase/chi020425u2plane,0,739456.story> [11 January 2003]. Describes ETP as a "satellite-based system" incorporating "a pod attached to the top of the aircraft…" This theater controlled asset (the airborne platform it's attached to) relays the collected data back to a ground station in CONUS. The data is analyzed and made available to the theater. This program also allows for the unanalyzed data to be made available on NIMA's WARP dissemination system. All within minutes—equivalent to theater organic assets using TDL.

[46] When the Global Hawk is made ETP capable, the limitations of the human body is no longer an issue.

[47] Frank Wolf, "U-2 Extended Tether Used for First Time in Combat," Defense Daily International, 25 (26 April 2002). This was the first time for combat operations.

[48] The airspace in Afghanistan was not secure for the entry of military airlift transports.

[49] The exact timelines are classified.