

An hourglass-shaped graphic with a globe in the top bulb and another globe in the bottom bulb. The hourglass is light blue and has a dark blue cap at the top and a dark blue base at the bottom. The globe in the top bulb is dark blue, and the globe in the bottom bulb is light blue. The text is centered within the hourglass.

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February 2, 2009

Congressional Research Service

Report 95-560

Intelligence Implications of the Military Technical Revolution

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Updated May 1, 1995

Abstract. The availability of precise, real-time intelligence has been an integral part of a military technical revolution being implemented by the Department of Defense for post-Cold War conflicts and peacekeeping operations. Providing this intelligence requires new types of equipment, analysis and organizational relationships within the U.S. intelligence community.

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CRS Report for Congress

Intelligence Implications of the Military Technical Revolution

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Congressional Research Service · The Library of Congress



INTELLIGENCE IMPLICATIONS OF THE MILITARY TECHNICAL REVOLUTION

SUMMARY

The availability of precision guided munitions (PGMs) and precise intelligence transmitted in "real time" lies at the center of a military technical revolution that is changing the ways in which future military operations are likely to be planned and conducted. This revolution requires changes in the functions and organization of the U.S. Intelligence Community.

During the decades of the Cold War, intelligence agencies were organized around collection disciplines, *e.g.*, signals intelligence, photographic intelligence, and human intelligence. Collection efforts were managed by Washington-based agencies, principally, the National Security Agency, the National Reconnaissance Office, the Defense Intelligence Agency, and the Central Intelligence Agency. Their efforts were largely (but by not means exclusively) directed towards supporting senior policymakers in dealing with the threat from the Soviet Union. Support to military operations was provided by service intelligence organizations using information that became available from national-level agencies.

The Persian Gulf War, which occurred just as the Soviet Union was collapsing, saw the dispatch of PGMs to destroy specific targets without extensive collateral damage and injuries to noncombatants. This capability stands in sharp contrast to the area bombing campaigns of World War II and Vietnam. This success occurred even though many intelligence systems and communications links were not designed to provide extensive real-time support to lower echelons of military commands. It was possible in large measure because analysts in Washington and military staffs in the Gulf commands devised innovative uses of existing intelligence and communications systems.

Subsequently, the Intelligence Community, with congressional support and encouragement, is being restructured to ensure that support to military commanders assigned regional and peacekeeping missions has a high priority. Relationships between national and tactical systems are being rationalized. New surveillance equipment and communications links are being procured. Personnel are being trained to draw upon all the resources of the Intelligence Community to provide real-time support to military operations.

There are major challenges remaining, however, to ensure that this process of intelligence "tacticalization" goes smoothly, that interoperability among equipment used by different services and intelligence agencies is achieved, and that a reasonable relationship between force structure, intelligence and communications "architectures," and likely operational missions in the uncertain post-Cold War world is maintained. Some observers have also expressed concern that national intelligence not be neglected as necessary adaptations to the military technical revolution are implemented.

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INTELLIGENCE IMPLICATIONS OF THE MILITARY TECHNICAL REVOLUTION

INTRODUCTION: A NEW MILITARY TECHNICAL REVOLUTION

An ongoing military technical revolution¹, centered in large measure on the combination of innovative reconnaissance and communications technologies with precision guided munitions, is profoundly affecting the functioning of the U.S. Intelligence Community. As congressional committees and the Commission on the Roles and Capabilities of the U.S. Intelligence Community² are currently reviewing the roles and missions of the Intelligence Community, most public attention has been focused on the clandestine activities of the Central Intelligence Agency (CIA). Nevertheless, the vast bulk--perhaps almost seven-eighths--of the Nation's intelligence budget is invested in defense-related intelligence. It is, furthermore, in this area that roles and missions are changing most rapidly, with major implications for the future acquisition, analysis, dissemination, and use of intelligence.

The ability to give a military commander precise information on an enemy target and weapons that can destroy that target with minimal collateral damage has played a major role in the transformation of a national security strategy once centered on nuclear weapons. This change in strategy demands *pari passu* a transformation of intelligence support to military operations that can capitalize on technological capabilities to wage what has been termed

¹The term "military technical revolution" (MTR) (or "revolution in military affairs" (RMA)) is becoming increasingly used in defense studies to categorize the changes involved in the use of the combination of new defense technologies and the organizational structures to take full advantage of them. Although there are many aspects of the MTR, this report focuses on the impact of enhanced surveillance and communications technologies combined with precision-guided munitions. According to some observers, a new epoch of warfare is emerging, distinct from the atomic age that preceded it, in which victory can be achieved by precision attacks on an opponent's forces and infrastructure without massive collateral damage. Curiously, Soviet commentators in the waning days of the Soviet Union gave the concept more attention than Western observers; see Mary C. FitzGerald, "The Soviet Military and the New 'Technological Operation' in the Gulf," *Naval War College Review*, Autumn 1991. For additional background on the question of military technical revolutions, see Dan Gouré, "Is There a Military-Technical Revolution in America's Future?", *Washington Quarterly*, Autumn 1993, and Michael J. Mazaar, *The Military Technical Revolution: A Structural Framework; Final Report of the CSIS Study Group on the MTR* (Washington: Center for Strategic and International Studies, 1993). Continued technical improvements will probably make PGMs preferred weapons for future limited wars and peacemaking operations in which the goal is to successfully neutralize targets with reduced likelihood of losing pilots and inflicting unnecessary damage to civilians.

²Created by the FY1995 Intelligence Authorization Act, P.L. 103-359; see Richard A. Best, Jr., Intelligence Issues and the 104th Congress, CRS Issue Brief IB95018.

Information Warfare (IW). Military commanders will in the future need precise, real-time intelligence data that may be provided either by sensors under their own control or by an intelligence center thousands of miles away.

A characteristic feature of the new MTR is the use of precision guided munitions (PGMs) to destroy targets without widespread collateral damage. To an extent and under ideal conditions (and the Iraqis provided fairly good conditions), this military technical revolution validates the theories of airpower advocates in the 1920s and 1930s who argued that airpower could achieve victory by destroying the enemy's central production, supply, and command systems. In the Second World War, airpower precision bombing remained more of a goal than a practice as efforts to strike industrial facilities often came to include saturation bombing of large populated areas. In Korea and Vietnam, early versions of precision weapons were not used effectively in combat operations (until the final stage of U.S. involvement in Vietnam). In the Persian Gulf War of 1990-1991, PGMs were often used with devastating and acknowledged effect.

An essential requirement for the effective use of PGMs, however, is precise targeting data. Often lacking during the Vietnam conflict, accurate locating data on some targets can now be obtained by a combination of satellite and manned and unmanned aircraft and communicated to tactical commanders and to pilots virtually in real-time.³ This capability to provide near real-time data is fundamental to the military technical revolution. With highly accurate and real-time intelligence, U.S. forces can often destroy enemy troop dispositions and defense infrastructure without necessarily killing large numbers of civilians or damaging civilian facilities.

In Desert Storm, availability of accurate intelligence on the locations of enemy facilities and military equipment, even single tanks, and an ability to communicate it down to tactical levels, underlay the Allies' successful campaign that was achieved with minimal losses of civilian and friendly personnel. The Persian Gulf experience, along with downsizing resulting from the end of the Cold War, are leading to a significant transformation of the U.S. Intelligence Community, what some have termed a "tacticalization" of U.S. intelligence. Although this transformation has major implications for relationships among the various agencies and for intelligence spending, it has been little noticed publicly outside of specialized publications directed to the electronics and communications equipment industries.

³An introduction to the history of PGMs is provided by Donald I. Blackwelder, "The Long Road to Desert Storm and Beyond: The Development of Precision Guided Bombs," thesis presented to the School of Advanced Airpower Studies, Maxwell Air Force Base Alabama, 1993. Blackwelder does not, however, consider that PGMs constitute a true revolution in military affairs. See also, Richard P. Hallion, *Storm over Iraq: Air Power and the Gulf War* (Washington: Smithsonian Institution Press, 1992), pp. 303-307; also, David R. Mets, *The Quest for a Surgical Strike: the United States Air Force and Laser Guided Bombs* (Eglin Air Force Base, FL: Air Force Systems Command, Armament Division, History Division, 1987).

Since the end of the Persian Gulf War, the Defense Department and the Intelligence Community have focused on measures to enhance intelligence support to U.S. military forces. These initiatives include the acquisition of new surveillance and communications hardware as well as the creation of new organizational links between intelligence collectors, analysts, and military commanders. Funding requirements are likely to remain high, given requirements for better intelligence support to smaller military forces. These changes also affect the organization of the U.S. Intelligence Community at a time when intelligence roles and missions are under searching review by both Congress and the executive branch.

Efforts to provide tactical intelligence directly to field commanders are forcing a "flatter", *i.e.*, a less hierarchical, intelligence structure, with fewer layers of coordination between collectors, analysts, and operational staffs. According to some observers, the Desert Storm experience saw renewed use of the U.S.-based intelligence organizations of the individual services that, with state of the art communications capabilities, gave tactical support to far-distant intelligence elements.⁴

A key concern felt by some observers who are studying the MTR phenomenon, however, is that more than an accumulation of new equipment is required. There is a concomitant need for new organizations, even new mindsets, to take full advantage of the possibilities in the new technologies. Desert Storm saw major innovations, but there were also many instances in which available information could not be provided to commanders who needed it because of incompatible equipment or because there were too many layers of command (some of which were perceived to be uncooperative). Not all military commanders proved equally adept at managing intelligence and information resources. Many observers believe that the Defense Department and the Intelligence Community must continue to make major adjustments to ensure that full advantage can be taken of the military technical revolution.

Concern must also be given to the potential threat that other countries (or groups) may take advantage of the military technical revolution to wage "information war" against the United States. Much of the equipment and software can be obtained commercially and is not beyond the reach of forces opposed to U.S. interests. Computer-based files and communications systems have proven vulnerable to penetration and destruction or alteration by amateurs. A country or group with a sufficient number of persons possessing sophisticated technical skills (perhaps obtained at Western universities) might successfully target DOD's systems. Given the number of sensitive systems likely to be employed (and the fact that many are based on commercially available products), the potential for serious disruption is genuine.

⁴It should be added that effective intelligence support to military operations is also dependent upon the availability of global positioning satellites (GPS) that permit accurate locating data to be established.

THE END OF COLD WAR INTELLIGENCE

The U.S. Government and its armed forces have needed and acquired intelligence since the earliest days of the Republic. A limited involvement in international affairs required only a modest intelligence apparatus. Although the Army and the Navy created separate intelligence components in the latter part of the nineteenth century, and the State Department has always gathered information through diplomatic contacts and, also, from time to time involved itself in intercepting foreign communications, such efforts were comparatively small and did not involve significant questions of governmental administration. The establishment of a community of agencies devoted to acquiring secret information, analyzing it, and further disseminating it was a product of the post-World War II period when the United States maintained for the first time a large peacetime military establishment deployed throughout the world.

The U.S. Intelligence Community, as it evolved over the Cold War decades, was built around several major collection and analysis organizations--the Central Intelligence Agency (CIA), the National Security Agency (NSA), the Defense Intelligence Agency (DIA), the intelligence organizations of the military services, and offices for satellite reconnaissance programs whose existence was for many years classified. Other departments have intelligence components and the State Department's Bureau of Intelligence Research has always played a major role in analysis of international political and economic questions. The Federal Bureau of Investigation (FBI) and the Drug Enforcement Agency (DEA) are considered members of the Intelligence Community although their focus is on domestic law enforcement. Nevertheless, CIA, DIA, NSA, and the satellite offices⁵ always have primary responsibilities for acquiring information about the nation's principal external enemies and its strategic threats. These agencies have also been responsible for the bulk of intelligence spending which, according to media accounts, eventually amounted to some \$30 billion in the 1980s.

CIA, NSA, DIA, and the satellite reconnaissance agencies are largely built around several collection disciplines. CIA and DIA (through Defense attaches) collect human intelligence, *i.e.*, through contacts with human sources or agents in foreign countries. NSA is responsible for intercepting and analyzing foreign communications and other signals, such as radar emissions. Reconnaissance aircraft and satellite programs have achieved well-known successes in overhead photography, radar, and electro-optic imagery.⁶ These types of collection were largely focused on the Soviet Union and the rest of the Communist bloc during

⁵The National Reconnaissance Office (NRO) manages the acquisition and deployment of satellite systems; the Central Imagery Office (CIO) is responsible for managing collection requirements or taskings. Satellite photography is interpreted by the Defense Intelligence Agency and by the National Photographic Interpretation Center (NPIC) which is part of the Central Intelligence Agency.

⁶Different systems are required for different types of missions and for different parts of the world and to overcome obstacles such as smoke, vegetation or darkness; procedures are being developed to use data from one system to "cue" another (sometimes automatically) that can provide unique information about a target.

the Cold War. In addition to attempting to gather political intelligence, the Intelligence Community placed high priorities on military equipment and installations, force dispositions, and training exercises.

Intelligence during the Cold War was largely centralized for several reasons. The nature of the threat--Soviet/Warsaw Pact aggression that could lead to world war--meant inevitably that the principal consumers of intelligence were the most senior levels of government in Washington. It was widely accepted that the complex signals intelligence (sigint) and satellite technologies that then existed could most efficiently be managed and operated at national-level headquarters. Great credence was given to the Pearl Harbor precedent that cautioned against the dangers of different pieces of intelligence being disseminated separately to different commands without a consolidated and central assessment. The organizational structure that resulted from these considerations has been described as "stovepiping," *i.e.*, intercept sites of different agencies located throughout the world funneling information directly (by-passing the local commands) to their respective Washington-area headquarters where it would be analyzed and consolidated with the products of other agencies.

In some cases, full analysis of information could be completed only slowly as signals had to be exploited and photography retrieved in accordance with the existing technology. Intelligence has been provided to all military echelons and to other consumers throughout the government, but fundamental priorities have been placed on serving Washington decision-makers. The highest threat was an attack by Soviet strategic nuclear systems, and collection and analysis priorities centered around the design, capabilities, and operational characteristics of these weapons along with indications and warning of their potential use. Soviet weapons systems--missiles, bombers, submarines--were developed and deployed over a lengthy period; testing and exercises were conducted on a regular basis. U.S. intelligence systems were designed to provide warnings of impending attack on an instantaneous basis, but much intelligence effort was devoted to monitoring developments that were relatively slow-paced, even at times static. Furthermore, the Soviet Union and the Warsaw Pact had the appearance of permanence; many senior intelligence analysts believed that there would be long lead times for policy changes and that, largely because of the danger of nuclear escalation, precipitous adventures would be avoided.

To deal with the Soviet/Warsaw Pact threat, the U.S. invested heavily in complex and expensive reconnaissance and intercept systems that could observe developments taking place in missile sites or submarine bases over periods of months and years. Soviet research and development were high priorities requiring careful analysis of technological innovations, acquisition of materials, and production capabilities. Sustained efforts were made to monitor communications procedures revealed in military exercises, with special attention given to subtle changes that indicated new tactics and capabilities.

Although CIA, NSA, and DIA were assuredly Washington-centered, efforts were made to ensure that relevant national intelligence was also made available

to military commanders and other consumers throughout the world. The intelligence components of the military services and the unified and specified commands had offices responsible for ensuring that data produced by national intelligence organizations was incorporated into training exercises as well as their procurement processes. In many cases, signals intelligence acquired for national consumers was also transmitted directly, in "real-time," to appropriate military headquarters. Sigint has always been handled in very restricted channels, but increasingly it is being made available to tactical commanders. In the mid-1980s a program, known as TENCAP (Tactical Exploitation of National Intelligence Capabilities), was established to utilize overhead reconnaissance and other systems for tactical purposes. In addition, military commanders have possessed a wide variety of tactical intelligence collection systems and had access to a number of service, and later joint, intelligence centers where processing and analysis could be undertaken according to the commander's needs. Some of these have not been considered as falling within the intelligence category for managerial and budgetary purposes. Tactical systems include reconnaissance aircraft, sigint collectors, and various acoustic devices. Tactical and national intelligence has been shared among various parts of the Intelligence Community, except for certain tightly compartmented programs, but not always on a real-time basis.

INTELLIGENCE IN DESERT STORM

The Persian Gulf War experience, to a far greater extent than the Vietnam experience, marked a decisive turning point in the work of the U.S. Intelligence Community. Assessing the Soviet threat was the most important mission of intelligence agencies before, during, and after the U.S. military involvement in Southeast Asia; there was, moreover, little interest in preparing U.S. military forces for future Vietnams. The Persian Gulf War, on the other hand, occurred just as the Soviet Union was collapsing; and the intelligence capabilities used to gain victory over Iraq appear to many in both the Clinton Administration and in Congress to be important for potential future engagements in regional conflicts and peacekeeping operations.

The Persian Gulf War of 1990-1991 brought home to military professionals, and to a wider civilian audience, the potential application of new intelligence and communications systems to combat operations. The intelligence contribution to Allied victory was highly important, if not decisive, despite serious deficiencies in knowledge of the Iraqi nuclear program and in the disposition of mobile SCUD launchers.⁷ The ability to locate specific targets very precisely and to achieve "information dominance" over the Iraqis was clearly demonstrated and, all observers recognized, would inevitably be sought in any

⁷Intelligence on the Iraqi nuclear program was an area in which the Intelligence Community clearly failed to collect the appropriate data and to present it in a meaningful form to senior policymakers (who may not have been, according to some critics, interested in pursuing the question). This problems lies, however, beyond the scope of this report.

future conflict. The main tasks of the Intelligence Community would be to ensure that these capabilities were developed and enhanced.

The Iraqi invasion of Kuwait in August 1990 had been seen as a direct challenge to Western interests and to international order. Iraq was not, however, perceived as an agent of the Soviet Union and linkage with any ambitions by Moscow in the region was disregarded. Thus, the United States and its allies were able to plan the liberation of Kuwait without much concern for its implications for an East-West superpower rivalry. The Intelligence Community, which had not previously considered Iraq as a major military concern for the United States, scrambled to gather basic information on Kuwaiti geography, the Iraqi armed forces, and military infrastructure. Open sources, including those available at the Library of Congress, were consulted. Old attache and embassy reports were reviewed and various databases searched for information useful to military commanders planning what became a full-scale assault on Iraqi forces in and near Kuwait and the Iraqi military itself. DIA coordinated the establishment of a Joint Intelligence Center in the Pentagon bringing together analysts from DOD intelligence agencies (with links to CIA analysts) to provide intelligence support to Central Command as well as senior officials in Washington.⁸

In the Persian Gulf area, Central Command also created a Joint Intelligence Center to prepare analyses and coordinate theater-level reconnaissance efforts. Extensive reconnaissance missions were launched by a variety of Air Force and Navy platforms, including unmanned aerial vehicles (UAVs), U-2, AWACS (Airborne Warning and Control Aircraft) to provide data on airborne threats, and RF-4C aircraft along with two not-yet-operational Air Force/Army JSTARS (Joint Surveillance and Radar Attack Radar System) aircraft with capabilities to track ground targets over wide areas. Satellites were retargeted to acquire information on the situation in Kuwait and Iraq, although they could not provide the total coverage desired by military commanders and were in any event limited by cloudy weather and sandstorms. It has been estimated that 85% of U.S. reconnaissance assets were employed to support Desert Storm operations, but many of these were non-interoperable and their deployment left little extra capacity elsewhere in the world.

A key difficulty that had to be overcome was insufficient communications capabilities, especially for imagery (which requires greater capacities than plain text).⁹ In some cases, lengthy computer printouts had to be delivered by human courier because communications channels were overburdened or because systems used by different services or at different echelons were incompatible. It was an oft-noted source of frustration for both intelligence officers and military

⁸A valuable discussion of intelligence arrangements during the Gulf War can be found in James A. Winnefeld, Preston Niblack, and Dana J. Johnson, *A League of Airmen: U.S. Air Power in the Gulf War* (Santa Monica, CA: RAND, 1994), especially pp. 181-221),

⁹The lack of interoperability among secondary imagery dissemination systems has been described as "a failure of considerable magnitude." *Ibid.*, p. 14.

commanders that available information could not be forwarded to the appropriate level in time for it to be used.

The widespread availability of informal communications channels creates its own disadvantages. As a RAND study of the airwar noted:

Personal computers with modems supported by fax machines relayed far greater amounts of information over telephone lines than did the official military message system. The extensive use of PCs, modems, faxes, and other commercially available systems was largely unanticipated, overwhelmed existing communications infrastructure and became a user-discipline issue in communication content and prioritization. This resulted in data overload, which in turn meant that in many instances data were ignored, misdirected, or misjudged.¹⁰

THE AIR CAMPAIGN

As planning for the liberation of Kuwait developed, attention centered on an intense air campaign by Allied air and naval forces designed to incapacitate the Iraqi leadership and destroy key Iraqi military capabilities in preparation for a subsequent ground attack. It was also based on a determination to minimize casualties among civilians in Kuwait and in Iraq. The campaign launched by the Allies' ground and carrier-based aircraft involved the use of some 17,000 PGMs that could destroy Iraqi forces even in hardened installations without excessive collateral damage (and without the need for repeated sorties¹¹). In the event, "[o]f the 85,000 tons of bombs used in the Gulf War, only 8,000 tons (less than 10 percent) were PGMs, yet they accounted for nearly 75 percent of the damage."¹²

Widespread use of bombs with laser guided, electro-optics and imaging infrared sensors was one of the most noted characteristics of the Persian Gulf War; television footage of PGMs flying through windows unequivocally demonstrated to the media and the public the reality of revolutionary military technology. Cruise missiles and PGMs were used with devastating effect against Iraqi installations and ground forces. The extensive intelligence requirements

¹⁰Winnefeld, Niblack, and Johnson, *A League of Airmen*, p. 213.

¹¹As the official *Gulf War Air Power Survey* noted, "Desert Storm reconfirmed that LGBs possess a near single-bomb target-destruction capability, an unprecedented if not revolutionary development in aerial warfare. The magnitude of effort to destroy individual targets in previous wars illustrates the point. Were they so targeted during WW II, it would have taken 150 B-17 sorties dropping over 9,000 bombs to hit a particular building. Twenty-five years later, in 1967-68, 177 F-105 sorties and 380 tons of bombs were required to destroy the Doumer bridge in Hanoi. U.S. Dept. of the Air Force, *Gulf War Air Power Survey*, Vol. IV, Planning and Command and Control (Washington: Dept. of the Air Force, 1993), pp. 87-88.

¹²LGEN Buster C. Glosson, "Impact of Precision Weapons on Air Combat Operations," *Airpower Journal*, Summer 1993, p. 5.

for supporting PGM attacks (and precise attacks on ground forces as discussed below) during Desert Storm essentially caught the Intelligence Community by surprise. Cold War-era collection systems were available and could be diverted from their intended targeting, given an abatement of an imminent Soviet/Warsaw Pact threat. Communications capabilities, especially secure facsimile and secure STU-111 telephones, were being gradually introduced and upgraded throughout the Defense Department. Yet, creating systems for uniting reconnaissance systems originally designed to monitor fixed ICBM complexes with communications systems designed for transmitting relatively small volumes of traffic proved to be technically challenging and administratively difficult, even with several months of preparation.

Nevertheless, the exigencies of planning and executing air strikes against Iraqi military targets led military officers and intelligence officials to improvise methods (known colloquially as "workarounds") to permit intelligence from national-level and other systems to be utilized by planners of the air campaign. The results, while not perfect, were impressive. As the Air Force's *Gulf War Air Power Survey* indicated:

The ad hoc relationship between Washington and Riyadh intelligence centers challenged the axiom that intelligence developed in theater is better and more timely than intelligence developed in the United States. With the help of the national intelligence agencies in Washington, the steady stream of requests from [Central Command] met with a corresponding response that over time turned into a steady dialogue. Many times Washington intelligence analysts knew the target had been struck before in-theater analysts did.¹³

The Iraqi Air Force chose to avoid interception efforts, giving Allied forces instant air superiority. If it proved impossible to destroy SCUD delivery systems and the central Iraqi command authority, allied air strikes destroyed air defense installations, communications links, munitions depots, bridges, industrial facilities, and other vital components of Iraq's warmaking capabilities. This mission was accomplished without massive attacks on civilian targets.

There were extensive controversies over Bomb Damage Assessment (BDA). Washington agencies inevitably tend to be skeptical of pilot reports and field commanders are adamant in exercising their own judgment as to the need for follow-up strikes. New technical problems of interpretation arose when a penetrating bomb left a barely visible hole in a tank which had been functionally destroyed by a crippling explosion inside. Some differences over BDA were doctrinal rather than technical, usually turning on the question of what extent of damage constitutes "destruction" or "incapacitation" (e.g., a bridge with one span down may be only 10% destroyed but 100% incapacitated). A House Armed Services Committee report concluded that, "[i]t is therefore essential that the

¹³Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey Summary Report* (Washington: Dept. of the Air Force, 1993), p. 132.

intelligence community, at all levels, develop accepted, rational and precise doctrine for conducting tactical BDA in the future."¹⁴

THE GROUND CAMPAIGN

Following on the initial air campaign, the Allied ground campaign was designed to evict Iraqi forces from Kuwait and to destroy the bulk of Iraq's combat power. Ground warfare planners working in Riyadh, Saudi Arabia faced a sizable force of experienced Iraqi troops, well dug in throughout Kuwait, as well as significant reserves in Iraq itself. The Intelligence Community had monitored Iraqi capabilities during the Iran-Iraq War of 1980-1988, but detailed knowledge of Iraq's order of battle was not available. The Iraqis, aware of Allied signals intelligence capabilities, attempted to rely on landline communications which were considerably more difficult to intercept. Nevertheless, high-quality intelligence was developed prior to the initiation of Desert Storm that gave senior commanders an awareness of basic Iraqi capabilities and troop dispositions, if not as much about their state of readiness as might have been desired.

An intelligence product whose utility has been especially noted during the conflict was the "tactical template," a graphic representation of the disposition of enemy units based on all-source intelligence updated with sufficient frequency as to be useful for fast-changing tactical operations. As the ground campaign was underway, however, it quickly became apparent that tactical commanders also sought detailed intelligence data on the disposition of enemy forces they were to encounter. Once it was realized that overhead imagery from satellites, aircraft, and UAVs might be available and could yield tactically usable data, demands for such products mounted.

Data derived from satellite reconnaissance was a valuable component of the intelligence available to tactical commanders even though the U.S. satellite program was not optimized for around-the-clock coverage of a rapidly changing combat situation. There was incomplete satellite coverage of the region and weather conditions, especially heavy sandstorms, complicated photography. Much reliance was placed on other forms of imaging not affected by cloudcover or haze. Only with difficulty were communications downlinks capable of transmitting imagery established within theater commands. Satellite imagery was supplemented by reconnaissance aircraft and UAVs¹⁵ that were directly controlled by local or regional commands.

¹⁴U.S. Congress, House of Representatives, 103d Congress, 1st session, Committee on Armed Services, Subcommittee on Oversight and Investigations, *Intelligence Successes and Failures in Operations Desert Shield/Storm*, Report No. 5, August 16, 1993, p. 21.

¹⁵See Richard A. Best, Jr., *Intelligence Technology in the Post-Cold War Era: The Role of Unmanned Aerial Vehicles (UAVs)*, CRS Report 93-686F, July 26, 1993.

JSTARS, an Air Force and Army program, achieved major successes in locating Iraqi ground installations and troop dispositions. Even though initial plans did not call for JSTARS deployment to the Persian Gulf, the sophisticated sensors capable of sending locational data on ground targets via real-time communications links to ground commanders, were widely praised for supplying data unavailable from other sources.

Less information is available about the contribution of signals intelligence to the Allied victory. As noted, the Iraqis, first by choice, then by necessity, used landline communications that are more difficult to intercept. A senior Army intelligence officer noted that in the Gulf as in Grenada and Panama, "there was almost no tactical SIGINT collection. Indeed, Army tactical SIGINT linguists carried out duties as interrogators, document translators, and other assignments in demand."¹⁶

Similarly, little has been published about the contribution of human intelligence (humint). Having established agents in Iraq would not likely have been a high CIA priority during the Cold War and, in any event, decisionmaking in that country is limited to a small coterie surrounding Saddam Hussein. Agents were sent into Iraq in the weeks prior to the launching of Desert Storm and an extensive effort was undertaken to debrief deserters, but apparently humint was far less important in this conflict than in other situations.¹⁷

THE ROLE OF SERVICE INTELLIGENCE ORGANIZATIONS

One of the more interesting developments that became apparent during Desert Storm was the important role of U.S.-based service intelligence agencies--working with DIA--in directly supporting their forces in combat thousands of miles away. The creation of Joint Intelligence Centers (JICs) in the aftermath of the passage of the Goldwater-Nichols Defense Reorganization Act of 1986 had led some observers to suggest that intelligence necessary for military operations could be assembled on a regional basis. Although the Central Command's intelligence staff (CENTCOM/J-2) eventually grew from a staff of fewer than 10 to some 700,¹⁸ manning constraints and the dynamics of Desert Storm planning (much of which was done in a highly compartmented setting), local commanders turned--often on an *ad hoc* basis--to larger service intelligence offices in the U.S. for support, supplied by direct communications links. As is the case with large organizations, the availability of rapid communications and computer data bases has served to "flatten" the bureaucratic hierarchy. These

¹⁶BGEN John F. Stewart, Jr., "Operation Desert Storm: The Military Intelligence Story: A View from the G-2, 3rd U.S. Army," (Riyadh: Third U.S. Army, April 1991), p. 28.

¹⁷General Stewart indicated that in Grenada and the Gulf there was virtually no clandestine humint that contributed to the military operation. Ibid. (Clandestine humint excludes the debriefing of deserters.)

¹⁸See *Intelligence Successes and Failures in Operations Desert Shield/Storm*. pp. 5-6.

offices had access to all-source national intelligence as well as to more extensive files than were available in-theater. Perhaps more importantly, they could draw upon the expertise of more experienced analysts, familiar with the unique needs of ground, air, and naval forces, than could be replicated in the Persian Gulf region. The Army's official history of the Gulf War made the argument that:

Obtaining the level of detail required by each Service requires a fundamental understanding of that Service's needs. Knowledge of Army tactics, weapons, and operational methods enables trained analysts to cull very specific information of value to tactical commanders. An Army officer reviewing satellite photos of ICBM sites could count the individual silos, but he would not be able to pick out other details to know if the installations were operational. Each Service carries its own cultural values and technical expertise developed from many years of military experience. Making tactical intelligence assessments without the benefit of such a background is difficult, if not impossible. In the case of the Iraqi invasion of Kuwait, an inexperienced analyst looking at the Iraqis shifting forces to the border on August 1 believed that they were merely training. Only an Army officer familiar with the last-minute starts and stops of tactical maneuver saw the moves as a final shift to attack positions.¹⁹

Similarly, Central Command's Air Force planners in Riyadh, preparing plans for the air campaign in strictest secrecy, came to depend far more heavily on an informal organization within the Air Force's Washington staff, known as Checkmate, than upon Central Command's intelligence assets. Checkmate became "an ad hoc fusion center for intelligence and operational information [that] maintained contact with national intelligence agencies and a number of planning cells in Washington." As the *Gulf War Air Power Survey Summary Report* further recalls:

It did not take Black Hole personnel [Central Command's air attack planners] long to realize that they could obtain more current information by calling Washington on their STU-III secure telephones and secure faxes than they could get from in-theater intelligence sources. By the time the war started, the Black Hole had become its own intelligence organization: it had its own intelligence sources, and it did its own targeting.²⁰

Although some observers had questioned the role of service intelligence offices, especially in the post-Cold War period, their contribution in Desert Storm has arguably demonstrated their continued value to supplement the role of regional joint intelligence centers. This perspective, however, is a counterpoint to some of the underlying ideology of the military technical

¹⁹BGen. Robert H. Scales, Jr., *United States Army in the Gulf War: Certain Victory* (Washington: Office of the Chief of Staff, United States Army, 1993), pp. 164-165.

²⁰*Gulf War Air Power Survey Summary Report*, pp. 131, 131-132.

revolution that emphasizes the advantages of jointness over service "parochialism".²¹ Due to the emphasis that has been placed on joint intelligence efforts in recent years, upgrading the role of service intelligence agencies in supporting tactical commanders may become controversial.

INTELLIGENCE AFTER THE PERSIAN GULF WAR

When the Persian Gulf conflict had ended, the Intelligence Community as well as the Defense Department turned to planning programs and budgets for the remainder of the decade. The drawdown of U.S. forces from Europe, temporarily accelerated by the need to deploy troops to the Gulf, was continued. Robert Gates, appointed Director of Central Intelligence (DCI) in 1991, presided over a comprehensive reassessment of intelligence requirements in the post-Cold War World (known as National Security Review-27). The incoming Clinton Administration in January 1993 immediately launched a "Bottom-Up Review" of the nation's defense posture with a concomitant, if unpublicized, Intelligence Bottom-Up Review (IBUR). More recently, the General Accounting Office (GAO) has conducted a comprehensive assessment of intelligence spending projected for the rest of the decade. These efforts, combined with substantial budgetary and manpower reductions mandated in defense and intelligence authorization and appropriations acts, have led to a downsizing of intelligence agencies and the elimination of obsolete and duplicative functions, especially those that dealt with the military forces in the former Soviet Union and Warsaw Pact countries (although there remains strong interest in several of the former Soviet states).

The transformation has also been heavily influenced by the lessons of the Persian Gulf War, even though it is well recognized that future crises will require support from a different mix of intelligence assets. In particular, humint may be sometimes much more important while, in other cases, overhead surveillance may be hindered by greater cloudcover or heavily forested terrain and a need for more extensive night coverage. Above all, the months of preparation prior to the launching of Desert Storm may not be replicated. Major attention has been given to acquiring new electronic equipment to improve tactical intelligence collection and to enhance communications at tactical levels.

NEW INTELLIGENCE ARCHITECTURES

To take full advantage of the military technical revolution, the Defense Department and the Intelligence Community are establishing what has been termed as a better "architecture" of information systems. It is not just a matter of new sophisticated and interoperable equipment; organizational relationships must be established. Commanders must know where to get the information they need in a form that is usable or "actionable." They must have adequate staff

²¹See, for instance, Mazaar, *The Military Technical Revolution*, p. 22.

support to create the optimal intelligence and information architectures for a specific mission.²² Intelligence agencies must be prepared to make the information they have directly available to military commanders in needed formats and timeframes. Desert Shield and Desert Storm both saw unnecessary breakdowns in communication, failures to deliver needed information, and wasteful duplication of effort. The tendency in Desert Shield and Desert Storm for all parties to improvise and circumvent established reporting arrangements, all facilitated by computers, faxes, modems, contributed to victory, but it might have led to another outcome.

Few, if any, would argue that all intelligence collection, analysis, and dissemination should be centralized in one agency. Most see the real benefits of much enhanced capabilities for using intelligence at tactical levels to achieve objectives while helping to save the lives of friendly forces and civilians. There remains, nonetheless, a need to avoid the breakdowns and limitations that have occurred and excessive costs at a time of severe pressure on defense and intelligence spending.

Although most observers applaud the greater availability of intelligence to military commanders, the quantities of data available and the access of all echelons to finite numbers of collectors and analysts have the potential to create conditions of information overload or to swamp collectors and analysts. It will probably be necessary to consider the extent to which some central management of the intelligence process would be advantageous and the appropriate responsibilities of the DCI, Washington-area agencies, joint commanders, etc. In some cases questions will arise regarding the widespread use of raw data that is not analyzed by Washington agencies; this would be of particular concern regarding sensitive political and diplomatic intelligence that also has direct military implications.

A number of initiatives have been taken to establish better intelligence "architectures". The Bush Administration enhanced the managerial role of the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (C³I), giving the incumbent authority to insure interoperability across service lines to an extent not previously possible, given service procurement responsibilities. A significant innovation by the Clinton Administration was the establishment of the Defense Airborne Reconnaissance Office (DARO) in November 1993. DARO is tasked with managing the development and acquisition of manned and unmanned airborne reconnaissance systems throughout DOD. While not part of the Intelligence Community, its mission is to ensure that reconnaissance efforts are fully considered from a joint service perspective to improve coverage and avoid duplication of effort. There are limits, however, in DARO's ability to transfer funds from intelligence to non-intelligence programs (especially because funds are authorized separately).

²²The need for commanders to directly manage intelligence/information assets and to have sufficient staff support is discussed in U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition & Technology, *Report of the Defense Science Board Summer Study Task Force on Information Architecture for the Battlefield*, October 1994, especially pp. 5-22.

DARO works in coordination with the National Reconnaissance Office which is part of the Intelligence Community and performs similar functions for spaceborne systems. The goal is a new architecture of information support to warfighters by 2010; to reach the goal DARO is developing an investment strategy which can function within likely budgetary constraints. The current Vice Chairman of the Joint Chiefs of Staff, Admiral William Owens, in his role as chairman of the Joint Requirements Oversight Council (JROC)), emphasizes the need for critical thinking about the effect new technologies will likely have on future joint operations and emphasizes careful investment in new platforms and systems that embody them. Legislation recently introduced in the 104th Congress (S. 727) provides for an Accelerated Architecture Acquisition Initiative through which the Central Imagery Office would "establish, implement, and deploy a worldwide imagery architecture," including hardware, software, communications, and services.

A pervasive concern has been the "fusion" of data from various systems to provide all-source analysis to a commander. While neither JSTARS nor AWACS have been systems sponsored, funded, or operated by the Intelligence Community, they provide data on targets also covered by national intelligence systems such as overhead photography and sigint. Each system has strengths and limitations, but skillful analysts can fuse all available data, from whatever source, to provide commanders with a more complete picture of the battlefield. In addition, information from one source can cue operators of other systems to important targets. Efforts to enhance "fusion" of national and tactical intelligence as well as related reconnaissance data have been underway for several years, requiring new forms of cooperation between collectors in intelligence elements and those in non-intelligence reconnaissance units.

Training analysts in fusion tasks and in the use of communications equipment (such as the Army's All Source Analysis System (ASAS) that can receive and correlate data from all intelligence sources) has been part of this effort and has required overcoming long-established administrative lines of authority (and the practice of "stovepiping"). Although incorporated in official field manuals and training exercises, the effort to choose among intelligence sources and databases can be difficult and complex. Using the increasing varieties of intelligence support likely to be available will require greater sophistication among junior officers and enlisted personnel than has previously been the case.

Below the Cabinet level, there are a number of interagency groups within the Intelligence Community attempting to improve the flow of intelligence to users. These include the Intelligence Systems Board and the Information Management Policy Working Group. Their work includes efforts to achieve equipment interoperability as well as the creation of an intelligence architecture to allow information in all agencies to be accessed by authorized users throughout the Government. One project, known as INTELINK, is a worldwide intelligence information network modeled in part on the INTERNET. INTELINK contains information from intelligence agencies, including imagery, video, voice, finished reports, maps and other data that can be accessed

throughout the world. A special problem being addressed is the need to restrict sensitive information to a limited set of users (unlike INTERNET which is open to the entire world).²³

NEW INTELLIGENCE ORGANIZATIONAL RELATIONSHIPS

Intelligence support to military forces will require cooperation among Washington-area agencies to ensure that available intelligence is stored in ways that are easily accessible by military commands. This represents a significant change for agencies whose traditional focus is on support of national-level policymakers. Analysts will have to be capable of using information from a variety of intelligence sources; traditional specialization in the separate intelligence disciplines will have to give way (or at least be supplemented by) a larger group with cross-disciplinary training and expertise. Intelligence officers serving in the field must be able to combine data from national sources, including open sources, with information provided by local assets. All this means a far better trained intelligence corps and potentially much heavier investments in electronic and communications technology.

The role of service intelligence organizations is currently undergoing refinement to incorporate the lessons of Desert Storm as well as the acquisition of new technologies. Methodologies are being worked out for "split-based" or "reachback" intelligence support whereby tactical military commanders can pull required intelligence support from various echelons including headquarters elements in the U.S. as well as from their own organic intelligence elements. At all levels, there is greater emphasis on combining data from all intelligence sources (sigint, photography and other imagery, humint, open sources, etc.) to provide commanders with a complete and readily usable product.²⁴

It is also likely that eventually the functions of intelligence agencies will be significantly realigned to support new military doctrines. DIA will undoubtedly have a more important role in overseeing the work of the service intelligence agencies, even though they are unlikely to be consolidated. To signify a larger DIA role, some have suggested that the DIA Director be given the larger title, Director of Military Intelligence. There will be greater decentralization as tactical sigint systems, satellite ground stations, and reconnaissance aircraft and UAVs provide some of the data that have heretofore been provided by NSA and

²³See Steven T. Schanzer, "INTELINK: An Information Strategy," *American Intelligence Journal*, Autumn/Winter 1994.

²⁴As one senior Army intelligence officer has explained, "No single echelon has all the assets it needs to satisfy the intelligence requirements of that echelon. To compensate, the Army doctrinally has created an intelligence system of systems in which echelons mutually support each other, primarily on the basis of the higher echelon supporting the lower [Robust, flexible communications] will allow national, departmental and theater capabilities to be leveraged in support of the tactical warfighter." Major General Paul E. Menoher, Jr., "Responsive Communications Key to Army Intelligence," in Alan D. Campen, ed., *The First Information War* (Fairfax, VA: AFCEA International Press, 1992), p. 72.

the satellite agencies. Yet, because satellites and sigint facilities will continue to be both expensive and irreplaceable for some missions, central mechanisms will be required to ensure that their uses are prioritized. Some observers have argued that a close look should be taken at the respective roles and missions of the Central Imagery Office, the National Reconnaissance Office, and the National Photographic Interpretation Center with a view to consolidation or better alignment.

In recent years, the role of CIA analysts in monitoring order of battle data and other defense-related questions has decreased, with responsibilities in these areas centered in DIA or elsewhere in DOD. During the Cold War both CIA and DIA collected and analyzed intelligence on Soviet and Warsaw Pact military developments; to some extent there was useful competitive analysis given the importance of the capabilities and intentions of Soviet and Pact forces, but observers also noted a tendency for analysis to reflect bureaucratic disputes over sensitive political and budgetary questions (a tendency not, of course, limited to Soviet analysts). With the end of the Cold War and reductions in CIA personnel levels and budgets, DCIs Gates and R. James Woolsey authorized the concentration of military intelligence analysis in DOD with an exception made for nuclear proliferation and military threats that remain key concerns for national policymakers. CIA will retain residual capabilities to analyze key tactical issues and developments as they arise, as well as political-military issues that do not fall clearly in one category or another. In many areas, CIA analysts will be able to contribute a wider perspective than is available in defense agencies and steps are under consideration to ensure that their contribution can be made available to military commanders.

These developments in the Intelligence Community have been largely separate from controversies in the national media over the future of U.S. intelligence. They have occurred outside the continuing debate over counterintelligence, the propriety of covert actions conducted by the CIA, and the question of at what point intelligence agencies recognized internal decay in the Soviet Union. Many of them involve complex and technical systems that are of greatest interest to specialists in the military and in defense industries. The changes that have occurred have not, thus far, involved a restructuring of the legislative charters of intelligence agencies nor massive budgetary reallocations beyond the ongoing drawdowns.

NEW PROGRAMMING AND BUDGETING PROCEDURES

Congressional oversight has played an important role in supporting the acquisition of state-of-the-art communications and reconnaissance equipment and requiring that the equipment acquired be interoperable, based in large measure on conclusions drawn from the Persian Gulf War experience and from a longstanding determination to streamline procurement and reduce duplication

of effort.²⁵ In addition, the two intelligence committees have worked to reduce the number and size of intelligence staffs throughout DOD.

Equipment for intelligence activities is acquired under two basic programs; the National Foreign Intelligence Program (NFIP) and Tactical Intelligence and Related Activities (TIARA). The former system is closely managed by the DCI and is designed to acquire national systems, including satellites and sigint systems that can obtain information needed by national-level policymakers. TIARA systems, managed in DOD, are designed to acquire information for military commanders. In the post-Cold War period, the intelligence requirements of commanders and policymakers may converge, even if there is a commitment to avoid micromanagement from Washington. (For instance, detailed knowledge of the state of Iraqi defenses became crucial not only for Allied military commanders in Saudi Arabia, but also for senior civilian officials who made decisions regarding the course of the war against Iraq.)

Coordinating the acquisition and use of surveillance and communications systems that appear in NFIP and TIARA programs is a central issue in providing the intelligence resources required by the military technical revolution. It is a problem for the executive branch to coordinate the cross-cutting responsibilities and authorities of the Secretary of Defense and the DCI. In requiring a review of the relationship between national and tactical programs, the House Armed Services Committee noted in 1993:

Over the years, the boundaries between TIARA and NFIP components of the intelligence budgets have become a source of confusion and contention. The committee is concerned that the lack of clearly established definitions for NFIP and TIARA have led to the sometimes arbitrary assignment of intelligence programs and functions within these categories.²⁶

The same year, the House Appropriations Committee noted:

²⁵In July 1991, the Senate Armed Services Committee noted that the war had "revealed shortcomings in intelligence support to unified commanders and their combat forces, especially for damage assessment and targeting of mobile tactical systems. The committee believes that these shortcomings are due primarily to management problems and deficiencies in intelligence processing, analysis, and dissemination. To remedy these problems, the committee recommends a significant package of tactical intelligence funding and policy initiatives . . ." U.S. Congress, Senate, Committee on Armed Services, 102d Congress, 1st session, *National Defense Authorization Act for Fiscal Years 1992 and 1993*, S. Rept. 102-113, July 19, 1991, pp. 10-11. The House Armed Services Committee in 1994 acknowledged the progress that has been made in recent years to better manage tactical and national systems to support military commanders, but noted that much remains to be done, identifying satellite and airborne reconnaissance as well as signals intelligence architectures. U.S. Congress, 103d Congress, 2d session, House of Representatives, *National Defense Authorization Act for Fiscal Year 1995*, H. Rept. 103-499, May 10, 1994, pp. 372-373.

²⁶U.S. Congress, House of Representatives, 103d Congress, 1st session, Committee on Armed Services, *National Defense Authorization Act for Fiscal Year 1994*, H. Rept. 103-200, July 30, 1993, p. 16.

When TIARA was originally defined, technology was not as advanced and programs were much simpler to define. Smart weapons, advanced sensors, and ground stations have made the distinction . . . cloudy.²⁷

In response, a series of twelve meetings in 1993-1994 jointly chaired by the DCI (R. James Woolsey), and the Deputy Secretary of Defense (William J. Perry), addressed the relationships between national and tactical programs and, reportedly, resolved many of the existing uncertainties. Subsequently, joint DOD/DCI meetings at the staff level (and the creation of a Joint Review Programs and an Intelligence Systems Board composed of representatives from DOD and elsewhere in the Intelligence Community) have become part of an ongoing commitment to ensure that NFIP and TIARA programs complement each other to the maximum extent possible.²⁸ A common budget framework has been implemented for the FY1995-FY1996 program and budget cycle with data for both national and tactical programs consolidated in functional and activity presentations. Some observers have, however, recently argued that DOD should have one official responsible for reviewing all TIARA programs (as the DCI is responsible ultimately for all NFIP programs).²⁹

Other observers see a larger role for the Community Management Staff (CMS) which works directly under the DCI to coordinate intelligence collection and analysis efforts and prepare budgets. Although the CMS and its predecessor, the Intelligence Community Staff, have largely focused on routine budgetary issues, some believe that it is in a good position to ensure coordination of the Intelligence Community's involvement in the military technical revolution as well as maintain an effective interface with congressional committees.

CONGRESSIONAL OVERSIGHT

NFIP and TIARA programs also represent a challenge for Congress. They are handled differently in the Senate and the House of Representatives. In the Senate, the Armed Services Committee has oversight of TIARA programs (with informal review by the Intelligence Committee) whereas the House Intelligence Committee oversees both NFIP and TIARA programs. The House Intelligence

²⁷U.S. Congress, House of Representatives, 103d Congress, 1st session, Committee on Appropriations, *Department of Defense Appropriations Bill, 1994*, H. Rept. 103-254, September 22, 1993, p. 26.

²⁸H. Rept. 103-499, pp. 372-373. See also, Michael F. Munson, "Intelligence Resource Management," *American Intelligence Journal*, Autumn/Winter 1994, p. 13.

²⁹See, for instance, the comments of Representative Dicks, quoted in Joseph C. Anselmo, "Reshaping Intelligence," *Focus: A Supplement to Aerospace Daily*, February 24, 1995, p. 292. One well-connected colloquium on intelligence issues has recently suggested that budgets for both national and tactical systems be consolidated under the direct control of the DCI. See John Hollister Hedley, *Checklist for the Future of Intelligence* (Washington: Georgetown University, Institute for the Study of Diplomacy, 1995), p. 12.

Committee does work closely with the National Security (formerly the Armed Services) Committee on TIARA programs. A proposal in the 102d Congress to bring tactical programs under the oversight of the Senate Intelligence Committee was not accepted.³⁰ The defense subcommittees of the appropriations committees approve funding in both categories. In 1994, the Senate Intelligence Committee complained about the transfer of one program from NFIP to TIARA without notice to the Committee and directed the DCI to provide at least 30 days notice prior to future transfers from the NFIP.³¹

Beyond NFIP and TIARA, lie a large number of sizable *reconnaissance* programs managed by the services. These include platforms, sensors, and operations under local commanders and are designed to acquire targeting data for tactical use. They have not been considered as intelligence systems for management or budgetary purposes nor have they always been closely coordinated with intelligence programs. In addition, they have usually been acquired and managed by each service. The Office of the Assistant Secretary of Defense for C³I and DARO have been in the forefront of such efforts in regard to surveillance and communications equipment. Reconnaissance programs are overseen in Congress by armed services/national security and appropriations committees; the intelligence committees are not directly involved. Nevertheless, the capabilities provided by such systems are integral parts of military commanders' information/intelligence support.

CONCLUSION: THE INTELLIGENCE COMMUNITY IN THE 21ST CENTURY

The military technical revolution requires that intelligence in the coming century be more available at every echelon of military operations. It is likely that the Intelligence Community will be less centralized than it was during the more than four decades of the Cold War. Bureaucratic infrastructure can be reduced and positions eliminated. At the same time, there will be more data acquired, analyzed, and disseminated. Analysts separated by thousands of miles will be able to communicate with each other, bypassing various theater-level processing centers. Intelligence will become readily available, an integral part of the precise targeting and damage limitation efforts that are likely to characterize military operations in the coming century.

There is no central point, in the Intelligence Community, DOD, or in the Congress, at which questions relating to intelligence support to military operations are resolved. More fundamentally, there is no central "vision" of the

³⁰See the comments of Senator Boren on this issue, *Congressional Record*, September 23, 1992, pp. S14722-14723.

³¹U.S. Congress, Senate, 103d Congress, 2d session, Select Committee on Intelligence, *Authorizing Appropriations for Fiscal Year 1995 for the Intelligence Activities of the U.S. Government and the Central Intelligence Agency Retirement and Disability System and for Other Purposes*, S. Rept. 103-265, May 5, 1994, pp. 8-9.

military technical revolution that has been agreed on. (Many observers would add that, given the dynamism of technological changes, any such "vision" would soon be out of date.) Some may argue the need at least for a "TIARA Czar" and a realignment of the oversight responsibilities of the congressional committees. Given the dynamic advances in surveillance and communications technologies, it is, at the least, important that careful coordination be maintained to ensure that the potentialities of the military technical revolution be maximized.

Important requirements will remain for intelligence support to national-level policymakers. The changing kaleidoscope of post-Cold War issues will require in-depth expertise regarding a wider variety of topics than was true in earlier decades. Such concerns extend from the need to monitor troubled conditions in areas such as the post-Soviet republics and Yugoslavia to tracking wire transfers of cash by terrorist or narcotics organizations. National policymakers will continue to turn to the Intelligence Community for background information on a wide variety of international issues.

The inability to know which topics and regions will be of critical concern either to future policymakers or military commanders requires that Washington-area agencies maintain large databases and libraries as well as inventories of personnel with some expertise in disparate geographical and subject areas. The ability to retrieve information on new topics quickly has grown exponentially with the advent of Internet and electronic databases which allow rapid searching of enormous files of newspapers, journals, or other publications for information on specific names or subjects. Nevertheless, the management of open source intelligence has its own challenges and can involve considerable expenses.

The Intelligence Community of the future will be significantly different even as it continues to perform some of the main functions that have characterized its work for five decades. The lessons of Pearl Harbor led to the creation of a centralized Intelligence Community and they have not been forgotten. Although some observers emphasize that important national-level intelligence concerns will continue in the post-Cold War environment and must be addressed by intelligence agencies, all recognize that the sources and methods used during the Cold War with the Soviet Union and the Warsaw Pact, however, must change. The military technical revolution will have a major influence on the nature of the evolution, but successful adaptation will necessitate overall coordination that will be difficult to achieve, given disparate organizations, lines of authority, and committees of congressional oversight.