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The Intelligence Lessons of the Iraq War(s)

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Intelligence and the Strategic Lessons of the Iraq War and the War After the War

The war and "war after the war" in Iraq has exposed broad challenges for intelligence. Some are strategic and involve areas where any separation between the problems for intelligence and the problems at the policy level is artificial, and would be the issue. Others occur at the warfighting level, where it is equally apparent that any narrow separation of intelligence functions from the broadest possible consideration of command, control, communications, computers, and intelligence (C4I), overall battle management (BM), and the broadest use of intelligence, surveillance, and reconnaissance (IS&R) in netcentric warfare would be highly artificial.

Like the conflict in Afghanistan, the "war after the war" in Iraq has also made it clear that intelligence cannot perform its proper role if it focus on the defeat of enemy military forces -- particularly conventional military forces of the kind that dominated the Cold War. Both the Iraq and Afghan conflicts have exposed the fact that there is a serious danger in the very term "post conflict." They have exposed critical failures in American understanding of the world it faces in the 21st Century, in the nature of asymmetric warfare and defense transformation, and inevitably in the strategic climate in which every element of the intelligence community must function:

- *First, the US faces a generational period of tension and crisis in the Middle East and much of the developing world. There is no post conflict; there is rather a very different type of sustained "cold war."* The "war on terrorism" is only part of a period of continuing tension and episodic crises in dealing with hostile extremist movements and regimes. At a minimum, the US faces decades of political and ideological conflict. More probably, the US and its allies will deal with constantly evolving and mutating threats. These will involve steadily more sophisticated political, psychological, and ideological attacks on the West. They will be sustained by massive economic problems and demographic pressures that create a virtual "youth explosion, and by the regional failures of secularism at both the political and ideological level. The "wars" in Iraq and Afghanistan are actually "battles, " and the keys to victory lie in a sustained US campaign to help our allies in the region carry out political, economic, and social reform; in supporting efforts to create regional security and fight terrorism, and in checkmating and containing hostile movements and nations.
- *Second, defeat or victory in this struggle will be shaped largely by the success of American diplomacy, deterrence, and efforts to create and sustain alliances that occur long before military action. They will also be shaped by US ability to reach out to the UN, international organizations, and moderates in the Islamic world and other challenged areas.* US efforts to create favorable strategic outcomes in asymmetric conflicts and in conflicts involving any form of nation building must be conducted in a political environment shape by information operations on a continuing and global basis. Victory can only come through the equivalent of a constant program of political, psychological, and ideological "warfare" that is design to win a peace more than to aid in the military phases of a conflict. A climate of trust and cooperation must be established before any given clash or war takes place.
- *Third, no matter how well the US adapts to these realities, it will have to make hard strategic choices which should be made well before it uses military force.* The present contest between neoconservatives and neoliberals to see who can be the most self-deluded, intellectually ingenuous -- and use the most naive and moralistic rhetoric -- is not a valid basis for either war or dealing with its aftermath. Iraq and Afghanistan are both warnings of the complexity, cost, and time required to even attempt to change national political systems, economies, and social practices. Long before one considers any form of "nation building," one must decide whether such activity is practical and what the strategic cost-benefits really are. In many cases, it will not be worth the cost of trying to deal with the aftermath of overthrowing a regime and carrying out any form of occupation. When the objective *is* worth the cost, both the executive branch and Congress must honestly face the fact that the results will still be uncertain, that 5-10 years of effort may be required, and that the end result will often be years of occupation and low intensity conflict, as well as years of massive economic aid.

- *Fourth, preparation and training for the security and nation building phases of a conflict require that planning, and the creation of specialized combat units and civilian teams with suitable resources and regional expertise to carry out the security and nation building missions, take place long before the combat phase begins.* Success requires the battle plan and US military operations to be shaped to aid nation building and create security after the enemy's regime and armed forces are defeated. It requires the ability to make a transition to security and nation building activity as US forces advance during the combat phase and long and before "victory." It requires political campaigns designed to win hearts and minds of the peoples in the nation to begin before combat starts.
- *Fifth, in more cases than not, the aftermath of conventional conflict is going to be low intensity conflict and armed nation building that will last months or years after a conventional struggle is over.* As Iraq and Afghanistan show that it's the war after the war that counts, and which shapes US ability to win conflicts in any grand strategic sense.
- *Sixth, the US cannot succeed through a mix of arrogance and ethnocentrism.* The US is not the political, economic, and social model for every culture and every political system. It has much to contribute in helping trouble nations develop and evolve, but they must find their own path and it will not be ours. In most cases, economic and physical security; dealing with the educational and job problems created by demographic change, and creating basic human rights will be far more important than trying to rush towards "democracy" in nations with no history of pluralism, no or weak moderate political parties, and deep religious and ethnic divisions. Evolution tailored to the conditions and the needs of specific countries, can work; revolution will inevitably prove to lead to years of hardship and instability. The idea that the US can suddenly create examples of the kind of new political, economic, and social systems it wants in ways that will transform regions or cultures has always been little more than intellectual infantilism, and Iraq provides all the proof the US can ever afford to acquire.

This analysis addresses such strategic issues as they affect intelligence, as well as many detailed lessons at the tactical level. It draws on a range of official studies of these issues as they affected the Iraq War. It should be noted, however, that it is based purely from unclassified sources. This severely limits some aspects of the resulting coverage of key issues and analysis.

Broader Lessons for Interagency Action Growing Out of the Iraq Conflict(s)

If the US intelligence community is to provide US policymakers and warfighters with the support they need in the conflicts that are likely to shape much of the 21st Century, the entire US interagency structure must learn from both its successes and mistakes in Iraq and Afghanistan, and reshape the role of US intelligence as it reshapes the other functions of the US government.

The New Strategic Climate in Which Intelligence Must Function

The US must adapt its entire security structure to a new world that requires an objective – not an ideological – intelligence assessment of the problems that must be dealt with, and of the size and cost of the effort necessary to achieve decisive grand strategic results. Neither a capabilities-based strategy nor one based on theoretical sizing contingencies is meaningful when real-world conflicts and well-defined contingencies require a strategy, force plan, and intelligence support that can deal with reality on a country-by-country basis, rather than be based on ideology and theory.

- *Great as US power is, it cannot substitute for coalitions and the effective use of international organizations, regional organizations, and NGOs.* In order to lead, we must also learn to follow. We must never subordinate our vital national interests to others, but this will rarely be the issue. In practice, our challenge is to subordinate our arrogance to the end of achieving true partnerships, and to shape our diplomacy to creating lasting coalitions of the truly willing rather than coalitions of the pressured or intimidated.
- *At the same time, armed nation building is a challenge only the US is currently equipped to meet.* While allies, the UN, and NGOs can help in many aspects of security and nation building operations. They often cannot operate on the scale required to deal with nation building in the midst of serious low intensity combat.
- *Deterrence and containment are more complex than at the time of the Cold War, but they still are critical tools* and they too are dependent on formal and informal alliances.
- *War must be an extension of diplomacy by other means, but diplomacy must be an extension of war by other means as well.* US security strategy must be based on the understanding that diplomacy, peace negotiations, and arms control are also an extension of – and substitute for – war by other means. It is easy for a “superpower” to threaten force, but far harder to use it, and bluffs get called. Fighting should be a last resort, and other means must be used to limit the number of fights as much as possible.
- *Military victory in asymmetric warfare can be virtually meaningless without successful nation building at the political, economic, and security levels.”* Stabilization” or “Phase IV” operations are far more challenging than defeating conventional military forces. They can best be conducted if the US is prepared for immediate action after the defeat of conventional enemy forces. Both in Afghanistan and Iraq, the US wasted critical days, weeks, and months in engaging in a security effort before opposition movements could regroup or reengage. It left a power vacuum, rather than exploited one, and it was not prepared for nation building or the escalation of resistance once the enemy was “defeated.”
- *Force transformation cannot be dominated by technology; manpower skills, not technology, are the key.* The military missions of low intensity combat, economic aid, civil-military relations, security, and information campaigns are manpower dominated and require skilled military manpower as well as new forms civil expertise in other Departments. Human intelligence can still be more important than technical collection, local experience and language skills are critical, and the ability to use aid dollars can be more important than the ability to use bullets. Simply adding troops or more weapons will not solve America’s problems any more than trying to use technology to make US forces smaller and more cost-effective will. The missions that are emerging require extremely skilled troops with excellent area skills, far more linguists, and training in civic action and nation building as well as guerilla warfare.

- *“Jointness” cannot simply be an issue for restructuring the US military, and is far more than a military problem. It must occur within the entire executive branch, on a civil-military level, and throughout the intelligence community as well as at the military level. An advisory National Security Advisor is a failed National Security Advisor; effective leadership is required to force coordination on the US national security process. Unresolved conflicts between leaders like Secretary Powell, and Secretary Rumsfeld, the exclusion of other cabinet members from key tasks, insufficient review of military planning, and giving too much power to small elements within given departments, have weakened US efforts and needlessly alienated our allies. The creation of a large and highly ideological foreign policy staff in Vice President’s office is a further anomaly in the interagency process. The US interagency process simply cannot function with such loosely defined roles, a lack of formal checks and balances, and a largely advisory National Security Advisor. “Jointness” must go far beyond the military; it must apply to all national security operations.*
- *Policy, analysis, and intelligence must accept the true complexity of the world, deal with it honestly and objectively, and seek “evolution” while opposing “revolution.” The US is involved in four very complex wars, each of which requires the most objective intelligence and analysis that is possible. There is no room for ideological sound bites or overly simplistic solutions, and force transformation cannot cut some mystical Gordian knot. The US cannot afford to rush into – or stay in – any conflict on ideological grounds. It cannot afford to avoid any necessary commitment because of idealism. What it needs is informed pragmatism.*

One simple rule of thumb is to stop over-simplifying and sloganizing – particularly in the form of “mirror imaging” and assuming that “democratization” is the solution or even first priority for every country. The US needs to deal with security threats quietly and objectively on a country-by-country and movement-by-movement basis.

The US must seek reform with the understanding that progress in economic development, raising the living standards of the ordinary citizen, dealing with population problems, and improvements in human rights may often not only be more important in the near term than progress towards elections, but that “democracy” is purposeless, or actively destructive, unless viable political parties exist, political leaders have emerged capable of moving their nations forward toward moderation and economic development, and enough national consensus exists to allow different ethnic, ideological, and religious factions to function in a stable pluralistic structure. Finally, the US must act with the understanding that other societies and cultures may often find very different solutions to political, social, and economic modernization.

The US cannot afford to carelessly abuse words like “Islam” and “Arab,” or ignore the sensitivities of key allies like South Korea in dealing with the threat from the North. It cannot afford to alienate its European allies or lose support in the UN by throwing nations like “Iran” into an imaginary “axis of evil.” It needs nations like Saudi Arabia as an ally in the struggle against movements like Al Qaida, and it cannot afford to confuse terrorist movements driven by different and largely neo-Salafi beliefs with terms like Wahhabi, any more than it can afford to act as if Al Qaida somehow dominated a far more complex mix of different threats.

The US needs a nuanced pragmatism that deals with each nation and each threat individually and in proportion to the threat it really presents. It must give regional and other allies a proper role and influence in decision-making rather than seek to bully them through ideology and rhetoric. It needs to engage the checks and balances of the fully interagency process, of area and intelligence professionals, and seek a bipartisan approach with proper consultation with the Congress.

- *Stabilization, armed nation building, and peacemaking require a new approach to organizing US government efforts. It is not clear when the US will have to repeat stabilization and nation building activities on the level of Iraq. It is clear that that the civilian agencies of the US government were not adequately prepared to analyze and plan the need for the political, security, aid, and information programs needed in Iraq, and to provide staff with suitable training and ability to operate in a high threat environment. The State Department was prepared to analyze the challenges, but lacked both planning and operational capability and staff prepared to work in the field in a combat environment.*

The integration of USAID into State has compounded the problems of US aid efforts which had previously transferred many functions to generic aid through the World Bank and IMF. There was no staff prepared, sized, and training to deal with nation building on this scale, or to formulate and administer the massive aid program required. Contractors were overburdened with large-scale contracts because these were easiest to grant and administer in spite of a lack of experience in functioning in a command economy and high threat environment. US government and contractor staff had to be suddenly recruited – often with limited experience – and generally for 3-12 month tours too short to ensure continuity in such missions.

It is a tribute to the CPA and all those involved that so much could be done in spite of the lack of effective planning and preparation before the end of major combat operations against Iraq's conventional forces. The fact remains, however, that this should never happen again. Denial of the importance and scale of the mission before the event in no way prevents it from being necessary when reality intervenes.

- *New capabilities are required within the National Security Council, the State Department, and the Department of Defense for security and nation building missions.* It does not matter whether the tasks are called post conflict, Phase IV, stabilization, or reconstruction missions. The US must be as well prepared to win a peace as it is prepared to win a war. It must have the interagency tools in place to deal with providing security after the termination of a conflict, and to support nation building in terms of creating viable political systems, economic stability and growth, effective military and security forces, and public information system and free press. This requires the National Security Council to have such expertise, the State Department to have operational capability to carry out such a mission, the Department of Defense to have the proper military capabilities, the intelligence community to be a full partner in the process and other agencies to be ready to provide the proper support. The US must never again repeat its most serious mistakes in Iraq and Afghanistan. It must make security and nation building a fundamental part of the planning and execution of military operations directed at foreign governments from the start. A clear operational plan for such activity must be prepared before military operations begin, the costs and risks should be fully assessed, and the Congress should be fully consulted in the same way it is consulted before initiating military operations. The security and nation-building missions must begin as combat operations proceed, there must be no pause that creates a power vacuum, and the US must act from the start to ensure that the necessary resources for nation building are present.
- *US military strategy must give interoperability, military advisory efforts and intelligence cooperation the same priority as jointness. The US needs to rethink its arms sales and security assistance policies.* The US needs to pay far more attention to the social and economic needs of countries in the Middle East, and to work with other sellers to reduce the volume of sales. At the same time, it needs to work with regional powers to help them make the arms they do need effective and sustainable, create local security arrangements, and improve interoperability for the purposes of both deterrence and warfighting. The US needs to recast its security assistance programs to help nations fight terrorism and extremism more effectively, and do so in ways that do not abuse human rights or delay necessary political, social, and economic reforms.
- *The US needs to organize for effective information campaigns while seeking to create regional and allied campaigns that will influence Arab and Islamic worlds.* The US needs to revitalize its information efforts in a focused and effective way that takes advantage of tools like satellite broadcasting and the Internet while working directly in country. The US, however, can never be an Arab or Islamic country. It needs to work with its friends and allies in the region to seek their help in creating information campaigns that reject Islamic radicalism and violence, encourage terrorism, and support reform. The US should not try to speak for the Arabs or for Islam; it should help them speak for themselves.
- *The US private sector and foreign direct investment should be integrated into the US security strategy and efforts to achieve evolutionary reform.* The US has tended to emphasize sanctions over trade and economic contact in dealing with hostile or radical states, and assign too low a

- priority to helping the US private sector invest in friendly states. A “zero-based” review is needed of what the US government should do to encourage private sector activity in the Middle East.
- *There is no way to “drain the swamp.”* There simply is no way to eliminate the causes of terrorism in the mid-term and the emergence of new cadres of terrorist and insurgents. This does not mean the US should give up on reform and addressing these problems. It does mean the US must accept that it cannot win in the sense of eliminating them or turning hostile areas into secure and disarmed areas and that high quality policy and intelligence analysis is needed to determine what can and cannot be done and set suitable priorities.
 - *The US has agonizing decisions to make about defense resources, as well as those in the intelligence community and other agencies.* The fact that the current Future Year Defense Plan does not provide enough funds to allow the US cannot come close to fund both its planned force levels and force improvement plans is obvious. Everyone with any experience stopped believing in estimated procurement costs long ago. What is equally clear now, however, is that the US faces years of unanticipated conflicts, many involving armed peacemaking and nation building, and must rethink deterrence in terms of proliferation. This is not a matter of billions of dollars; it is a matter of several percent of the US GNP.
 - *Limit new strategic adventures where possible:* The US needs to avoid additional military commitments and conflicts unless they truly serve vital strategic interests. The US already faces serious strategic overstretch, and nothing could be more dangerous than assuming that existing problems can be solved by adding new ones – such as Syria or Iran. This means an emphasis on deterrence, containment, and diplomacy to avoid additional military commitments. It means a new emphasis on international action and allies to find substitutes for US forces.

Key Intelligence Lessons

Improved intelligence is needed in all of these areas, but the Iraq War has shown that several are of particular importance:

- *Current methods of intelligence collection and analysis, cannot guarantee adequate preparation for stabilization operations, properly support low intensity combat, or properly support the nation-building phase. The US needs to fundamentally reassess its approach to intelligence to support adequate planning for the combat termination, security, and nation building phases of asymmetric warfare and peacemaking operations.* It is equally important that adequate tactical intelligence support be available from the beginning of combat operations to the end of security and nation building operations that provides adequate tactical human intelligence support, combined with the proper area expertise and linguistic skills. Technology can be a powerful tool, but it is an aid – not a substitute – for human skills and talents.
- *New approaches are needed at the tactical and field level to creating effective teams for operations and intelligence.* Tactical intelligence must operate as part of a team effort with those involved in counterinsurgency operations, the political and economic phases of nation building, and security and military advisory teams. It is particularly critical that both intelligence and operations directly integrate combat activity with civil-military relations efforts, US military police and security efforts, the use of economic aid in direct support of low intensity combat and security operations, the training of local security forces and their integration into the HUMINT effort, and the creation of effective information campaigns.
- *Current methods of intelligence collection and analysis, and current methods of arms control and inspection, cannot guarantee an adequate understanding of the risks posed by proliferation.* The US needs to fundamentally reassess the problems of intelligence on proliferation and the lessons Iraq provides regarding arms control. Far too much the media coverage and outside analysis of the intelligence failures in Iraq has focused on the politics of the situation or implied that intelligence failed because it was improperly managed and reviewed. There were long standing problems in the way in which the CIA managed its counterproliferation efforts, and institutional biases that affected almost all intelligence community reporting and analysis on the subject.

- *National technical means and open-source intelligence cannot substitute for human intelligence (HUMINT).* HUMINT has its own limits, but it is clear that many of the previous requirements require both peacetime and wartime human intelligence networks in the area concerned, and analysts with the expertise to use it. "Soft" intelligence has become far more important.
- *Technology-based force transformation and the revolution in military affairs are tools with severe and sometimes crippling limits.* The ability to provide Intelligence, Surveillance, and Reconnaissance (IS&R) coverage of the world is of immense value. It does not, however, provide the ability to understand the world, deal with complex political issues, and fight effectively in the face of terrorism, many forms of low intensity conflict and asymmetric warfare, and the need to deal with conflict termination and peace making or protect nation building.

The ability to use precision weapons, helicopter mobility, and armor to destroy enemy conventional forces and blow fixed targets up "24/7" is also of great tactical value, but it does not mean that defeating enemy conventional forces really wins wars. The US is as bad at knowing what to blow up in terms of strategic targeting and many aspects of interdiction bombing as it was in World War II.

There also are good reasons to question whether many aspects of "Netcentric" warfare are little more than a conceptual myth, concealing the military equivalent of the "Emperor's new clothes" in a dense forest of incomprehensible PowerPoint slides than cannot be translated into procurable systems, workable human interfaces, and affordable Future Year Defense Plans.

In practice, there may be a need to make far more effective use of legacy systems, and evolutionary improvements in weapons and technology, to support "humancentric" forms of military action requiring extensive human intelligence and area skills, high levels of training and experience, and effective leadership in not only defeating the enemy in battle but winning the peace.

This, in turn, means creating US military forces with extensive experience in civil-military action and which can use aid as effectively as weapons – dollars as well as bullets. It also means redefining interoperability to recognize that low technology allied forces can often be as, or more effective, as high technology US forces in such missions.

- *The Iraq War showed little correlation between conventional order of battle analysis, and measures of manpower and equipment strength, and warfighting capability.* This is not an argument that numbers are not important. It is an argument that force ratios must be fundamentally rethought in terms of joint warfare and force quality and the interactions between asymmetric kinds of force. The type of military analysis common in the order of battle analysis in World War I and II, or the force ratio analysis and war games used in the Cold War, assume roughly symmetrical forces in terms of structure, quality, and leadership. It is questionable whether that assumption has ever had more than limited validity. It is clearly invalid today.

The comparative strengths and weaknesses of the Coalition and Iraqi forces allowed the Coalition to attack with forces that seemed inadequate by any previous calculation of quantitative force strength. The Coalition attack still involved carefully reasoned risks, and risks—by definition—make failure a possibility. However, the Coalition made a correct assessment of military capability in terms of a new era of high-technology joint warfare, and Iraq lacked the leadership to make effective use of older concepts of warfare and new approaches to asymmetric warfare.

The lessons for other developing or dated military forces are clear: They are to concede, proliferate, place vastly greater reliance on asymmetric warfare, or find some mix of all of these options. The lesson for the United States and Britain is that they have generally pursued an approach to coalition and joint warfare that gives them astounding strength in terms of traditional measures of force numbers.

At the same time, the insurgents in Iraq have shown that most future opponents are not likely as inept as the regime of Saddam Hussein and may make much better use of proliferation and asymmetric warfare. When Iraq did use asymmetric warfare effectively, it had at least some success. The pace and lethality of the Coalition attack never stopped the more dedicated elements

of Iraq's forces from fighting with skill and courage, in spite of the massive institutional and leadership problems imposed upon them from above. The importance of every aspect of force quality is a lesson of the Iraq War. Hubris is not a lesson of any war.

The Overall Architecture of Intelligence for Warfighting and Stability Operations

Both the Iraq and Afghan conflicts have shown that current methods of intelligence collection and analysis, cannot guarantee adequate preparation for stabilization operations, properly support low intensity combat, or properly support the nation-building phase. The US needs to fundamentally reassess its approach to intelligence to support adequate planning for the combat termination, security, and nation building phases of asymmetric warfare and peacemaking operations.

The same jointness is needed in the intelligence community effort to prepare for asymmetric warfare that is needed in the overall interagency process, and to ensure that the analysis given to policymakers, planners, and operators fully presents the problems and challenges that must be dealt with in stabilization and armed nation building. There must never again be a case in which the Department of Defense filters or rejects community-wide analysis or priority is given to intelligence for military operations in ways that prevent adequate intelligence analysis and support being ready for the stabilization and nation-building phase.

Situational Awareness; Intelligence Surveillance, and Reconnaissance (IS&R); and Command, Control, Communications, Computers, and Intelligence (C4I)

Situational awareness, the value of intelligence, and the need for effective command and communications are fundamentals as old as the history of war. Once again, dramatic changes took place in the quality of their execution during the Iraq War. The United States had vastly improved every aspect of its intelligence, targeting, and command and control capabilities since the last Gulf War, in addition to having spent some 12 years in surveillance of Iraqi operations and military developments. Its combination of imagery, electronic intelligence, signals intelligence, and human intelligence was honed in Afghanistan, and improved communications and command and intelligence fusion at every level gave it near real-time day and night situational awareness.

It is arguable whether these changes should be called an “evolution” or a “revolution” in military affairs. Much of the so-called “transformational” nature of U.S. forces is the result of trends that are now over 30 years old and that were foreseen in the planning documents of the 1960s. It is clear, however, that the United States has made steady advances and that its capabilities are much more advanced than at the time of the Gulf War.

General Richard Myers, the chairman of the Joint Chiefs, described these changes as follows.¹

...Joint warfighting is the key to greater things on the battlefield. I think that's been clearly proven here. We have very good integration. The thing that enables that and eliminates gaps and seams is the C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance). I think such systems are performing as we thought—all the systems. I am trying to think of something that has not lived up to what we expected and I am hard pressed.

At the same time, as is the case with virtually every lesson of the war, the war did expose significant weakness in Coalition operations and U.S., British, and Australian success

was heavily dependent on Iraqi failures and weaknesses. V Corps commander Lt. General William Wallace makes the following comments about Iraq's performance:²

“We should be careful at this point, because wars are kind of like good wine, they tend to get better with age. But it seems to me that regardless of whether Saddam still had a command-and-control apparatus in place toward the end, it continually took Iraqi forces a long time—somewhere on the order of 24 hours—to react to anything we did. By the time the enemy realized what we were doing, got the word out to his commanders and they actually did something as a result, we had already moved on to doing something different. For a commander, that's a pretty good thing—fighting an enemy who can't really react to you.

The Scale of the IS&R Effort

Even if one looks only at the air campaign, some raw numbers highlight the importance of the intelligence, surveillance, and reconnaissance effort. Some 80 dedicated Coalition aircraft flew more than 1,000 sorties on IS&R missions. They gathered some 42,000 battlefield images and provided 2,400 mission hours of SIGINT coverage, 3,200 hours of full mission video, and 1,700 hours of moving target indicator coverage.³ The sheer scale of the battle management takes is indicated by the fact that the database for the command and control of the air battle involved some 1,800 airspace control measures, of which an average of 1,200 had to be implemented a day. During the war, battle management had to “deconflict”—take steps to ensure that Coalition forces could safely operate in the same area—750 air and TLAM operations and 414 air and ATACMS operations.

Another measure of activity is the massive increase in communications activity that took place between the period before and after the war:⁴

Activity	Prewar	Wartime	Percent Change
Commercial Satcom Terminals	5	35	+560
Average Commercial Bandwidth (Mb)	7	10	+47
Military Satcom Terminals	20	44	+120
Average Military Bandwidth (Mb)	2	3	+68
Terrestrial Links	11	30	+173
Average Terrestrial Bandwidth (Mb)	2	10	+444
Global Broadcasting System (Mb)	24	24	0
Total Terminals	36	107	+167
Total Bandwidth (Mb)	113	783	+596

The Limits of IS&R Organization and Integration

At the same time, the United States still had major problems with many aspects of its IS&R systems. These problems also affected the British and Australian forces, which were largely dependent on the U.S. systems. Some of these problems were procedural and long-standing. The United States was able to do a much better job of integrating the national intelligence effort by the CIA, NSA, NRO, and NIMA into the warfighting effort, but coordination problems still remained, and warfighters note that overclassification, compartmentation, and restrictions on the release and dissemination of intelligence continued to present major problems. To put it bluntly, many actual users of intelligence in combat still see overclassification and dissemination as major problems and the security officer as much of a threat as the enemy.

Despite the increase in communications activity, there were still problems in handling the sheer scale of the IS&R effort. The volume of operational activity helped to contribute to the effective collapse of the effort to provide timely battle damage assessment data during the first few days of the war. The analysis and dissemination of IS&R data was much better than it had been in the Gulf War. However, many problems remained.

Key Barriers Inhibiting Progress

A GAO study conducted after the war, provides a good summary of the most important problems analysts have found in examining the lessons of the war, and which are reflected in many of the personal comments of military officers and contractors involved in the conflict and in the design and support of relevant IS&R systems:⁵

Despite the improvements brought about by advances in networking and precision weapons, DOD has identified a variety of barriers undermining continued progress in implementing the new capabilities-based strategy. For example, concerns were raised about shortages of digital communications, commercial satellite capacity and bandwidth, and other equipment. However, four interrelated areas stood out as key barriers to continued progress: (1) the lack of standardized, interoperable systems and equipment; (2) DOD's continuing difficulty in obtaining timely, high quality assessments of the effects of bombing operations; (3) the absence of a unified battlefield data collection system to provide standardized measures and baseline data on the efficiency and effectiveness of bombing operations; and (4) the lack of high quality, realistic training to help personnel at all levels understand and adapt to changes in the operating environment brought about by the move to a highly networked force using advanced technologies.

The Limits of IS&R Capability

As General Tommy Franks noted in his first briefing to the Congress on the lessons of the Iraq War, the steady advances in IS&R systems and technology, and the expansion of analytic assets, do not mean the United States did not face serious limits on US intelligence capability to support IS&R systems.⁶ The following key problems and shortfalls emerged during the war:

- The United States simply did not have enough area experts, technical experts, and analysts with language skills at any level to make optimal use of its sensors and collection. This was as true at the national level as at the tactical level, and collection overload was a problem in many areas.
- As has been discussed, the United States had a far greater capability to target buildings than to characterize what went on in those buildings and the effects of strikes on most sets of structures. It could not measure the level of wartime activity in many cases (facilities with high emission levels were an exception), and this made many efforts at "effects-based" operations difficult and sometimes impossible. Moreover, estimates of the level and nature of underground and sheltered facilities and activity were generally highly problematic.
- The problem was compounded in many cases by an inability to establish clear parameters for operations in "strategic areas" like the value of potential leadership targets, degrading given C4I assets, attacking LOC facilities, or attacking military depots, facilities, and industrial activities. At least some experts feel the end result was that the U.S. IS&R effort mistargeted leadership facilities, exaggerated the importance of C4I strikes, and overtargeted fixed military facilities. It is, however, unclear whether the United States and its allies had any choice. Striking more targets in the face of uncertainty was probably better than striking only those targets where a high confidence could be established as to the effect.
- The IS&R effort was not able to characterize and target the Iraqi weapons of mass destruction effort before or during the war, or to provide reliable warning of the tactical threat. It seems to have been somewhat better in dealing with potential delivery systems. But the level of

improvement relative to the inability to locate the Iraqi chemical, biological, and nuclear effort is unclear.

- The IS&R effort often had to take a “worst case” approach to the potential role of Iraq’s security forces, intelligence services, irregular forces like Saddam’s Fedayeen, and unusual military formations like the Special Republican Guards. In fairness, however, it is difficult—if not impossible—to accurately characterize the warfighting capability of forces that have never fought and that do not conduct open and realistic exercises.
- The IS&R sensor and analytic effort focused more on major combat forces, with heavy weapons, than on infantry or irregular forces. It could do a much better job of locating and characterizing weapons platforms and military emitters than of dealing with personnel and forces that relied on light vehicles. It was generally difficult or impossible to locate distributed forces in a built-up or urban environment until they were driven into some form of open military activity, and the United States often lacked the density of specialized assets like UAVs to carry out this mission even when open activity took place.
- The IS&R effort did much to reduce collateral damage and the risk of civilian casualties. It was neither organized nor capable, however, of assessing either civilian or military casualties.
- Improvements in C4I and the structure of the IS&R effort sharply reduced the time between the acquisition of targeting data and actual fire on the target, although many problems remained. The speed and intensity of the war do seem, however, to have led to a major breakdown in the battle damage assessment (BDA) process. Quite aside from the many gaps and uncertainties remaining in the BDA process, the IS&R system could not close the cycle in terms of target-shoot-assess on a timely and accurate basis, and this remains a critical challenge in creating true netcentric war.

None of these problems in analytic and collection capability can be called “intelligence failures.” Rather, they are currently “intelligence impossibilities.” Either the sensors and technology to collect the necessary information are lacking, or suitable analytic tools do not exist, or both. As is the case with so many other aspects of the Iraq War, however, it is important to understand that many major challenges and problems remain to be resolved.

Netcentric Warfare, and Near-Real-Time Intelligence

Many aspects of the C4I and IS&R systems used in the Iraq War reflected an evolution of past capabilities and dealt with problems that occurred in previous wars. The Coalition applied such systems, however, in a form of joint warfare that had an unparalleled degree of near-real-time situational awareness that shortened the “kill chain” from targeting to strike, and the sensors-to-shooter gap from days to hours in the Gulf War to hours to minutes in the Iraq War.⁷

At this point, there is no way to analyze the relative role of space, UAVs, fixed-wing aircraft, SIGINT, ELINT, imagery, Special Forces, and human intelligence in detail. It is clear, however, that the resulting mosaic of intelligence and sensor data was far better than in the Gulf War, and was processed and disseminated far more quickly. The time-consuming and relatively rigid process of sortie planning and targeting that shaped the Air Traffic Order in the Gulf War was replaced with a far quicker and more responsive system.

One senior officer described this process as follows:

All such offensive air operations, manned or unmanned, were coordinated with the USCENTCOM air component command headquarters. The types of targets were broad-ranging. Some of them were time-sensitive targets—where intelligence led the US to believe that a particular location was a valuable target. And so in a relatively brief period of time, particularly compared to the years past, the coalition was able to do the planning, get the missile loaded with its mission data, out of a submarine or—a British or American submarine or American ship—and down range and export on the target, or some rather more stationary and strategic targets, including missile defense facilities, to Republican Guard headquarters and some regime structures in and around Baghdad and all throughout the country...I think his degraded ability to command and control his formations meant that those Republican Guard formations had very little situational awareness on the battlefield of where to maneuver to, which played right into the decisive lethality that both the ground and the air component were able to put on him.

Lt. Gen. David D. McKiernan, the commander of the Coalition Forces Land Component Command, described the role of such assets, and netcentric warfare, as follows:⁸

Network-centric warfare is an idea, a concept, and a reality that has been around now for some years. And to give you a good example, much of the command and control that this regime executed for its military was done through fiber optic cable and repeater stations. Through very, very good intelligence, and targeting and execution, that capability was consistently degraded to the point where we think he really had very little ability to command and control tactical formations before we closed with him with ground formations. And that's a reflection of network-centric warfare, of knowing where to go in that command and control network to take it out or degrade it so that he loses his ability to command and control his formations.

... the technology advances in our military today, compared to my experiences in Desert Storm, allowed me to talk via tactical satellite communications and other means across a battle space of hundreds of miles; to be able to conduct, when we need to, video teleconferences, where commanders can plot out where they're at and what decisions they need to do next; and all of that put together in a joint construct, where I could see where all the airframes were, where all the ships are, where my counterparts in the air and the maritime components can see where the ground formations are.

When you put all that together, that allowed us to make decisions with situational awareness of where we were at, where the enemy was at, and our view of the terrain and the weather much, much faster than we ever could in the past and exponentially faster than our opponent could. So

when you put all that together, it allowed us to make decisions and then execute those decisions faster than any opponent.

It is important to note, however, that many of the US commands and intelligence branches supporting USCENTCOM remained focused on the needs of a single service, and that many of the improvements in jointness were the results of improvising new approaches, rather than the result of a solid, well established system for joint warfare. As one example, an Air Coordination Element, led by an Air Force major general supported by 18 airmen, was attached to the Army's operations staff so that there would be closer cooperation in providing close air support and liaison with the USCENTCOM command staff in Qatar and the Combined Air Operations Center (CAOC) in Saudi Arabia. The manning of the CAOC was also increased from 672 personnel before the war to 1,966 during the conflict. Seven other teams, headed by a general or colonel, were assigned to each of the land force commanders to similarly improve operations, planning, and liaison. Britain had liaison officers attached to various U.S. elements to improve interoperability.

The Broader Picture: The Need for An Integrated Common Operating Picture, Interoperability, and the Possible Need to Eliminate Service-Oriented Subordinate Commands in the Theater

These experiences raise broader questions about the need to restructure US command, control, communications, and intelligence systems, and the possible need to restructure theater commands and their intelligence support. As General Franks has noted in his analysis of the lessons of the war, one key lesson of the war is the ability to exercise joint command over all the US services, and allied forces, at distances as great as 7,000 miles - - the approximate distance from the theater to the USCENTCOM headquarters in Florida and the US national command authority in Washington.

At a minimum, this requires the US to keep developing the best common operating picture (COP) possible, and to develop a truly integrated, user-friendly, tracking and command and control architecture that brings together the operations of all of the military services. It also requires the US to design this system for information sharing with the allies of the United States.⁹

The report on the lessons of the Iraq War by the British Ministry of Defense reinforces the importance of this kind of advances in command and control, as well as for the importance of interoperability:¹⁰

The UK has a wide range of communications and information systems performing different functions. These were not all compatible with each other or with US systems, which led to interoperability difficulties. As a result, reliable, secure, timely and effective communication between all stakeholders could not be guaranteed.

The concept of Network Enabled Capability (NEC) involves the integration of sensors, weapons and decision-makers in order to deliver rapid, controlled and precise military effect. Shortening the time between targeting decisions and execution...is a prime example of this. Many new capabilities introduced through the UOR process in this operation were designed to improve the passage and exploitation of information as first steps in the development of NEC.

The British report also notes the value of the ability of UK and US special operations forces to track each other's locations, thus improving situational awareness at all levels of

command. It notes that this led to more effective battle management and an increase in operational tempo in all weather conditions.

The may, however, be broader lessons for “jointness.” It is clear from the US experience during the Iraq War that all service-oriented commands should have strong teams from other services as part of their permanent organization and should train with such teams in peacetime. Some have argued that the need for jointness is so great that it requires a separate military profession. At a minimum, it requires that service-centric commands train and operate with joint elements at all times, and that major changes take place in command post and field training exercises to ensure this.

The lessons of the Iraqi War also, however, indicate that it may be time to restructure regional commands like that naval, land, and air commands of USCENTCOM into true joint force commands, rather than having subordinate air, army, marine, and naval elements. The trade-offs between the continuing need for service expertise and jointness are difficult ones, and will need careful examination, but jointness should not be a matter of one-time solutions or teams improvised before or during a conflict.

Problems in Standardization and Interoperability

The GAO study referred to earlier found that problems in standardization and interoperability were one of the key barriers to integrating intelligence activity into the overall structure of command and control activity and to properly supporting netcentric warfare. These problems affected every aspect of US activity, not just intelligence, and often slowed operations and reduced effectiveness:¹¹

The lack of standardized, interoperable systems and equipment during joint operations was one of the most frequently reported problems we found during our review. According to DOD officials and reports, this longstanding problem undermines many operating systems at DOD, including systems used to provide shared situation awareness of the battlefield, battle management command and control, and damage assessments of the effects of bombing operations.

For example, officials from the Joint Forces and Special Operations Commands told us that during Operation Iraqi Freedom, ground forces arrived in theater with several different, noninteroperable Blue Force Tracking systems. Blue Force Tracking systems are devices carried by friendly ground units and vehicles that continuously or periodically transmit their locations to a central database, allowing their locations to be displayed on computer screens. Since there is no joint standard for such tracking systems, the joint force commander is responsible for resolving the interoperability problems created by the use of disparate systems. To provide a common picture of the location of ground forces using these systems, commanders had to develop a number of creative solutions to bridge the differences between them and integrate them into a coherent system—requiring considerable time and effort.

DOD officials also told us that the use of differing formats for processing information creates similar problems. For example, each service and unified command have their own instructions for performing operations such as reporting on the results of bombing missions. A recent DOD report found that during joint operations in Afghanistan, the Central Command received mission reports using at least 23 different formats.⁹ This created difficulty in receiving messages and required time-consuming manual data manipulation and entry. Operations in Iraq also faced similar problems.

According to the Joint Forces Command report on Iraqi Freedom, the process of evaluating the effects of attacks in Iraq was beset by a lack of commonly understood operational level standards. Integration of information was undermined by groups adopting their own standards and reporting formats, resulting in difficulties in translating information and coming to a mutual understanding

because they were not able to make specific comparisons between formats or to a common format. DOD has published a number of joint publications to help standardize operations in the joint environment.

These publications provide general terms of reference and descriptions of processes, such as the targeting process, for use by personnel from the various services while operating in the joint environment. However, according to DOD officials, these publications do not provide enough detailed guidance, such as standardized formats for reporting mission results, for the actual conduct of operations. As a result, each unified command must develop its own implementing procedures, with no system to ensure standardization among the commands. Further, according to DOD officials, when the pace of operations increases to high levels, there is a tendency for personnel to revert to using their own familiar service procedures.

We have also reported that a variety of equipment—such as reconnaissance aircraft, satellites, ground-based stations processing intelligence data, ground targeting equipment, and digital transmission systems used to transmit information between airborne and ground personnel—is not interoperable across the services. Similar to the examples cited above, the inability of these systems to operate effectively together can limit access to communications and other needed capabilities and confuse and slow targeting activities as less efficient alternatives must be used to achieve the mission.

DOD recognizes that improved interoperability and standardization are central to the transformation of its forces, and is attempting to address the problem. However, the problem is complex and difficult to resolve because military operations and acquisition systems have traditionally focused on the services and the specific weapons platforms needed for their specific missions—not on joint operations with interoperable systems and equipment. DOD's budget is organized by service and defense agencies, as we and the Defense Science Board recently reported in separate publications.¹⁰ Therefore, the process of defining and acquiring the right capabilities is dominated by the services and defense agencies. Joint force commanders' views are considered in this process, but they have a difficult time competing with individual service interests that control the process. As a result, the acquisition of systems and equipment often fails to consider joint mission requirements and solutions, and there is no guarantee that fielded systems will operate effectively together. DOD is addressing the need for more interoperability and standardization in several ways. For example, DOD's April 2003 Transformation Planning Guidance requires the commander of the Joint Forces Command to develop a plan to address DOD's interoperability priorities. These priorities include such efforts as development of a common operational picture for joint forces; improved intelligence, surveillance, and reconnaissance capabilities; improvements to selected targeting linkages; and improved reach back capabilities. The planning guidance also requires the services and the Joint Forces Command to develop plans for achieving the desired transformational capabilities, including an identification of the initiatives taken to improve interoperability. DOD is also attempting to reform the acquisition process to align it with a new capabilities-based resource allocation process built around joint operating concepts. Instead of building plans, operations, and doctrine around individual service systems, DOD is attempting to explicitly link acquisition strategy to joint concepts to provide integrated, interoperable joint war-fighting capabilities. For example, in June 2003, the Chairman of the Joint Chiefs of Staff issued Instruction 3170.01 that established the Joint Capabilities Integration and Development System. This system provides new guidelines and procedures for joint staff to review proposed acquisitions for their contribution to joint war-fighting needs.

DOD is also developing the Global Information Grid to act as the organizing framework for network-centric operations and help ensure interoperability in information operations throughout DOD. Begun in the late 1990s, this effort seeks to integrate the information processing, storing, disseminating, and managing capabilities—as well as the associated personnel and processes—throughout DOD into an integrated network. DOD's Chief Information Officer has described this network as a private military version of the World Wide Web. The effort includes programs to develop the policies and guidance needed to implement network-centric concepts across DOD, as well as programs to provide the technological improvements needed for the success of network-centric operations. Parts of this effort, such as policy and procedural guidance, bandwidth

expansion, and improvements to reach back capabilities, have begun or are in place. For example, definitions of requirements for interoperable information technology that are used in developing the Global Information Grid are cited as the authoritative guidance in the requirements determination and acquisition areas—including the Joint Capabilities Integration and Development System discussed previously. However, according to officials involved in the effort, development of the grid is still in its early stages and is planned to continue to the year 2010 and beyond.

While DOD appears committed to improving interoperability, DOD officials state that such reforms require difficult cultural changes to fully succeed. However, we previously reported that various problems have undermined past reforms, including cultural resistance to change, stovepiped operations, difficulties in sustaining top management commitment (the average tenure of top political appointees is only 1.7 years), and other problems that continue to exist today.¹¹ For example, in November 1997, DOD announced the establishment of the Defense Reform Initiative, which was a major effort to modernize DOD's business processes and ignite a "revolution" in business affairs at DOD. The initiative was overseen by the Defense Management Council composed of senior defense leaders reporting to the Secretary of Defense. However, by July 2000, we reported that the initiative was not meeting its time frames and goals in a number of areas. We concluded that the most notable barrier was the difficulty in overcoming institutional resistance to change in an organization as large and complex as DOD. Moreover, the effectiveness of the Defense Management Council was impaired because members were not able to put aside their particular services' or agencies' interests to focus on department wide approaches.

Similarly, cultural impediments to change were also illustrated in our March 2003 report on ground-based systems for processing intelligence data.¹³ In that report, we stated that DOD's system for certifying their interoperability was not working effectively. In 1998, DOD began a program to reduce the number of ground-based systems that process intelligence data from various sensors and ensure that the remaining sensors are interoperable with other DOD systems. DOD requires that such information systems be certified, and to help enforce the certification process, the department set up a review panel to periodically review such systems and place those with interoperability problems on a "watch list." However, 5 years after the program was started, we reported that only 2 of 26 systems in the program had been certified and, despite this problem, the systems had not been placed on the watch list. DOD officials cited a number of reasons for the noncompliance, including that military services sometimes allow service-unique requirements to take precedence over joint interoperability requirements. DOD strongly agreed with our recommendations to take several steps necessary to enforce its certification process.

While these comments are directed primarily at the Department of Defense, they are -- if anything -- substantially more serious in the 15 agencies that make up the US intelligence community, and particularly in those agencies that primarily support the Department of Defense. The culture problems are not only compounded by bureaucratic rivalries, but by major over-classification and compartmentation problems which, in turn, lead to a host of outdated, inefficient, and needless different IT systems,

Areas for Improvement and Problems at the Unit Level

There are many other areas where U.S. and Coalition intelligence operations in the Iraq War did not represent the state of the art the US will need in the future. At present, netcentric warfare is not a "system of systems" in any real world sense. It is rather a "systemless mix of systems" where many systems remain service centric, and where the command structure and coordination must be improvised around each new contingency. Almost inevitably, this improvisation works best between the highest levels of command and the major combat unit level. It is weakest at the level of the practical warfighter -- particularly the war fighters involved in ground combat.

It is clear from discussions with some of the officers involved, as well as with technical experts in the Department of Defense, that “netcentric” warfare is in a rapid state of flux and that many further advances can be made. Methods and technology could be improved in many areas at every level, from communications in the field to basic procedures for integrating high-level decisionmaking. In case after case, the technology available during the Iraq War was also already in transition. In many cases, parts of U.S. forces were more advanced than other parts, or follow-on technology was already in development or procurement.

It is clear from talking to both general officers and more junior officers that the net was weakest at the battalion level and below. These problems were the result of technology and equipment, tactics, and training and not any one cause. But they limited jointness, and sometimes the commands from higher levels outpaced the ability of combat and logistic elements at lower levels to interact and coordinate. Such problems also do not seem to have been characteristic of any service or element of combined arms; they appear in virtually every after action report from the field at lower levels of command.

Service-Level Problems in IS&R/C4I/BM

Each service still had a series of unique organizational, technical, and communications solutions to the circulation, processing, and dissemination of IS&R data, and this presented particular problems for both U.S. and allied ground forces.

For example, the U.S. 1MarDiv headquarters did not have direct access to satellite primary imagery, although it did have access to satellite secondary imagery via image product libraries (IPL) and all-source product servers. This lack of direct access was not a matter of the Marines not having the capability or of the NIMA withholding data. Rather, it resulted from a Marine commander's decision based on prioritization of requirements and allocation of resources. Given the MEF's AOR, mission, prioritized requirements, etc. the commander opted to use the MEF's primary imagery receive assets (IntelBn's TEG-M and a dozen TEG-E's) to support the deep battle, employing them at the MEF Command Element (CE) and the Marine Air Wing (MAW). The commander allocated in direct support of the MarDiv 100 percent of his tactical UAVs (two Pioneer squadrons), TCDL receive suites for P3 AIP connectivity, and enough Trojan Spirits for MarDiv HQ and every RCT to use for secondary imagery reachback.¹²

Nevertheless, the analysis of the lessons of the war by the 1st Marine Division provides a powerful reminder that true netcentric warfare must get intelligence to the warfighter:¹³

The 1st Marine Division G2 did not have current, high-resolution, National imagery support during preparation or combat phases of the Operation. Baseline CIB was the only tool available to the Division—and used to great success- but was dated and incomplete. There were no successful National Imagery ad-hoc collections in support of the Division for the entire war.

Unlike the MEU, the Division did not have access to an organic TEG-E to download and exploit National Imagery. This was a weakness during planning, but a critical vulnerability during combat operations. There were issues with bandwidth, exploitation, and processes that caused this state of affairs, but the bottom line was no successful ad-hoc National imagery exploitation products during the entire war....Once the Division crossed the line of departure, contact with the Intelligence Battalion was sporadic, and even this avenue was closed. It was frustrating to be desperate for current high-resolution imagery of Safwan Town (for example) and unable to receive it in response to a tactical unit's request, only to see perfect imagery appear in an NGIC assessment only days later. There was a broken link in this chain.

The only National imagery available to the Division was the 1m Controlled Imagery Base (CIB), and most of the Division's intelligence effort was based on products we built using this as a baseline. The NIMA provided Controlled Imagery Base (CIB1), though coverage area was large, did not provide the resolution required for detailed tactical planning. Some of the baseline coverage provided was also dated and misrepresented some areas that had changed over the last year.

If National level imagery products are to be of use to the tactical (Battalion) commander, the capability to request and follow through on National imagery collections must reside at lower echelons. The collections management hierarchy must be flattened. The Division must have the ability to download and exploit imagery organically, much like the MEU does now. Reliance on an external agency to anticipate requirements, know what is important to the supported commander, and be a full partner in the intelligence effort is not realistic. Division should never enter planning or combat operations without complete baseline imagery coverage at no worse than 1m resolution. Baseline imagery must be reasonably current and have high enough resolution to be able to identify tactical terrain. It must also be geo-rectified and include elevation data to be used for thorough terrain analysis to support operational planning.

A British View

These are problems that occurred for the British army as well as US forces:¹⁴

It has long been recognized that the Army's main tactical communication system, the ageing Clansman radio, suffers significant limitations. A new system, Bowman, will be introduced into service from 2004. As an interim improvement, Clansman was supplemented by the purchase of items such as lightweight tactical satellite communications systems, ensuring our forces had maximum operational flexibility. In addition, the Bowman Personal Role Radio, trialed in Afghanistan, was available to all combat troops for the first time. This short-range radio is designed to facilitate communications within small infantry teams. The US Marines have subsequently bought some 5000 sets.

One of the key realities of the war, and indeed of all efforts to create a netted or matrix approach to warfare is that some parts of the net or matrix are always much more advanced than others, and some are critical weaknesses. There were still significant communications failures; battle damage assessment was still a major problem; and so was the ability to "characterize" infantry and irregular land forces and the function and actual level of activity and capability in buildings. In fact, one Army analysis of the problems in information technology during the war focused heavily on the need for improved energy sources to replace batteries.¹⁵

Some quotes from Joshua Davis, an embedded reporter from *Wired*, give a clearer picture of the realities of netcentric warfare versus the image and of the practical challenges this poses for intelligence:¹⁶

The war was a grand test of the netcentric strategy in development since the first Gulf War. At least, that's the triumphal view from the Pentagon briefing room. But what was it like on the ground?...I tracked the network from the generals' plasma screens at Central Command to the forward nodes on the battlefields in Iraq. What I discovered was something entirely different from the shiny picture of techno-supremacy touted by the proponents of the Rumsfeld doctrine. I found an unsung corps of geeks improvising as they went, cobbling together a remarkable system from a hodgepodge of military-built networking technology, off-the-shelf gear, miles of Ethernet cable, and commercial software. And during two weeks in the war zone, I never heard anyone mention the revolution in military affairs.

...A ruddy Texan sticks his hand out at me: "Lieutenant Colonel Caddell. Glad to meet you." Timothy Caddell is in charge of wiring the JOC (joint operations center). He manages the 65 servers and 50 Army, Navy, Marine, and Air Force network administrators who keep the control

center's generals connected to the war. "In October, this was an empty warehouse," he says. "It takes most big companies years to bring 65 servers online. We did it in three months."

Caddell leads the way to one of the shipping containers. Inside, two soldiers baby-sit three rows of Sun servers. "This is where the Global Command and Control System lives," Caddell says. GCCS—known as "Geeks" to soldiers in the field—is the military's HAL 9000. It's an umbrella system that tracks every friendly tank, plane, ship, and soldier in the world in real time, plotting their positions as they move on a digital map. It can also show enemy locations gleaned from intelligence. "We're in a whole different ball game from the last Gulf war," Caddell says. "We had a secure network back in '91, but the bandwidth wasn't there and the applications weren't there. Now they are."

The prime example, he says, is a portal called the Warfighting Web. Launched just nine months ago, it lets military personnel access key data—battle plans, intelligence reports, maps, online chats, radio transcripts, photos, and video. Caddell sketches out a typical scenario: A Special Forces unit in northern Iraq attacks an Iraqi irregular unit. The firefight is recorded with digital video, which is uploaded to GCCS via secure satellite. JOC intelligence officers fire up the Warfighting Web, click through to "Latest Intelligence," watch the fight, write a summary, and post follow-up orders to the unit. The soldiers either download the orders directly or receive them by radio from the nearest Tactical Operations Center, the most forward command post on the network.

We leave the GCCS container and head past a row of large refrigerated metal boxes. Caddell steps up to one and leans on a 3-foot metal lever. The thick front wall swings open, revealing two rows of Compaq servers. A blast of cool air hits me; the temperature here is about 20 degrees lower than in the warehouse. "Welcome to Siprnet," he says. GCCS runs over Siprnet—the Secret Internet Protocol Router Network—in the same way that Web applications run over the public Internet. The difference with "Sipper" is that it's basically a far-flung local area network. To maximize security, it doesn't connect with the Internet proper. But it links Centcom to the battlefield and, among other things, allows Franks to talk to Rumsfeld and President Bush via two-way videoconference every evening.

Caddell has one more important piece of Centcom to show me. "How would you like to see the JOC help desk?" he says, motioning me out of the container. We head toward the far end of the warehouse, where Specialist Adam Cluff—a heavysset, droopy-eyed kid from Utah—stands at attention when he sees Caddell. It looks like he'd been taking a nap. I ask him what he does here. "If a general has a problem with his Web browser, then I fix it," Cluff says. "How do you fix it?" I ask. "I consult Microsoft online help."

...The US Forward Command is a half hour due east of Kuwait City, approximately 75 miles from the Iraqi border. I've flown here from Qatar to learn more about the 11th Signal Brigade, the soldiers tasked with wiring the battlefield. They tote M16s, but their job is to jump out of helicopters and set up packet-based wireless networks. Their unofficial motto: Connecting the foxhole to the White House. Without these guys, Lieutenant Colonel Caddell's Warfighting Web would have no war to fight. For the 11th, the epicenter of the campaign is here at Satellite Park, where a dozen dishes are spread across a patch of dirt enclosed by razor wire. The operation is monitored by four men and a woman, each with a laptop and a secure digital telephone. They are the controllers. Each oversees the health of one of the brigade's five networks. That means all of the Army's battlefield communications flow through these five people.

Their laptops display icons representing a web of nodes and switches. When the icons are green, everything is running fine. But when a link turns red, panic sets in. "A link went red yesterday," says Sergeant Danny Booher, one of the controllers. "One of my guys came under mortar fire near Basra and the satellite got hit." Booher got on the phone with his nearest unit, and, minutes later, there was a humvee racing through the desert, towing a satellite dish on wheels.

Lieutenant Colonel Mims...chimes in. "If it's a question of the network going down, we get helicopters, air support, tanks—whatever we need," he says. As the brigade's intelligence chief, Mims is in charge of knowing where the enemy is and positioning forward signal units in secure

locations. In the first Gulf war, Mims was a junior intel officer. "Signal has become a lot more complicated in the Internet age. We used to only have to worry about radios. Now it's about providing enough bandwidth to power streaming video and monitor real-time troop and vehicle movement."

The improvement in communications is the real innovation in this war, he explains. He grabs my notebook and a blue ballpoint pen and draws an obtuse angle. "When we attacked in the last Gulf war, we basically had our vehicles lined in a wedge," he says. "We had five divisions moving across the desert like that. As they went through, they'd sweep an area clear—if there's a problem, the other unit can see and hear it, and, more important, the unit is close by and can arrive quickly to help. In that model, once you move through, the rear zones are secure. There's not much left back there." Now Mims draws a bunch of small circles spread out on the page. This is Rumsfeld's theory of swarm tactics. Because technology allows soldiers to keep track of each other, even when they're out of one another's sight, they can now move in any formation. "We may not always know exactly where the enemy is," Mims explains, "but we know where we are. When the enemy engages us in this spread-out fashion, we send air cover to protect the unit until the support forces arrive."

Swarm theory holds that you move fast and don't worry about securing the rear. The benefits to this are many. First, you need fewer troops and less equipment. War becomes cheaper. Second, it's harder for the enemy to attack a widely dispersed formation. Third, units can cover much more ground—they aren't forced to maintain the wedge by slowing down to accommodate lagging vehicles. Fourth, swarming allows you to go straight for the heart of the enemy's command structure, undermining its support from the inside out rather than battling on the periphery. Swarm theory is also moving online—into chat rooms, an application Mims is pioneering for military purposes. When a problem develops on the battlefield, a soldier radios a Tactical Operations Center. The TOC intelligence guy types the problem into a chat session—Mims and his colleagues use Microsoft Chat—and the problem is "swarmed" by experts from the Pentagon to Centcom. Not only is the technology changing the way we maneuver, Mims notes, it's changing the way we think.

But the system is not without problems. Because anyone on Siprnet who wanted to could set up a chat, 50 rooms sprang up in the months before the war. The result: information overload. "We've started throwing people out of the rooms who don't belong there," Mims says. "What's funny about using Microsoft Chat," he adds with a sly smile, "is that everybody has to choose an icon to represent themselves. Some of these guys haven't bothered, so the program assigns them one. We'll be in the middle of a battle and a bunch of field artillery colonels will come online in the form of these big-breasted blondes. We've got a few space aliens, too."

..."When we were deployed from the States," says Lieutenant Marc Lewis—the commander of the convoy's 27 heavy equipment trucks—"they told us that we would be given encrypted, military-issue radios when we got here. When we arrived, they told us we should have brought our own." What Lewis brought was four Motorola Talkabouts, each with a range of about 1,000 feet. In the half-dozen convoy trips he's made since arriving in country, Lewis has taken to distributing a Talkabout to the first and last trucks. The other two go to vehicles at strategic points in between. It's hardly secure. Anybody with a radio could monitor the conversations.

Lewis is improvising as best he can. Before leaving the States, he bought a handheld eTrex GPS device, which he uses to track each of his forays into Iraq. In essence, he's created a map of Iraq's charted and uncharted freeways and desert roads. He just has no way to share it with anybody. But he is able to navigate as well as any of the tank or missile commanders he transported. I notice that at least four other soldiers in the convoy have brought their own store-bought GPS handhelds. These devices keep the convoys on track in lieu of having proper systems. "If we run out of batteries," Lewis says when showing me his map of Iraq, "this war is screwed."

Even in the case of fixed-wing air systems—which generally had the best and most digitized communications and flow of targeting and tactical intelligence data—there were many problems in interoperability, communications, and data flow, as well as in

procedures and computer support. These included a wide range of problems affecting the “sensor-to-shooter gap,” time-urgent targeting, and dynamic targeting, as well as deconflict and avoiding friendly fire.

The most serious problems, however, seem to occur at the level of the land warfighter, and some experts have even called this the “digital divide:” a separation of the military above the division level into a largely digital force while most of the force below that level still relies largely on “analog” human beings.

The U.S. Army, the Marine Corps, and allied forces like the British Army all had different levels of “digitization.” The U.S. Army was the most advanced land force, but its units had different levels of capability. Ironically, the 4th Infantry Division—the unit best equipped to use such capabilities—was not committed. It also is not clear just how much the United States was able to solve the coordination, processing, data allocation, and bandwidth problems exposed in Afghanistan or to deal with new capabilities to retarget aircraft in mid-flight. What is clear is that such technologies offer great promise and will rapidly evolve beyond the level of operations used in the Iraq War.

Target Characterization and Battle Damage Assessment

Two other areas are of critical importance in determining the efficiency of IS&R systems and of any concept of netcentric warfare. One is target characterization. The other is battle damage assessment. Both are closely related, since the key issue is often what the target actually consists of, and what it actually does, and not the level of damage needed or achieved. At present, the limits to the state of the art are often far more serious than military planner and intelligence officials seem willing to admit. The Iraq War showed, however, that much still needs to be done, and that the problems in such areas seriously limit real-world capability to carry out "effects-based" operations.

Target Characterization

United States was far better equipped to target Iraq's armored and heavy ground forces, active land-based air defenses, and military emitters than it had been in past wars. The ability to strike at Republican Guard forces almost continuously during the conflict, even during sand and dust storms, is particularly impressive.

The ability to characterize armor versus other military vehicles seems to have remained a problem, as did the ability to find well-dispersed systems like aircraft and individual surface-to-air missiles or surface-to-surface missiles that were not actively moving or emitting.

The United States had far less capability, however, to deal with light irregular forces or to characterize the size and nature of asymmetric forces, particularly those that sheltered in urban or built-up areas. It had critical problems in locating and characterizing infantry and irregular forces that did not use military vehicles. This problem was equally serious in Afghanistan, and in both Iraq and Afghanistan the US has found it has even greater problems in locating and characterizing insurgent and terrorist elements and forces.

As the British report on the lessons of the war notes, these targeting problems were compounded by the need to subject targeting to careful political review, and to the need to minimize civilian casualties and collateral damage. As is the case in IS&R, jointness has become a civil-military requirement as well as a military one, and the political content of targeting has become an increasingly important issue for warfighting:¹⁷

Planning for the air campaign included the development of a list of potential targets that would help the coalition to achieve its overall objectives. Over 900 potential target areas were identified in advance. All targets were derived from the campaign plan and were selected to achieve a particular military effect (such as the degradation of Iraqi command and control systems). Operating within parameters agreed by Ministers, Commanders taking targeting decisions had legal advice available to them at all times during the conflict and were aware of the need to comply with international humanitarian law, the core principles of which are that only military objectives may be attacked, and that no attack should be carried out if any expected incidental civilian harm (loss of life, injury or damage) would be excessive in relation to the concrete and direct military advantage expected from the attack. Extensive scientific support including detailed computer modeling was used in assessing potential targets. Strong coordination between the MOD, the Permanent Joint Headquarters (PJHQ) at Northwood and the in-theatre National Contingent Command helped ensure coherent target planning (a lesson from previous operations). The Department for International Development was also consulted on key humanitarian infrastructure issues. The process for approving all targets for UK aircraft, submarine-launched cruise missiles or for coalition aircraft using UK facilities was conducted with appropriate

political, legal and military oversight at all levels. We also influenced the selection and approval of other coalition targets.

For all the advances in sensors, weather remained a problem. The United States was able to locate and target most Iraqi forces during the dust storms in late March, but the storms still sharply degraded coverage and the US sometimes could not track even the moments of large armored and mechanized units in rear areas. Weather made battle-damage coverage of Iraqi ground forces almost impossible. General Myers, the chairman of the Joint Chiefs, has stated that the United States had no clear picture of how successful its air strikes were against the Republican Guards during the dust storms, and the fact that it had a high level of success could only be confirmed once the weather had cleared. As a result, the United States had to persist in its advance in spite of considerable uncertainty.¹⁸

The United States had problems in dynamic targeting of covered and sheltered facilities. UAVs and electronic intelligence assets, plus the use of Special Forces, do seem to have given the Coalition a better capability than the US and its allies have during the Gulf War to know when buildings were empty and to locate new dispersed forces and facilities. The United States did not have enough of these need assets establish anything like full coverage, however, and is only beginning to learn how to best use them and fuse them into the overall IS& process.

Moreover, each asset the United States does have has important limits. It still is impossible to see within buildings or shelters without men being physically present. In at least some cases, the United States actually struck at underground facilities or bunkers that postwar examination showed did not exist. These may even have included the “bunker” that the United States attacked on the first night of the war in an effort to kill Saddam Hussein and key elements of the Iraqi leadership.¹⁹ It is generally impossible to characterize the nature of the equipment and operations in sheltered or covered facilities unless their purpose is clear from previous intelligence sources or their profile of activities is clear.

The US could not characterize or target many elements of Iraq’s irregular forces, or characterize the mixes of Iraqi forces that were suddenly thrown together once much of the organized Iraqi order of battle collapsed under the pressures of the fighting. It was not able to target effectively once insurgency became a problem, except in rare cases where most targeting data came from HUMINT.

Battle Damage Assessment

The issue of battle damage assessment (BDA) is a particularly important area of uncertainty. The data the United States (and Britain) have made public in the past on battle damage assessment have scarcely been reassuring. The data on so-called kills of large military weapons like armor and ground kills of aircraft and missiles have generally proved to be either exaggerated or uncertain. Data on attacks on command and control facilities, infrastructure targets, leadership targets, and industrial base and POL targets have often been able to show the damage to the building but were unreliable in assessing the effect—a problem that is progressively more important if the concept of “effect-based” operations becomes a key factor in war fighting. The long-standing reluctance of the United States to estimate enemy casualties ever since Vietnam seems to have

compounded delays in finding ways to both target and assess battle damage to infantry and light forces, as well as paramilitary and terrorist forces, that are primarily people and not things.

The Iraq War showed that the United States and Britain had learned not to rush out with BDA statistics and estimates, although this may have been the result of the fact that the BDA process largely collapsed early in the war. Several U.S. and allied officers have also made it clear since the war that the few estimates the coalition did issue on the level of equipment losses in the Republican Guard may simply have been broad estimates based on rough extrapolations from the improved imagery that became available after the dust storms ended, and could not distinguish battle damage with any accuracy, or whether the break up of Iraqi combat capability was the result of physical damage to Iraqi weapons or the result of desertions.

The GAO has provided a description of these problems that provides unusual detail for an unclassified document:²⁰

DOD's difficulty in obtaining timely, high quality assessments of the effects of bombing operations continues to be a difficult problem to overcome. Problems with battle damage assessments have been repeatedly identified since at least Operation Desert Storm in 1991. DOD has taken some steps to address these problems, but they continue to reoccur. As a result, some DOD officials have called for approaching battle damage assessments in different ways.

BDA Cannot Match the Pace of Operations

Reports from DOD and others have identified repeated difficulties in conducting battle damage assessments in operations in Iraq, as well as other operations dating back at least to Operation Desert Storm in 1991. Battle damage assessments are a critical component of combat operations. Slow or inaccurate assessments can result in inefficient use of forces and weapons, as targets must be struck repeatedly—but sometimes unnecessarily—to ensure their elimination as a threat. Inadequate damage assessments also slow ground advances, as units and individuals face uncertainty about enemy capabilities, which can ultimately increase their risk of death or injury since they may have to close with the enemy to understand the conditions ahead of them.

However, DOD reported that battle damage assessments during operations in Iraq could not keep up with the pace of operations and failed to provide the information needed for operational decisions. Reports on operations in Afghanistan also identified similar problems during Operation Enduring Freedom. Our report on Operation Desert Storm¹⁴ found that battle damage assessments during that conflict were neither as timely nor as complete as planners had assumed they would be. Battle damage assessments were performed on only 41 percent of the strategic targets in our analysis, resulting in potentially unnecessary additional strikes to increase the probability that target objectives would be met.

The inability of damage assessment resources to keep up with the pace of modern battlefield operations is due to several factors. According to DOD officials, advances in network-centric operations and precision weapons have increased the speed at which targets are generated and attacked. At the same time, however, DOD does not have an occupational specialty for battle damage analysts. This results in shortages of trained analysts when resources are surged during operations, leaving unified commands to rely on untrained and inexperienced personnel brought in from other areas and trained on the job. For example, during operations in Afghanistan and Iraq, the Central Command experienced requirements for large manning increases in its battle damage assessment capability. While the command was ultimately able to increase its staff of analysts to about 60, this was only a fraction of the estimated requirement. Typically, the Central Command has about three to five full-time personnel assigned to its battle damage assessment group.

Moreover, according to Central Command officials, even when they obtained personnel they were often untrained. Operations were further slowed, as these personnel were required to receive on-the-job training. Battle damage assessment training is available at both the service and joint levels. However, according to

DOD officials, the absence of a formal occupational specialty for battle damage assessment means there is little incentive for personnel to seek the training. Further, even if trained, analysts are required to use the instructions of the unified command in charge of operations during actual conflicts. DOD officials told us that there is no requirement for these instructions to be standardized, making it more difficult for personnel from the services to quickly adapt to operations. Finally, according to officials, DOD does not have a comprehensive system to track personnel who have received battle damage assessment training, further exacerbating problems in quickly locating trained analysts during surge situations.

Attempts to Address the Problem Have Been Limited

In recognition of the continuing problems associated with battle damage assessments, DOD has taken some steps to address these problems. However, these attempts have been somewhat limited. For example, DOD established the Joint Battle Damage Assessment Joint Test and Evaluation program in August 2000 to investigate solutions to battle damage assessment process problems. The program was focused on assessment processes used by U.S. forces in Korea, but it also analyzed processes used in Operations Enduring Freedom and Iraqi Freedom. Program officials developed a variety of enhancements that could improve the battle damage assessment process. For example, program officials developed improvements to the processes used in Korea to standardize disparate systems and speed the flow of information between analysis and command centers. To help address analyst training problems, they developed a compact disc-based course to provide quick training for untrained personnel assigned to fill shortages of analysts during conflicts. Further, they also developed an agreement with a reserve organization to develop a core of trained battle damage assessment analysts and to have those personnel available to meet surge requirements for the Korean command.

However, according to program officials, acceptance of such approaches is voluntary within DOD, and many have not been implemented outside Korea. They are trying to gain additional support for adoption of their enhancements. Program operations will be discontinued and a final report issued by December 2004. In addition to this program, DOD officials told us that a Combat Assessment Working Group was recently established at the Joint Staff to discuss ways to address problems with the battle damage assessment process. However, the group had not developed formal recommendations at the completion of our audit work in March 2004.

Officials Call for Different Approaches

Some DOD officials have called for more effort to be focused on assessing battle damages from an “effects-based” framework. The effects-based operational concept calls for an increased emphasis on conducting military operations and assessing their effects, in terms of the military and nonmilitary effects sought—rather than in terms of simply the destruction of a given target or an adversary. According to a recent Defense Science Board report,¹⁵ the emergence of this concept has been influenced by the opportunity provided by precision weapons, shared situation awareness, and other advances enabling the precise use of force, as well as the needs presented by the nature of current military campaigns. Operations from Kosovo to Iraq have been characterized by tension among multiple strategic and operational objectives: destroy enemy infantry and air defenses and drive the current regime from power, but do not injure civilians or damage necessary infrastructure.

The use of an effects-based battle damage assessment approach would mean that instead of the traditional focus only on damage or destruction of a target, battle damage assessments should also attempt to determine whether command objectives are being met by other influences in the battlefield. For example, initial bombing attacks on nearby targets may persuade enemy troops to abandon a target facility, eliminating the need to bomb the target facility at all. According to the Joint Forces Command’s report on Iraqi Freedom, commanders in Iraq attempted to use an effects based approach to analyze military operations. However, when the speed of operations exceeded their capability to analyze and assess how actions were changing the Iraqi system, they reverted to the traditional focus on simple attrition measures. Coalition forces reverted to counting specific numbers of targets destroyed to determine combat progress, rather than evaluating the broader effect created on the enemy. The command has called for recognition of problems with battle damage assessments as a major obstacle to effects-based operations, requiring a variety of changes to resolve.

DOD officials also told us that the traditional focus on damage and destruction results in leaders relying too

much on visual imagery to assess battle damages. This problem can cause leaders to delay battlefield progress until full visual confirmation of the desired affect is confirmed. According to these officials, given the increasingly reliable nature of precision weapons, it may be possible in some cases to rely on predicted or probabilistic effects, rather than full visual confirmation.

Absence of a Unified Battlefield Information System Confuses Effectiveness Measures

DOD does not have a unified battlefield data collection system to provide standardized measures and baseline data on the efficiency and effectiveness of bombing operations. According to DOD officials, the current system for collecting operational data is for the services and the unified commands to maintain their own databases, which are often quite extensive. Precisely how data is defined, gathered, and analyzed is at the discretion of each individual component and addresses specific needs. These unique requirements lead to different purposes for conducting analyses, different data collection approaches, and different definitions of key data elements.

For example, to better understand the impact of the tactical and technological changes on the efficiency and effectiveness of bombing operations, we analyzed the number of attacks and bombs required to damage or destroy a given target for operations in Kosovo and Afghanistan. A number of DOD officials told us that advances in the accuracy of bombing operations have raised the expectation that fewer attacks and bombs are now required to damage or destroy targets. Instead of traditional operations—where multiple sorties and multiple bombs were required to destroy one target—some officials now believe one bomb per target and multiple targets on one sortie should be the norm. The results of our analyses tended to support the idea that it took fewer attacks to damage or destroy targets in Afghanistan than in Kosovo. However, we could not gain agreement from the services on the results of these analyses because each had its own system for measuring operations, and the measures also differed from the ones used in our analysis.

Different Approaches Used to Measure the Number of attacks Required

The question of how many attacks are required to damage or destroy a target is basic to understanding battlefield effectiveness; however, we found no consistency among the services and the unified commands as to which of several basic measures should be used. Some group information about attacks based on “sorties”—defined as the takeoff and landing of one aircraft, during which one or more aim points¹⁶ may be attacked. Others do not attempt to group information based on sorties, making comparisons of information between databases difficult and confusing. For example, because the Central Command was in charge of operations in Afghanistan, we used its database to analyze bombing operations during Operation Enduring Freedom and compare those with the results of our classified review of Kosovo bombing operations. The Central Command’s database provides information about aircraft attacks and damages to aim points, since it is focused primarily on assessing battle damages. However, it does not provide the information needed to analyze by sortie, since it does not identify activities that took place between a given takeoff and landing. To compare the Central Command’s data with our data on Kosovo, we grouped the information on the basis of attacks. An attack was defined as each time that a single aircraft dropped one or more weapons on any single aim point. Based on this definition, our analysis found that it took fewer attacks to damage or destroy both fixed and mobile targets during operations in Afghanistan than during operations in Kosovo.

Similar comparisons could not be made with the Air Force’s and Navy’s databases on Operation Enduring Freedom because their data are not maintained based on this definition of an attack. Both services list data by aircraft sortie. More specifically, each record in the Air Force’s database corresponds to one delivery of a specific weapon type against an aim point, with each weapon delivery linked to a particular sortie and mission in the air tasking order. For the Navy’s analysis, which describes the percentage of sorties that dropped weapons, each sortie can have one or multiple attacks, defined as one run at a given target. Because both the Air Force’s and the Navy’s analyses are primarily assessments of weapons and not intended to measure battle damage information, the main focus is assessing data for and based on specific weapon drops. As a result, they contain no analysis that links the relationship between the number of sorties flown and the corresponding damage. A second basic element of effectiveness is whether or not bombing actions resulted in the desired effects. The services and the Central Command also differed in their approaches to measuring this element, further complicating analysis. The Central Command’s database

provides information on effects based on battle damage assessments, since measuring battle damage is the primary responsibility of the unified commands. However, the service databases are geared toward measuring the performance of specific systems.

The Air Force, for example, primarily focused its analysis of operations in Afghanistan on a munitions effectiveness assessment. This analysis measures the actual success of individual weapons against predicted results and does not address battle damage assessments. The analysis measures whether the bomb landed outside an area around the target within which the bomb was predicted to hit, known as the circular error probable. Air Force officials stated that it is possible for a weapon to be scored a miss for Air Force munitions effectiveness assessment purposes, but still cause significant damage to a target. According to the Air Force's analysis, the vast majority of munitions employed in Operation Enduring Freedom performed significantly better than expected. This could mean that the Air Force can adjust its planning and modeling assumptions to lower the number of sorties expected to be required to destroy a target.

Similar to the Air Force's analysis, the Navy measured effects based on weapon hit rates. However, the Navy's analysis assessed what fraction of Navy bombs that were dropped impacted the intended target and had a high order detonation, determined primarily by reviewing weapons system videos. According to officials, if a weapon hit the target and had a high order detonation, it was counted as a successful hit for analysis purposes. The Navy's analysis did not measure whether a weapon fell within the planned circular error probable, nor did it measure battle damages.

The services and the U.S. Central Command also differ in their treatment of the basic question of how to define a target as fixed or mobile. This distinction is important to considerations of effectiveness because it is much harder to hit mobile than fixed targets. Moreover, mobile targets may be becoming more numerous as adversaries attempt to use mobility to avoid the effectiveness of precision weapons. Inconsistent definitions of fixed and mobile targets result in different classifications of like targets and disagreement among officials when attempting to measure the relative effectiveness of bombing attacks against mobile and fixed targets.

The Navy's analysis, for example, classifies mobile targets as "mobile" and "moving." According to the analysis, mobile targets are those that can move between the time of launch and the time of impact, such as vehicles and aircraft. Moving targets are those that are actually moving when they are hit. Classification results are determined by a direct review of weapon system video or documentation in mission reports. Unlike the analysis, the Central Command's database classifies all targets capable of moving as mobile whether they are moving at the time of attack or not. The classification of moving is not used because such information is more detailed than is needed for battle damage assessment purposes.

In contrast, the Air Force's database does not classify targets as fixed or mobile. The database provides a description of the desired aim point, such as the center of a runway or troops, but leaves it up to the user to define which are mobile and which are fixed. There is a field for moving targets in the database, but according to Air Force officials, very few records have an entry in this field. Targets are only classified as moving when there is available weapon system video to confirm that the target was moving at the time the weapon was dropped. As a result of these differences, an attack on a truck that is moving at the time of an attack would be classified as mobile by the Central Command, as moving by Navy officials, and as either mobile or moving to Air Force officials, depending on the availability of weapon system video.

Fixed targets are also classified differently in some cases. For example, according to Navy officials, there are several types of fixed targets. Troops are classified as a fixed, area target because individual troops are not targeted with aircraft but rather as an area occupied by troops. However, buildings are classified as fixed, point targets where there is a specific place to hit. In contrast, the Central Command classifies fixed targets only as those that are not able to move, such as buildings.

Differences Can Cause Confusion in Operational Assessments and Financial Decisions

The absence of a baseline system to bridge definitional and other differences and provide clear, consistent information about actual bombing effectiveness creates confusion in several areas. For example, this confusion was graphically illustrated when we provided the results of our analyses to the services. The results tended to support the idea that it took fewer attacks to damage or destroy targets in Afghanistan than

in Kosovo. However, we could not gain agreement from the services on the results because our analyses were based on Central Command data that differed from that in their own systems, as previously discussed. Similar confusion occurred over the results of our March 2002 classified analysis of bombing operations in Kosovo. DOD did not concur with our use of the Air Force's Mission Analysis Tracking and Tabulation System database to analyze bombing operations, stating that no single database is completely accurate and contains all information needed for the analysis. However, that database was the most comprehensive available, developed specifically as a primary database for tracking airframe and weapon effectiveness during Operation Allied Force, and was used by DOD as the basis for its January 2000 report to Congress on operations in Kosovo. DOD cannot clearly resolve such confusion until baseline definitions of effectiveness measures are reconciled and a unified database developed. Further, reliable, consistent data on such issues is needed to make procurement decisions on the number of bombs and other resources DOD will need to procure for future conflicts. In this regard, we recently reported¹⁷ that differences in battle simulation models and scenarios used by the services and the unified commands were resulting in different estimates of munitions needed for operations, and, ultimately, in reports of munitions shortages. Clear, consistent, and up-to-date measures of the effectiveness of precision weapons—such as the actual number of aircraft and bombs required to achieve targeting objectives—could help resolve such differences and improve procurement and other planning decisions. In addition, as discussed earlier, precision weapons can be considerably more expensive than traditional munitions. Without clear data on bombing effectiveness, DOD cannot analyze the return on investment from the trade-off of fewer, but more expensive, precision weapons versus the use of more, but less expensive, traditional munitions.

The US and its allies simply do not yet have a fully effective and reliable set of sensors, processors, and methods to support netcentric warfare with reliable battle damage assessment or to provide such data quickly enough to support near-real-time allocation of force assets for either tactical or targeting purposes.

This does not mean that the U.S. and Coalition forces, and the US intelligence community, did not make improvements in target characterization and in at least some aspects of battle damage assessment during the war. It does mean that there is no public evidence that they did so, or that they solved past problems. More generally, it is a reason for analysts to show caution in talking about advances in netcentric warfare and IS&R technology, processing, integration, and near-real-time information flow and targeting as if the key problems have been solved or there is a firm empirical base for making clear trade-offs or program decisions.

It is also valuable to remember the past. For most of the nineteenth century, well-equipped Western armies achieved quick and decisive victories—often at great odds—against ineffective opponents. These same armies, however, were generally unable to predict their capability to fight each other, or the actual warfighting impact of the tactics and weapons that were felt to be “transformational” at the time. These problems became brutally apparent in the American Civil War and World War I. Furthermore, Britain found in South Africa and the Sudan, the French found in Vietnam, and the United States learned at the Little Big Horn that “transformation” cannot always compensate for numbers and overconfidence.

Bandwidth

The US has found in every recent war that it did not have the communications density and capacity to carry out all of the existing aspects of netcentric warfare and intelligence activity, much less the additional tasks that have already been discussed. Secretary Rumsfeld and General Tommy Franks also raised the need for more capacity or “bandwidth” in their initial reports to the Congress on the lessons of the war.²¹

The almost certainly is a valid need for additional bandwidth. However, there are also serious dangers in assuming that this is a lesson that always ends in increasing the density and complexity of C4I/IS&R operations, and the level of communications and processing density. "Bandwidth creep" threatens to become more and more demanding and expensive. It also tends to push information to virtually all potential users and to centralize decision making and review in the process. It is far from clear that today's problems are truly bandwidth problems as distinguished from a failure to create efficient systems that limit the need for bandwidth, and equally unclear that careful review has been made of where the flow of information should stop, of how much information can really be used, and of the need to delegate and limit information flow.

Put simply, it is as important to limit bandwidth use for intelligence and other C4I/BM/IS&R users as it is to increase it for all users. System efficiency is at least as important as systems growth. Avoiding information overload is as critical as jointness, and so is designing systems to effectively delegate and distribute both information and responsibility. Avoiding overdependence on over complex and overvulnerable systems is equally important, as is avoiding overcentralization of review and command.

The Need for Better Tactical Intelligence Support

The Iraq War has shown that better tactical intelligence support is needed from the beginning of combat operations to the end of security and nation building operations. It is particularly important that the US provide better tactical human intelligence support, combined with the proper area expertise and linguistic skills. Technology can be a powerful tool, but it is an aid – not a substitute – for the human skills and talents necessary to support low intensity combat, expand the role of tactical human intelligence, and do so in the context of supporting aid efforts and civil military relations, as well as combat operations. At the same time, civilian intelligence agency efforts need to be recast to support nation building and security operations.

Iraq and Afghanistan have also shown that tactical military intelligence must operate as part of a team effort with those involved in counterinsurgency operations, the political and economic phases of nation building, and security and military advisory teams.

It is particularly critical that both intelligence and operations directly integrate combat activity with civil-military relations efforts, US military police and security efforts, the use of economic aid in direct support of low intensity combat and security operations, the training of local security forces and their integration into the HUMINT effort, and the creation of effective information campaigns. In the future, this may require a far better integration of military and civil efforts in both intelligence and operations than has occurred in either Iraq or Afghanistan.

The Marine Corps assessment of lessons learned notes several other tactical intelligence problems, many of which have been echoed in less formal reporting by sources in the U.S. Army and U.S. Air Force. Most are all too familiar lessons of past conflicts:²²

- *Lack of Organic Aerial Collection at Division and Regiment:* After crossing the Line of departure, the Division received very little actionable intelligence from external intelligence organizations. The Division had to assemble a coherent picture from what it could collect with organic and DS assets alone. The nature of the battlefield, the extreme distances, high operational tempo and lack of a coherent response from a conventional enemy all made it difficult for an external agency to know what was tactically relevant and required by the GCE commander. The Byzantine collections process inhibited our ability to get timely responses to combat requirements with the exception of assets organic to or DS to the Division. This made the Division almost exclusively reliant on organic or DS collection assets. The Division found the enemy by running into them, much as forces have done since the beginning of warfare. The Pioneer worked great when the bureaucracy between the VMU and the Division G-2 could be negotiated, but the lack of a habitual relationship and adequate rehearsal time limited our ability to do so. A superb example of a successful UAV system was the Dragoneye, which was fielded to selected Battalions and allowed to collect against the commander's priorities, locations, and schedule without interference from higher headquarters. On a fluid high tempo battlefield, a highly centralized collections bureaucracy is too slow and cumbersome to be tactically relevant. The best possible employment option is to push more assets in DS to the lowest tactical level and increase available organic collections ...Procure scalable family of tactical intelligence collection platforms, both ground and air, and make them organic to the Division and Regimental intelligence shops. Empower the lower echelons and decentralize the collection process.
- *Lack of Tactical Intelligence Collection at Division and Regiment:* Generally, the state of the Marine Corps' tactical intelligence collection capability is well behind the state of the art. Maneuver units have limited ability to see over the next hill, around the next corner, or inside the next building. Supporting intelligence collectors (VMU, P-3AIP, ATARS, Theater, and National level assets) were great for developing deep targets, subject to the prioritization of higher

headquarters (Division and higher.) Navigating the labyrinth of collection tasking processes proved too difficult in most cases to get reporting on Division targets, and certainly for Battalion-level collections. For the amount of money spent on an ATARS POD, could be handsomely equipped with a suite of motion sensors, digital imaging equipment with zoom lenses, laser range finders, small UAVs, thermal imagers, robotic sensors, and other tactically focused intelligence collectors.

The Marine Corps has a tremendous void in its intelligence collection capabilities at the echelon that needs it the most....Procure scalable family of tactical intelligence collection platforms, both ground and air, and make them organic to the Division and Regimental intelligence shops. Integrate them into an intelligence collections toolkit and make it the TO weapon for a Battalion S-2. Follow the model of the Radio Battalion Modifications program as an acquisition strategy. This program maintains modern equipment at tactical units by buying non-developmental systems and fielding them.

- *Information Inundation vice "Smart Push":* Intelligence sections at all levels were inundated with information and data that had little bearing on their mission or Intelligence requirements. Information was not disseminated based on a proactive evaluation of what support commanders needed, it was just disseminated. There seemed to be little thought to tailoring information to specific MSCs or develop products that directly anticipated an MSC requirement. The concept of "smart push" (providing only the information, data, and intelligence that could support a given mission) was not used. It seemed that all data, information, and products were being pushed through overburdened communications paths with little thought to who needed what and when they needed it. The burden of sifting through tremendous amounts of raw data fell to each MSC's already overburdened intelligence section. Often, the MSC was forced to retrieve relevant collections reports directly from producing agencies or review the IOC journal to find relevant collections. Intelligence support to subordinate elements must be tailored to their current and anticipated future requirements. Too much time and bandwidth is wasted by employing the "information inundation" method....This applies to every echelon of command. Intelligence personnel at all levels, especially those in leadership positions, must be in tune with subordinate intelligence requirements, and guide a proactive effort to anticipate these requirements. Supporting intelligence agencies must proactively SEEK to know what their supported units require and seek to fill those requirements. This is a mindset and leadership issue, not a technical one.
- *Battle Tracking and Common Tactical Picture Management:* The 1st Marine Division G2 created its own Common Tactical Picture [CTP]by producing periodic overlays with the assessed enemy situation....There were a number of technical and management issues with the CTP. Perhaps more significantly, the enemy did not conform to our expectation of a conventional line and block organization for combat. Since there was little confidence in the automated CTP databases based on exercise experience, the Division created its own methodology of disseminating C2PC overlays every 2-3 hours with the current assessed enemy picture. The Division deliberately chose a periodic quality-controlled product over real-time erroneous information. This process also was flexible enough to handle the nonstandard nature of the enemy. The CTP architecture management responsibility has been largely abdicated to contractors. Although they are a talented and dedicated bunch, the fact that this process has to be contracted out is indicative of the fact that it is not usable by operational commanders in its current configuration. Track management seems to work well to track enemy airplanes or submarines, but is not flexible enough to reflect ground organization for combat at tactically usable levels. Trying to use the CTP "hammer" on a problem that is not a "nail" creates training and credibility issues at lower echelons. There seems to be little functionality for the COP/Common tactical picture as currently managed....Need the ability to customize for different enemy models or to create symbols to track incidents and events
- *Cumbersome Collections Bureaucracy:* OIF [Operation Iraqi Freedom] presented the intelligence community with unprecedented robust collection architecture to support combat operations. Unfortunately it also presented the community and more specifically the tactical user with the equally unprecedented cumbersome collection bureaucracy. The existing hierarchical collections architecture, particularly for imagery requirements, is wildly impractical and does not lend itself to providing timely support to combat operations. Requesting imagery coverage required the use of a

user-unfriendly PRISM system that was not readily accessible and provided the submitter of requests no feedback or other means of determining if his requirements were going to be met. There was no visible correlation between the submission of collections requests and actual collections conducted, nor does the current architecture provide any practical way to receive the results of user-requested collections from national or theater collection assets without conducting extensive and time-consuming database searches. The unwieldy nature of the automated system was further complicated by the need to work through multiple command layers in order to get tasking to a collection asset. All of this made for a collection management system that was too slow and cumbersome to provide meaningful support to the warfighter, particularly once operations had begun. This is not a technical issue, it is a human issue. The Byzantine labyrinth concocted to filter out collections requirements posed administrative hurdles too high for tactical users to leap. With few exceptions, such as the national support provided by NIMA, no meaningful or actionable imagery support to the GCE was provided by any collection asset not either attached to the Division or organic to it. [Need to] streamline collection request architecture. Modify existing PRISM system to provide automatic feedback to imagery collection requests and automatically route results of collections to requestors. Push more collection assets in direct support to maneuver units and field more and better tactical collections systems. Provide advocacy for MSC requirements at MEF and higher levels.

- *Problems with HUMINT:* OIF presented the intelligence community with an extremely robust collection architecture. There was near comprehensive IMINT, MASINT, and SIGINT coverage of the battle space, but there was very little HUMINT [human intelligence] available to provide insight into the human dimension of the battlefield. Advances in technology and the mature collection environment in the theater made for a great profusion of intelligence on the enemy. We had an unprecedented level of resolution on the disposition of enemy equipment and near instant warning of activation of electronic systems or artillery fires. In many cases we maintained virtual surveillance of selected enemy forces. But, in spite of these capabilities we remained largely ignorant of the intentions of enemy commanders. While we were able to point with some certainty where their armor and artillery were deployed, we were largely in the dark as to what they meant to do with it. This shortcoming was especially critical as much of the war plan was either based on or keyed to specific enemy responses. When the enemy “failed” to act in accordance with common military practice, we were caught flat-footed because we failed to accurately anticipate the unconventional response. This was primarily due to a dearth of HUMINT on the enemy leadership. In trying to map out the opposition’s reactions we were largely relegated to OSINT sources and rank speculation based on our own perceptions of the battlefield to make our assessments. There was no available intelligence on the opposition commanders’ personalities, educations, decisionmaking styles, or previous experiences. Lacking this information we were left with guessing what we would do in their place. This met with predictable results. In an effort to bridge the gap we did create an understudy program. Each Corps and Division Commander was assigned to a Marine Officer. The understudy then attempted to learn as much as possible about “his” commander, i.e., his training, history, decisionmaking tendencies, etc. This met with some success, but was limited to the amount of Intelligence and Open source information available.

Our technical dominance has made us overly reliant on technical and quantifiable intelligence collections means. There is institutional failure to account for the most critical dimension of the battlefield, the human one. As we saw demonstrated in OIF, the human aspect of the battle can be more important than the material one. Success on future battlefields requires that commensurate efforts be made to know the commander’s mind as well as the disposition of his forces....[We need to] focus national collection and analysis efforts on the idiosyncrasies of enemy leadership and work to build a national database that goes beyond basic biographical data to in-depth assessments on how potential enemy commanders think and behave. Information about Foreign Military Training curriculums and how this may influence their decisionmaking should be included.

- *HUMINT Representation on Division and Regimental Staffs:* The 1st Marine Division G2 did not have sufficient HUMINT Representation at the Division Staff level and there was no HUMINT representation at the Regimental staff level. The HUMINT reps provided did yeoman’s work

trying to keep up with the tremendous demand, but were stretched thin. The HUMINT capabilities provided to the Division were incredibly valuable and highly effective. There is a definite need to have HUMINT representation down to RCT level. The planning, support, analysis, and employment of assets are dependent on knowledgeable representatives advising the commanders and staff. HUMINT assets were frequently improperly employed, inadequately tasked and supported at the Tactical level. There was insufficient HUMINT expertise at the staff level to do the planning in support of the unit's mission. There is also a lack of personnel to do analysis, it was not being done and pushed down from higher, and there was no one to do it at the unit level. Having a staff HUMINT officer at the Division level for planning and preparation phases of the operation would also be of great assistance. There needs to be staff representation at all levels for HUMINT. There needs to be a limited analysis capability down at the Regimental Level. Provide an Analysis and control cell down to the Division and Regimental Level, proportionate to the requirement. Ensure the expertise exists in the team to provide planning support to the commander and Analysis support for the supported S-2.

The Need for Improvisation and Tailoring Systems to a Given Conflict

Another Marine report on the IS&R lessons of the war shows the degree to which each service had to improvise key elements of an IS&R system that was tailored to the specific needs of the Iraq War. At the same time, it provides a picture of a far more joint and effective tactical IS&R effort than the United States had ever previously been able to employ in combat:²³

I MEF deployed an initial command element to Kuwait in October 2002 to prepare for the MEF main body to arrive and commence combat operations against Iraq. This culminated nine months of planning and preparation. It also marked a critical milestone in the progress of the Marine Corps Intelligence Plan adopted in 1994. The MEF ISR team eventually totaled nearly 3,000 Marines, Soldiers, Sailors, Airmen, and civilians.

...The pre-war IPB support was exhaustive. The MEF ISR team, coupled with MCIA direct support, as well as leveraged support from JICCENT and the national intelligence community, generated an unprecedented understanding of the battlespace and threat capabilities and intentions.

...I MEF formed a Combat Intelligence Center (CIC) at Camp Commando in Kuwait that served as the intelligence "factory." The CIC formed around the Intelligence Operations Center (IOC) that provided current intelligence and reactive targeting support to the maneuver units. The MEF developed an all-source fusion center that included 1st Intelligence Btn analysts, Radio Battalion's OCAC, the 1st United Kingdom Armored Division's 245th Signals Battalion, an NSA cryptologic support element, a CIA Contingency Operations Liaison Team (COLT), and a NIMA quick response system for imagery and mapping support.

...I MEF G2 knew that the tyranny of time and distance would preclude precise tactical intelligence flow from the MEF to the maneuver formations. Thus, the MEF constructed the ISR team to enable economy of force operations to hold enemy formations at bay on the flanks, shape the Republican Guard Divisions in the deep fight, while facilitating the success of the RCT S2 and Fire Support Coordinator in the close fight. The plan called for providing the RCT's with the ability to directly receive most of the signals from the theater and tactical sensors. By cutting out the middle men (MEF and the GCE's) the intelligence got to [the] using unit much faster and in time to have a chance to shape the local action. The concept of centralizing ISR planning and control while decentralizing execution control worked quite well. Communications limitations kept the maneuver battalions from fully participating in this bold concept. Extending that intelligence umbrella to the battalion commander is the next hurdle in the intelligence plan.

Decentralizing the ISR elements and sensor feeds enabled the RCT's to act as semiautonomous intelligence teams. Each RCT had a Trojan Spirit II to give it mobile SCI communications. The attached SIGINT Support Teams took full advantage of this by using these terminals to pass their collected intercepts. An imbedded Radio Reconnaissance Sub-Team accompanied most Force

Reconnaissance Teams that were inserted into the deep battlespace. They provided threat warning to the recon teams and extended the MEF's ground-based SIGINT collection baseline into the unreachable deep nooks and crannies of the MEF's battlespace. The HUMINT Exploitation Teams (HET's), located with each maneuver battalion, provided a treasure trove of real-time intelligence, even providing tips that enabled immediate cross-boundary fire support coordination with U.S. V Corps on the MEF's left flank. Moreover, the HET's developed the intelligence that led to the dramatic rescue of U.S. Army POW's in An Nasiryah and Samarra.

Imagery was used extensively to help shape the deep battle and decisively influence the close battle. The MEF's Intelligence Operations Center had a large imagery receive and exploitation capability. The IOC tasked, received, processed, and exploited imagery from national satellites, U2, F-14 Tarps, GR-4, ATARS, as well as full motion video from UAV's. The IOC produced literally hundreds of precision mensurated targets so that Third MAW aircrews could destroy large Iraqi formations with precision armament well before the GCE's could close on the enemy.

PIONEERS (UAVs) from VMU-1 and VMU-2 were among the stars of this event. These squadrons were placed in direct support of 1st Marine Division and Task Force Tarawa. They provided full motion video through direct downlink to the RCT's, helping pinpoint targets in both the close and deep fight. Their real-time support enabled MEF Fires while relieving the GCE's of this burden and thereby energizing the entire MEF Fires Process.

1st Force Reconnaissance Company deployed numerous ground mobile recon teams along the flanks and in the depths of the MEF's battlespace. These economy of force operations proved invaluable in freeing up larger maneuver formations or sections of F/A-18s that would otherwise have been absorbed in this critical flank security task. An interesting side note is that none of the MEF's ground reconnaissance elements used parachute operations as a means of insertion. All teams were inserted by either 3rd MAW CH-53E's or by their own HMMWV's or fast attack vehicles.

...The Marine Corps Intelligence Plan paved the way to... notable successes....However, Operation Iraqi Freedom revealed areas for continued growth to include:

- a Marine Corps family of UAV's that cover the close fight through the deep fight;
- placement of the UAV squadrons in the MEF Command Element to ensure responsive command and control;
- complete review of the ATARS program to assure its relevancy in any future rapid, mobile warfare environment;
- continued aggressive decentralization of ISR to the maneuver battalion to enable semiautonomous ISR operations and facilitation of the targeting process; and
- complete overhaul of the Marine Corps language program. It was inadequate to the tasks demanded of it. Marine Corps ISR has made incredible advances in the last twelve years. The last four years have seen an especially accelerated pace of change. I MEF took full advantage of this increased capability. It paid off with pinpoint, relevant, and focused intelligence, not only at the point of attack, but also throughout the expansive MEF battlespace.

It is clear from this description—as well as from similar reports from the other U.S. services and from discussions with British and Australian officers—that the Iraq War shows the need for significant advances in creating a standardized IS&R architecture—one that operates on a joint level for all the U.S. services, has suitable interoperability with key allies, and expands “jointness” to cover the entire U.S. intelligence community, including the CIA, NRO, NSA, and NIMA. At the same time, it is equally clear that any such “system of systems” must be extremely flexible and modular, must use technology and software that are mature enough to support high-intensity warfighting without strategic warning, and cannot substitute for dedicated single service systems and

capabilities tailored to the needs of the warfighter at the combat level. As is the case with jointness, this describes a process of careful evolution that will almost certainly take a decade or more to mature.

Intelligence and the Force XXI Battle Command Brigade and Below (FBCB2) System

The intelligence community must also respond to major ongoing advances in the digital battlefield. U.S. forces in the Iraq War made good use of position-location-guidance radios, or "pluggers." These were given to platoon leaders and were paired with Force XXI Battle Command Brigade and Below, or FBCB2, software to provide the coordinates of forces down to the platoon level to the joint Global Command and Control System (GCCS) via satellites or radio frequencies. The GCCS could then retransmit the identification and location data to computers inside a company commander's vehicle.²⁴

In previous wars, military operations had to be conducted by relying on commanders using radios to repeatedly call in their positions (and on the timeliness and accuracy of such methods). The new Blue Force Tracking, or BFT, system used in the Iraq War provided that information in real time, and the software displayed it in the form of blue icons moving across a commander's screen to identify friendly forces. Commanders could also "click" on these blue icons to communicate with an unknown blue force even if it belonged to a Marine Corps or a British company.²⁵ This not only reduced friendly fire; it greatly improved situational awareness and the capability to carry out netcentric warfare.

The army describes the role of the system during the fighting as follows:

Coalition situational awareness of US and UK ground maneuver forces was accomplished using the Force XXI Battle Command Brigade and Below (FBCB2) System over a commercial satellite-based communications network. The FBCB2 capability was installed onto selective US and UK command and control (C2) vehicles, logistical support vehicles, and rotary-winged aircraft based on a "thin fielding" concept. The fielding concept employed the FBCB2 capability down to the unit company commander level, or as required by the unit mission. The beyond line-of-sight satellite-based communications architecture provided on-the-move combat operations over extended ranges and during adverse weather conditions, e.g., sandstorms. In addition to real-time situational awareness the FBCB2 capability provided reliable e-mail messaging and battlefield maneuver graphics overlays on digitized maps.

The FBCB2 capability integrated coalition "blue force ground tracks" with the Joint Common Operational Picture (COP). Technically, FBCB2 equipped platforms automatically updated their Global Positioning System (GPS) locations onto Blue Force Tracking (BFT) primary and alternate database servers. The BFT situational awareness display was integrated into the Joint COP using the Global Command & Control System (GCCS). The GCCS further disseminated and digitally displayed the Joint COP. The Joint COP displays an integrated air, ground, and sea friendly forces against positively identified and suspected enemy force positions. The Joint COP enabled real-time battle command and control at all levels of command, e.g., Division, Corps, and Theater.

The US Army Central Command's (ARCENT) Coalition Joint Force Land Component Command (CJFLCC) Center was completely modernized with state-of-art digital large screen video and graphic displays. The digitalization of the CJFLCC enabled the battlefield visualization of the Joint COP including the BFT situational awareness.

One problem in using the system to its full effectiveness was that the 4th Infantry Division was the only U.S. Army unit fully equipped and trained to use the system before

the war. This unit was originally supposed to be deployed through Turkey and had to be rerouted through the Gulf. As a result, it did not arrive in Iraq until the war was effectively over.

The command center at Doha was equipped with suitable displays, however, and 10-inch mobile terminals and antenna were rushed into the field for the units that deployed to Kuwait. It is unclear how many systems went into the field, how they performed, and the extent to which they were used by both land and helicopter forces. One report states that 50 systems were delivered to the UK, that the U.S. Army had some 8,000 systems on hand, and that the U.S. Marine Corp bought some systems. Details are lacking, however, and only the 4th Infantry Division seems to have had a key feature in the form of the tactical internet, a mix of elements including the Single-Channel Ground and Airborne Radio System and Enhanced Position Location System with line-of-sight radio transceivers. The others used satellite communications.²⁶

Also unclear is the degree of netting the FBCB2 system will have with air units in the future.²⁷ The Army does have a developmental airborne command and control system (A2C2S), but the links to Air Force, Navy, and Marine Corps C4I, battle management, and air control and warning systems are unclear.²⁸ The USAF has, however, opened a competition for a Battle Management Command (BMC2) system that will perform some of the necessary functions. It will include a network to relay targeting data to manned and unmanned systems, space assets, and ground based systems using common standards and an open architecture. As a result of the lessons of the Iraq War, it will also incorporate a joint system that tracks US and allied personnel, building on the Blue Force Tracking system described in the following section.²⁹

Blue Force Trackers

The United States has already taken steps to expand the use of the Blue Force Tracker and other systems that can both improve U.S. capabilities for netcentric warfare, integrate intelligence and operational data and reduce the risk of friendly fire. The Army was not the only service to find this system extremely useful. The Marine Corps report on the 1st Marine Division's lessons of the war found the Army system so effective that it recommended that it replace the Marine Corps system and be used not only for tactical purposes, but also to improve logistics and vehicle tracking and to correct the Marine Corps personnel system's inability to locate personnel accurately once they deployed to the theater:³⁰

During Operation Iraqi Freedom the 1st Marine Division used two distinct systems for Position Location Information (PLI). The MDACT program being fielded by MARCORSYSCOM was advanced to distribute over 319 MDACTs throughout the 1st Marine Division. The MDACT requires the line-of-sight transmission path provided by EPLRS radios and in order to function properly a significant amount of communications engineering is required to support radio channel spacing and IP addressing requirements. The MDACT/EPLRS system requires extensive operator and network engineer training to function properly. The BFT is a U.S. Army program that was advanced by CFLCC, V Corps, and I MEF to field 104 BFTs to the 1st Marine Division in order for CFLCC/V Corps to maintain PLI for Marine Units since the MDACT and BFT are not compatible systems. The BFT uses a commercial L Band Satellite communication system that is managed by the U.S. Army for the user and is basically an install and operate system but extensive behind the scenes coordination was required by the Army to make the BFT addressing and functioning transparent to the Marines of the 1st Marine Division. Operator training for the BFT is simplistic and the system is very operator friendly. Additionally the BFT provides a larger

throughput capability for free text or formatted messages to any BFT throughout the world via satellite connection and the 1st Marine Division Marines found this capability very useful to maintain PLI and data text messaging “on the move” from the Division to RCT to Battalion Command Posts. For the 1st Marine Division, BFT was the overwhelming system of choice.

Recommendation: That MCSC disestablish the MDACT program and establish a joint BFT program with the US Army that could support worldwide PLI for the Marine Corps from the MEU to the MEF. The new joint BFT program office needs to also establish a dismounted version of the BFT for Infantry use (a similar concept to the Dismounted Data Automated Communication Terminal

The British Ministry of Defense report on the lessons of the war reached similar conclusions:³¹

The ability confidently and quickly to distinguish between friendly and enemy troops is a vital but complex part of modern warfare, not least when operating in a coalition. Combat ID cannot be delivered by a single system or piece of equipment; it involves a combination of techniques, training and procedures (often operation-specific) reinforced by equipment.

The UK worked closely with the US to ensure that effective arrangements were in place, although the US did not decide which combat ID equipments they would operate until the end of 2002. A range of new equipment was procured to ensure that our capability was compatible, which primarily focused on equipment to allow recognition of forces from both ground and air and to enhance the situational awareness of UK forces.

The latter included some use of the US Blue Force Tracking system, which provides near real time tracking of assets deployed at unit level. By the start of operations, MOD had deployed 1861 vehicle-mounted and 5000 dismounted Combat ID sets. This was sufficient to meet the full requirement, although the scale of the equipment modifications required in theatre meant that some formations were still being fitted as the first units crossed the line of departure. In the air and at sea, extra “Identification Friend or Foe” (IFF) systems were procured to supplement those routinely fitted to all RAF aircraft and RN warships. This system is also used by the US. IFF systems are tested prior to each take-off and monitored during flight.

While no country has yet been able to field such a capability for land troops, the UK is actively involved in developing Battlefield Target Identification for ground-to-ground recognition in the future. Bowman will also improve situational awareness and, in turn, Combat ID.

While our aim is to provide UK forces with as effective a Combat ID system as possible, regrettably no system is 100% failsafe, no matter how sophisticated the technology. Sadly, a number of UK and US Service personnel were killed in so-called “friendly fire” incidents. These are still under investigation, but experience in this and previous campaigns indicate that we cannot relax our efforts or underestimate the importance of training, tactics and procedures in this vital area.

The US intends to act upon these lessons. The Army will lead the U.S. military services in an effort to create a strategy that will give every U.S. armored vehicle and aircraft a joint blue-force device to track other “friendlies” and give commanders the ability to instantly “message” any blue force that emerges as an icon on their displays or radar screens. This effort is to include the development of faster and more sophisticated systems to improve “situational awareness” and reduce friendly fire incidents.³²

According to press reports, on May 12, 2003, the Joint Requirements Oversight Council (JROC) approved the creation of an Army-led integrated product team (IPT) that will report to U.S. Joint Forces Command (JFCOM). It will review currently fielded systems to track forces, find capability gaps, assess new technologies, and develop a joint BFT architecture and funding strategy to be implemented during FY2006-FY2011.

The U.S. Strategic Command has previously taken the lead in creating systems for "joint blue-force situational awareness," by transferring conceptual development activity to JFCOM, which is now tasked with developing a concept to outline joint priorities and help the Army build a system architecture. The Senate Armed Services Committee has also called for a new acquisition strategy to develop a single interoperable blue-force tracking system to reduce the number of fratricide incidents, but the committee has questioned whether the level of involvement by other services and special operations forces matches the level of Army activity. Recent US Air Force plans to create improved jointness in the Air Force C² system indicate that it will, but this will be part of a broad effort that will not be fully operation before 2013.³³

The Full Force XXI Battle Command Brigade and Below System

This system has great growth potential, both in dealing with issues like integrating intelligence into netcentric operations at the tactical level and in dealing with issues like "friendly fire." It should be noted, however, that many aspects of the Force XXI Battle Command Brigade and Below system—developments intended to improve situational awareness and solve the friendly fire problem—were not fully available for the war. This system uses a mix of transponders, C4I/battle management systems, and display screens to keep track of both friendly and enemy forces. Its displays are highly sophisticated and can track movements even under complex maneuver conditions. Once available, they will allow the integration and display of "red blue" data at the tactical level in ways that have never previously been possible.

The end result is that the United States is seeking several improved capabilities as the result of the lessons of both the Afghan and Iraq Wars. It is seeking to reduce the time before blue-force positions show up in the satellite-enabled system. Aircraft were typically identified in one minute, whereas tanks were identified in four to five minutes. This reaction time is adequate for static ground forces, but not for vehicles maneuvering at speeds of up to 30–40 miles per hour. These delays, or "latency," need to be reduced to reduce fratricide. The new system will also build on another joint program, this one led by the Air Force, called the Family of Interoperable Operational Pictures (FIOP). This system is intended to integrate real-time land, air, and sea data into a single, Web-based mapping application. The Army team will take the lead in creating a single integrated ground picture, the ground piece of the FIOP, which will include coalition combat ID technologies.

What is far less clear is how the intelligence community is reacting in its efforts to provide the threat or "red" side of the data. The emphasis now seems to be heavily on fixing the bloc side problem, but all elements of intelligence affecting tactical operations need to be integrated into a common architecture to provide suitable threat data.

Intelligence and Effects-Based Operations: Fundamentally Changing the Effectiveness While Limiting Civilian Casualties and Collateral Damage

Despite the problems in U.S. and allied IS&R and targeting capabilities described earlier, improvements in these areas did allow the Coalition to use a new approach to targeting. This approach is called “effects-based” operations. In the Iraq War, this focused on providing the mix of intelligence and operational data necessary to allow the selective use of precision airpower to strike at targets to produce effects rather than simply maximize physical damage.³⁴ Examples of such targeting include knocking out power, communications, and fuel supplies to Iraq military forces, rather than attacking major infrastructure facilities. Others include selectively bombing Iraqi regular army forces to paralyze or reduce their movement rather than destroy them by attrition, and using sensor platforms like the E-8C JSTARS to attack actual military units in movement, rather than blow bridges and attack lines of communication.

Improved IS & R avionics and precision greatly reduced the need for multiple weapons to be used on a given target and for later restrikes. As one senior Air Force general put it, “Even in the Gulf War, the issue was always how many sorties it took to destroy a given target. In this war the issue is how many targets can be destroyed in a given sortie.”

Advances in IS & R precision also allowed the United States to reshape its targeting and choice of munitions to reduce civilian casualties and collateral damage. One irony behind the increased lethality of modern weapons and tactics is that they can be used to defeat the enemy with far fewer secondary costs. Improvements in laser-guided systems and the use of GPS allowed the use of smaller bombs and often allowed 500-pound bombs to be used instead of 2,000-pound bombs.

The United States made use of new targeting aids like the “bugsplat” program.³⁵ This allowed it to choose the munitions and angle of attack that could destroy the target to the point necessary to produce the desired effect, but to do so using the smallest munition and the angle and point of attack that would produce minimal risk to civilians and collateral damage.³⁶

Understanding Effects-Based Bombing

The USAF gave several briefings before the Iraq War that described these concepts in great detail, as well as the concepts behind the use of air power in the war plan.³⁷ One briefing in particular, by Col. Gary L. Crowder, the chief of Strategy, Concepts, and Doctrine of the Air Combat Command, provides a remarkable picture of the history of the changes in the U.S. approach to air power, as well as an explanation of the air portion of the coalition war plan and the need requirements, being placed on IS & R. His briefing included what proved to be a remarkably prescient analysis of the impact of effects-based bombing during the war. The following text may be long, but it provides one of the best possible explanations of the lessons that drove the use of air power in the Iraq war and the lessons that have emerged from it.³⁸

In the first day of Desert Storm, we struck more targets than were struck in all of 1942 and 1943 by 8th Air Force during the combined bomber offensive. And we were able to do that because we took really a radically different approach in terms of how we wanted to prosecute a military

operation....This is the capabilities that we had of advanced precision and stealth—gave the Air Force a little bit of a leg up in trying to move into this area of effects-based operations as we struggled to figure out how to do those types or exploit those capabilities to the greatest extent possible.

Over the course of the last decade, you have probably heard these terms, the term EBO or effects-based bombing, more and more often with each of the military services as each of the services has tried to...develop capabilities to more effectively and efficiently prosecute military operations.

The first piece, obviously, was the combination of stealth and precision. And I'll show you what that implication is for the conduct of air operations.

But the second thing is a different way of thinking about how we do—or what we want to achieve on the battlefield. Instead of a traditional attritional approach in terms of listing a bunch of targets and then go bombing targets, or finding where the enemy is and killing all the enemy, we really determined that what we wanted to do was in fact to achieve some sort of policy objective, and that you could, in fact, craft military operations to better achieve those policy operations in a more efficient and effective manner.

...First of all, it's important to understand the evolution and—or precision technologies since the Second World War. In the Second World War, the CEP of a B-17 was about 3,300 feet. And so if you wanted to destroy and have a high probability of destruction of a point target of about 6,500 feet, you'd need about 1,500 airplanes and about 9,000 bombs. That's a lot of stuff. And that's what drove those military operations and the destructiveness of the military air campaigns against both Germany and Japan.... precision is relative when you look at it today versus 1945.

By Vietnam, we had gotten significantly more accurate in the fact that these—a lot of these aircraft now [that]were doing the operations were fighter bombers, and dropping at a little lower altitude, we were able to be more precise. But still, it took a large number of airplanes to achieve the desired effect.

With the development of the laser-guided bombs, and specifically the laser-guided bombs on aircraft such as the F-111 and the F-117 in Allied—or, in Desert Storm, we were able to hit two independent targets very precisely with about 10-meter CEP or 10-foot CEP from a single aircraft. When we added additional aircraft, such as the B-2, that capability is now to the point where we can hit multiple targets on a single pass.

Circular error probable or CEP is the probability that that weapon will—that 50 percent of the weapons will land inside that line. So, if what I say basically is—if I say the CEP of a B-17 in World War II was 3,300 feet, that means there was a high likelihood that 50 percent of the bombs dropped landed with inside 3,300 feet. Today it's a radius of radius of 10 feet.

And it's important to understand that as we also develop Joint Direct Attack Munitions capability—these are these GPS-guided weapons—they also give us the ability for a large number of other aircraft besides just stealth aircraft to hit multiple weapons per targets. Navy F-18s are equipped with JDAM, as well as all the Air Force bombers. The B-1, for example, can carry 24 Joint Direct Attack Munitions in an internal payload that could be used against 24 separate targets.

...it's really important as well that what the capability of a Joint Direct Attack Munition has given to us, together with the integration of Global Positioning Systems on our aircraft is we are now able to achieve that near precision. And again, we have to understand that there is a difference between the precision of laser-guided weapons that are described here and the Joint Direct Attack Munition. The Joint Direct Attack Munition is not quite as accurate, although it is much accurate, we are finding in employment than we anticipated.

...But the addition of these capabilities gives us the ability to do a large number, an extremely large volume of fires or effects early in an operation in a very, very short period of time. And it really has been the evolution of about the last 20 years that has—from the earliest employment of laser-guided bombs in the Vietnam War, through Allied Force, Desert Storm and Enduring Freedom, that has given us this capability.

...It's also important to understand the role that stealth plays. We have an advantage in this conflict, in that the adversary has basically ceded most of his air—or about two-thirds of the country's air to us early, and so the extremely vicious fights that we had for air superiority—and even though we didn't lose a very large number of airplanes in Desert Storm and in Allied Force, those were sustained fights for air superiority... .

But nevertheless, this is the size of the initial strike packages that went into Basra in January 1991. And if you look at all of the support aircraft that were required for that strike package, you basically had about 41 aircraft with only eight bombers. I mean, we had aircraft to do sweep and escort over the top to protect the air assets from enemy fighters. We had actually used drones to tickle the air defenses and to enable us to more effectively target the enemy surface-to-air missiles. You had a variety of SAM suppression airplanes, F-18s and F-4Gs, and you also had electronic attack planes, the Navy's Prowlers, EA-6Bs. And all of that to get eight bombers to a target. That was the way we had to do operations without stealth aircraft.

...If you look at the difference between the employment of the F-117s on the first night of the Gulf War, we literally had a significantly greater capability because they required a far fewer amount of support assets. Now, we don't throw 117s up by themselves. They like a lot of other people flying around with them and other stuff to get the volume of the radars down for everybody. But nevertheless, it is an almost independent capability, and its stealth qualities enable us to do a large number of things because we don't require all of the support assets necessary that would be used for this.

It's important to understand as well that the evolution of both the Air Force and the Navy and Marine Corps' combat aircraft will enable us to do even the left package or more conventional strike package with a far small number of support aircraft to bombers, just because we have much more dual-use capability in each of the Air Force's, Navy's and Marines' fighter aircraft as well as our bomber aircraft.

... in Desert Storm, the escort package for non-stealth was about 5-to-1...stealth required ...a different approach. And I don't want to go into the specific details, but we used an area approach to support assets...the last thing we want—that F-117 or B-2 pilots want—is a bunch of wingmen out there that everybody can see. But it's important to understand that these were numbers, on the support side, from the first day of the war. As that operation proceeded, the support requirements obviously went down as we were able to erode the enemy air defenses. So again, this is not a—you know, a magic rule of thumb on how much support to conventional and stealth aircraft. But it is to understand that the stealth does give us some capabilities in addition to the precision and enables us to do a lot more stuff very early in a fight.

Now kind of to the meat, though I guess somebody had a lot of ideas here, but the old light bulb chart. The—everybody is kind of familiar with how a series or a parallel circuit works. In a series circuit, you really talk about—I mean, as we put light bulbs on a Christmas tree, you know, one bulb goes out and the whole thing is gone and you have to figure out which bulb was out. ...traditional military operations have taken kind of a serial approach, all the way back to time when it was a fact that you didn't have aircraft, so you had to take a linear approach to the battlefield and to defeat the enemy, you know, in turn.

But even with air assets, in terms of having to roll back enemy air defense, those types of things limited your ability to go after what you really wanted, because the air defense aren't the targets; the targets are the targets, and you have to go after the air defense to enable you to do other things, because once you can gain air dominance, then our surface combat forces have a significant greater—a significantly greater degree of flexibility in different things that they can do early in a fight.

And so, our ability to go after targets, if we had the ability to go after the entire target set from the—go after we wanted to instead of the air defenses, then go after the leadership, for example, early, or to go after industrial targets or whatever they may be, then that would actually provide us a significantly greater degree of leverage.

... in Desert Storm the traditional approach might have been to slowly roll that system back and to go after elements of the system one at a time. If we had a better way to do business, we might be able to go after that whole integrated air defense system. And that's, in fact, what we did in Desert Storm, is we were able to go right to the heart of the air defenses, take out the critical command and control early through creative use of Special Operations forces, Army Apache helicopters. And so we were able to take down the air defense system or to attack the air defense system as a system.

... You have to kind of work it and look at each element of that system and figure out what its vulnerable points are. And if you had the ability to do stealth and precision to give you a higher volume of fire, then you could go and attack this system as a system....

If you had the ability to not only go after that target system that might be air defenses but also simultaneously go after a target that might be military or political leadership, that might be essential industries or transportation, you could actually now attack the enemy as a system and work towards trying to achieve systemic collapse. I really have to contend here that this is—and I've said it several times. What we have enabled ourselves to do through development of more complex and a better understanding in intelligence and analysis of adversary systems is we have an improved ability to go after adversary's systems. And I'll talk to you how we might go about doing this.

In a—I'm going to use an example here of electrical power. ... we used this approach in Kosovo, in the operation—the war in Yugoslavia. Electrical power is an easier system for us all to understand, because we all understand that they're all linked together and they talk to one another, and they are, in fact, an electrical power grid.

So if I had a target set—target system that might be an electrical power grid—... I would list all those targets—if I used a traditional attritional approach, I would list all those targets on my target list. And then I would go through and sequentially destroy each of those electrical power stations or power substations or generating plants, and when I got to the end of my list, I was complete.

But when the Air Force leadership was planning the Gulf War, they realized that it's not my objective to destroy electrical power stations. What is my objective? Well, electrical power is in fact a critical commodity that ties together air defenses, national leadership and a large number of other things, to enable a cohesive defense of a nation. So my real effect was to affect that, the adversary's ability to command and control forces and react, and one way I could affect that was to neutralize electrical power.

But if I neutralized electrical power by going after every station, it would take up all my assets to neutralize that electrical power. But the reality is, electrical power is in many ways a fairly fragile grid. When you look at what happens when we have a snowstorm and a couple of power lines go down and 30(,000) or 40,000 people are without electrical power—and so there you do not have to attack each element of that system to make the system not work.

An effects-based approach might look at that system and say, "If I looked and analyzed the enemy as a system in this particular case, I might only need to have to take out two of those power plants to enable me to go do that."

In such a way, I would prioritize, then, those targets by the manner in which they would enable me to achieve that effect of neutralizing the adversary's electrical power, and I would only have to... strike two targets.

Well, there's a good advantage of that. The first advantage is, one, you created a far less amount of destruction on the ground that you have to go and rebuild. Another advantage of that is that I now only have to attack two targets instead of 12. And so those assets that I was using to attack the other 10 I can now use to attack another system. And so this opportunity shows us ways in—to more effectively tie the specific effects for which we employ force or information on the battle space to military and political objectives.

But what if there's a problem? What if there's a problem and one of the targets is a no-strike target, because there is no way you can go after that power plant and not create unacceptable civilian

casualties? Well, this opportunity—these analytical tools enable us...to find alternative methodologies. Maybe if you have to attack two additional targets, you can still neutralize the grid. The disadvantage, obviously, is you have more targets to strike, but the huge advantage is, you have achieved the same effect without creating significant collateral damage or civilian casualties.

Maybe there's an even easier solution. Maybe you go after power lines instead of power plants. An example is, in Allied Force, there were some—when we attacked the Yugoslavian electrical power system, there were some targets we simply could not take down to achieve the desired effect. As a consequence, the only way we could do that was to go after some of the power poles, or these 250-foot power towers. Difficult targets, and they're very difficult targets because they're designed to not have—weapons are designed with principally a blast effect, with mainly a blast effect. Well, power towers are designed not to be blown down, because that's their principal design characteristic. Nevertheless, we were able to neutralize those towers without civilian—or collateral damage, and neutralize the power system.

So there's a lot of different ways to do this. And oh, by the way, you don't even necessarily have to bomb anything. If you can pay somebody to turn the power grid off, that would be almost as effective...for example, in Desert Storm we frequently found instances where—after the fact, where electrical power plant operators knew they were going to leave their power plant off because if they turned it on, we'd bomb it. I had an instance—I flew in the Gulf War out of Turkey. I had an instance on the third night of the war where I flew a low-altitude mission into Turkey—or into Iraq from the north, and I saw the lights go out in a town all at once. The lights were there, and when approached the town, the lights went off. And so maybe just flying airplanes convinces these guys to turn the power off.

But the point here is, is that we don't have to attack everything, nor do you have to destroy everything. If we understood what the effect we desired on the battlefield, we could then figure out ways of creating that effect more efficiently, more effectively, striking less targets, using less weapons and, quite frankly, mitigating or easing potential concerns for collateral damage and civilian casualties.

That brings us back to how we got to enable us to do parallel warfare. By examining each one of those systems and understanding what the different target systems enabled us to do and what the specific political effect that we—and military objective we desired, we were able to attack a far greater amount of those target systems, creating a greater effect on each individual system, and that, in turn, started to collapse the system from the inside.

Again, I really need to caution that we are not talking about, hey, turning a computer on and finding out the answer to war. But it does provide us methodologies to more efficiently and effectively carry out military operations to achieve fairly clearly defined political and military objectives in ways that mitigates the potential negative side of casualties and collateral damage.

And that actually drives us to one of the principal issues here. The military forces in the Persian Gulf are doing some of the most, quite frankly, sophisticated planning that any military anywhere has ever done. Each of the component commanders and the Central Command planning staff under General Franks, are actually driving us to how in fact we do effects based operations across the military services. A good example of the effects based operations you see going on every day are the leaflet operations. In the '40s or '50s you might have said, Hey, if I—to defeat the enemy I have to defeat the enemy's army. No, I have to neutralize the enemy's army. And if the enemy's army decides to surrender because I used leaflets and convinced them that there was a better alternative than trying to fight me, then that's somebody I don't have to neutralize. And so there's an advantage here, and what we are trying to do with not only air operations but air and ground operations is really focus on what the desired political and military effect are, and then shape those desired effects on the battlespace.

But it only really truly works if you understand how each event that you do, everything that you do, how that ties back to the specific military and policy objectives that have been established for the commanders. And we do this fairly robustly in the Air Force. And I don't mean to belittle

either of the other—any of the other services, but Desert Storm caused us to try to think about this. And so we literally come up with a high heaven objective—what are my tasks that I have to come—build to achieve that objective, what are the effects that I need to create on the battlespace, and then what are the things that I need to do, what targets I need to hit, things I need to jam, information I need to corrupt on the battlespace to achieve those desired effects. So in many ways every single thing I do has to be shown to tie back to a political objective or I'm going to take it off the list of things to do, because we have too many things that we have to do to do things that are either not appropriate or not in line with the political or military guidance.

But the system that we develop in terms of developing both desired effects, examining capabilities and desired concepts of operation to achieve those effects doesn't work in isolation. The thing about war is it's against two humans. It's a human against a human, and the adversary is thinking, and he's trying to do something against you. And so, every concept of operations or idea, or capability that you have, you must then vet that against what the adversary is going to do, or what you anticipate the adversary is going to do. In doing that, you can evaluate the enemy as target systems, or as systems of systems. And that will help you understand how those different things interrelate and where the vulnerabilities between, perhaps, an integrated air defense system and communications systems might lie to enable you to more effectively prosecute those operations.

From an air perspective, this is how this is wrapped up and brought together on an air tasking order. We look at the CONOPS, we look at the desired effects we want to create on the battlespace, we look at the available assets. And quite frankly, we have one ATO in this war. And everybody's on the ATO, everybody's integrated and working off that single air tasking order so there's common command and control architecture for all the air players that are involved. And so, it's a critical element in—we think we learned that lesson a little bit the hard way in Operation Allied Force. But then we evaluate the target sets that we need to do, that—those effects that we need to create on the battlespace, we bring those together into a integrated plan, and the integrated air and ground and maritime plans are, in fact, that. They clearly have separate elements, but these plans have been more integrated than we have ever seen them in the U.S. military history. The—one could say that we fought side by side as services in Desert Storm, which that would be a fairly close description. But we didn't fight in an integrated manner.

The Air Force has sent a major general to work at the combined force land component commander's headquarters to enable a significantly greater degree of interaction between air and surface operations to better integrate these plans. But we build those things together and then you come up with something that looks like an air tasking order or a piece of paper, and you send it out to the troops and they execute. It's not quite that easy, but it's—it is, quite, frankly, I think a significant achievement on all the men and women who are out in the Persian Gulf at this point in terms of bringing all those different effects from each of the capabilities of each of the services together to achieve the best result possible.

There clearly are going to be opportunities to better do this in the future. We have emerging operational concepts. Joint Forces Command has been tasked to develop and further evaluate these. We have emerging capabilities, both in terms of munitions, in terms of aircraft, in terms of information capabilities, that we simply have scratched the surface on. But what in the end we hope to do with concepts such as effects based operations are to fight more effectively, efficiently and to make conflicts shorter because we can attack the adversary more completely as a system in a shorter period of time as opposed to a sequential series of attritional-type operations.

As for the concept of "shock and awe," ... it actually gets right back to some of the discussion on effects operations—effects based operations. You don't win a war by not intimidating an adversary. The—I think General Franks—I don't want to put words in his mouth, but I think the effects that we are trying to create is to make it so apparent and so overwhelming at the very outset of potential military operations that the adversary quickly realizes that there is no real alternative here other than to fight and die or to give up. And so, they really are trying to kind of ensure that everybody in Iraq understands what's coming. Because if they understand what's coming in a macrosense, I think that there will be a greater likelihood that they might choose not to fight for the regime.

... what will happen is the great unknown. And the—we could speculate all we want, and there's a million answers and everybody's probably got an opinion on that. But quite frankly, we really have little clear understanding of exactly what will happen when we step across that line. I think there's going to be a wide variety of different reactions by the Iraqi people and the Iraqi military forces.

...One of the issues I think that routinely comes up is for folks who are not involved in military operations and have not been involved in the extensive planning is to understand the difficult and really comprehensive process we use to mitigate collateral damage...

First, there is—we all have to understand that there is—the term "collateral damage" is often misused. From a military sense, collateral damage means or by definition is that damage that can be expected from the reasonable occurrence from attacking a system or attacking a target. For example, if I looked at a target and I examined—I was going to put a 2,000-pound bomb on it, and windows broke across the street, I can plan for that. And that is collateral damage. It is the anticipated effects created by the employment of force.

In collateral damage calculations, we try to make an assessment of human casualties. And you saw, perhaps, a lot of that take place in Allied Force, where targets were struck and timed specifically to minimize the potential for civilian casualties...It includes both structural damage and civilian casualties.

Now that is different from unintended damage, and it is different both philosophically and from a practical manner. Unintended damage is when something goes wrong. Either a fin breaks on a weapon and the weapon goes off course—and everything we drop is a mechanical device, and as like as we would that these things be perfect, they are in fact not. Mechanical devices that we employ can fail...

We will also have some degree of intelligence failure. We don't have perfect information. The Al Firdos bunker example or the Chinese Embassy are examples, perhaps, of intelligence failure. But it is what happens when something goes wrong. And it's really important to understand these two distinctions. And it's important because we can do a great deal to plan for and mitigate collateral damage. We can do a great deal to mitigate the potential for unintended damage, but there is very little we can do to plan for or substantially eliminate unintended damage because it is, by definition, something went wrong.

Let me talk a little bit about how we do this. Everything—first of all, there's not a target that we would strike that is not specifically struck to achieve a desired effect. And so we look at that target and we say, what do we want to do to that target? I want to neutralize or I want to destroy this bunker. And then I examine what munitions I might use to destroy that bunker... When we do that, we do an analysis not only of the target, the size and the capabilities of the munition designed to create the right effect, but we also do an analysis of the surrounding area to understand what the use of that munition on that target might do to structures outside the facility or to create either collateral or—I mean, civilian casualties or collateral damage.

...If, however, in the course of dropping that bomb, a laser-guided bomb, for example, a fin breaks off the laser-guided bomb and the thing goes spiraling 3,000 feet away from the target, there was really no practical way for me to plan for that. That is not collateral damage; that is unintended damage, and if there are civilians killed, they are unintended civilian casualties. I don't mean to kind of draw a fine legal line between the two, but it's important to understand that as we plan these things, there are a great deal of things we can do to mitigate collateral damage and in fact have potential to mitigate some unintended damage, but these things, again, are mechanical devices and some will fail. And so if somebody has a hope that we're going to go into a conflict and nothing is going to happen in terms of collateral damage, unintended damage or civilian casualties, I think you should absolve yourself of that hope because that probably is not a realistic expectation.

... we like to use the term "fast CD," but the—we do have an improved capability. It is designed principally for kinetic weapons; that is true.

...: We have developed planning tools that are at our air operation centers to enable us to more effectively project the potential explosion of an armament as it hits a particular structure.

...An example: When we were doing operations in Afghanistan, I think that we all need to hire the Afghan workers to build our walls, because we would blow some—a house up inside a wall, and it seemed like—that that wall protected all the structures around it. But the reality was—is when we drew our circle to examine potential collateral damage, we didn't take into consideration that there was another building there, or there was a wall, or that I was hitting one side of the building and the size of the—and the direction of the explosion that takes place on the ground is in fact not a circle. It's more like a butterfly effect.

...And so by using that tool, you can better understand the environment and the immediate neighborhood of where you're dropping that munition, and then you can do an examination of various things that might include changing the size of the weapon; changing when the weapon fuses, to perhaps fuse the weapon underground, to mitigate that explosion even more; or even changing the direction of your attack axis, because if you attack from one way, you might completely mitigate all effects, if things work properly, but if you attack from another, there might be no way.

...So it is one of a series of planning tools that we have incorporated into our air operations centers and out on the carriers as well, to examine different alternatives on—to better employ the right weapon and the right target in the right way.

... effects-based operation and collateral damage are fairly well—closely tied together, because the best way to mitigate collateral damage is only strike the stuff that you need to strike to—or affect the stuff that you need to affect.

..., from a targeteer—Air Force targeteer viewpoint, there are probably 50,000 targets in Iraq, maybe more. But you know, that's only in a development effort. In other words, as we examine a country—and we know Iraq pretty well—we look at every bridge, every power station, every military infrastructure, every air defense site, and we catalogue and develop a requirement of what that potential target might look like and what I might have to do to neutralize that target.

..., Nevertheless, what happens is, as we go through that planning process of defining clearly established political objectives, military objectives, determining the desired effects I want to create and then examine the target sets that I need to attack, I come up out of that 50,000 with some list of targets that I need to examine. Every one of those targets is examined for collateral damage. We first look to ensure that the target is directly tied to an objective. We then ensure that we do—we know enough about the target so that we can create the desired effect. You don't always know enough about the target, but to the degree that we can, we will try to understand what we need to do to that target to effect it. We choose the right weapon to create the desired effect. We then do a clear examination not only of the collateral damage potential, but also of law of armed conflict potential, and those types of issues, the legal implications of striking that target. And then we do everything we can do in the planning factor in adjusting the weaponeering and providing the tasking to air crews to enable us to most effectively achieve the desired effect with the minimum damage—minimal potential collateral damage for civilian casualties.

...But the reality is, is that these are very, very tough decisions that the senior military leadership has to make. There is no magic number that says five is acceptable, six is not. There is no magic way to determine when I do something whether the potential of civilian casualties is five or 10 or 20. We do have some ballpark assessments based on the population of an area, of who might be living in that area, whether it's a residential or commercial area, and the time of day you might strike that. But there is simply no way that I can say there is an easy answer.

...But in each case where civilian—the potential for civilian casualty exists, potential for collateral damage, those targets are all reviewed by the senior commanders.

... in most instances..., most of the targets that we are striking are—actually have very low potential for collateral damage because they're military targets that are generally military installations of that sort.

Nevertheless, there are going to be targets in which a closer evaluation needs to be made and some sort of determination by the commanders in the field of what is an acceptable number, or what we anticipate an acceptable range might be. And there's no one answer. Each target, you look at what the—for example, if you had a nuclear or a biological weapon sitting on top of a Scud missile that was surrounded by civilians, and that thing had the potential to go off and hit Kuwait or Israel, then I would probably be willing to accept a greater degree of civilian casualties because of the consequences of not acting on that target. If, on the other hand, it was a Scud missile without a warhead parked in a barn, then I probably wouldn't be willing to take as much risk to go after that target. But in each instance, the commanders will look at what the specific effects are, what they intend to achieve and whether or not that desired effect and military worth is worth that trade-off in terms of potential civilian casualties.

...We are finding that our—both our effects and accuracy with Joint Direct Attack Munition was significantly higher than we anticipated in Enduring Freedom in Afghanistan. However, for both laser-guided weapons—especially laser-guided weapons and Joint Direct Attack Munitions, we have to understand that a large percentage—perhaps the highest in modern history—a large percentage of the missions flown were doing something like time-sensitive targeting, and they took off without the target, and somebody gave them that target airborne. As a consequence, that is a little bit higher risk, because there's a lot of other things that can go wrong if I don't know what the picture of the target looks like. Nevertheless, solid preplanning improves our ability to do this.

...I can't give you a specific number on a specific weapon. But Joint Direct Attack Munition—the beauty of that weapon is that once it's gone from the airplane, it's going to where it's going—actually, the highest percentage of the time it's going to where it's going and I don't have to worry about a pilot trying to keep a laser spot on a target or worrying and maneuvering to do that.

... We have to understand that doing CAS out of a B-52 was not anything any of our tactical air control parties or B-52 crews practiced before Afghanistan. Additionally, we—many of them got that equipment for the first time when they were out in the field. But we have—the Air Combat Command has spent literally millions of dollars over the last year to get the best possible equipment to our combat controllers in the field so that they have the opportunity not only to have the best equipment but to train with that equipment well prior. So, we have worked on solutions to those challenges, yes.

... it's important to understand that the collateral damage assessment doesn't stop at an air operations center. Each of our—each of the—what we call them is JTACs, Joint Terminal Air Controllers, which are personnel from the Air Force, Army, Navy and Marines who are fully qualified as terminal controllers. In the Air Force we call them ETACs. Generally they're enlisted personnel in the United States Air Force.

As well as our airborne forward air controllers and our ground forward air controllers, each of these men and women have been trained to specifically make collateral damage assessments as they are airborne to try to ensure that they can mitigate that. Is that as good as using cosmic analytical tools back at the air operations center? No, it's not. But, it—literally, every pilot, when they drop a bomb, or every combat controller who—or terminal air controller who's calling a bomb in is trying to make all the right—make those decisions based upon the availability of the weapon, using the right weapon on the right target. I mean, working in Enduring Freedom, at the operations center it was absolutely amazing to me that after about a month we could have a conversation with the terminal air controller on the ground, an Air Force staff sergeant who might be 25 years old, and we tell him exactly the different types of airplanes that are available to him, and he will then say, all right, I'm using these weapons off this airplane against these targets, the F-18s with their laser-guided bombs are going to be more accurate so I want to use those weapons on these targets. So all of our personnel, most of our aircrews and most of our terminal air controllers are trained specifically to make those assessments. Is the airborne assessment as good as a complete analytical assessment in an AOC? No. But I think that these people are about as well trained as we can get them. They are some very, very talented individuals.

... in the Gulf War. In the Gulf War we had effectively 98 precision-guided munitions, we had 36 F-117s, we had 62 F-111Fs, and then we had a number of E/A-6s on the carriers. Today—and oh, by the way, most of those aircraft, other than 117s, most of the 111s would go after a single target or maybe two targets.

...Today, virtually every aircraft of the—I think the number is around 600-odd aircraft—every combat aircraft in theater has the capability of precisely striking multiple targets, and most of them can do it simultaneously. I mean, F-18s can carry a number—two to three JDAM, depending upon their anticipated targets. As I said, B- 52s can carry 12 JDAM, plus an internal configuration that might be conventional munitions or cluster munitions. B-2s—most of the airplanes are out there. So if I have about half the number of airplanes, but each of the airplanes is capable of striking multiple targets on a single day—on a single mission, and in many cases much more than just two or three, then the numbers of desired impact points—because each target we have to understand is actually a set of desired—a set of items. For example, a SAM radar site might be the radar itself, as well as each of the missiles, as well as perhaps a command and control facility. And so when I say an order of magnitude higher, I think we would literally see an order of ...we struck approximately 125—well, on the first day of the Gulf War, if you looked at it, we probably included somewhere on the number of 400 to 600 precision-guided weapons—or 300 to 400 precision-guided weapons. I think that number was going to be significantly higher.

...I just want to touch.. on some of these...myths about collateral damage. I mean, first of all, it cannot be avoided. When you employ military force, collateral damage is going to incur, unintended damage is going to incur, and unfortunately, and as tragic as it might be, civilians who have no business in the operation and who are not targets will be killed in the operation.

...We also must assume that we—we can't assume that intelligence is perfect. We clearly understand that it's not, and there will be some degrees or lack of complete information on targets that is going to cause us to do things that we would have done differently, had we known more information.

...Weapons don't always work. I'd like to give you a perfect answer on a mathematical percentage, but that simply isn't possible. ...we do have some historical data on weapons effectiveness and accuracy and reliability, but I think that we just have to understand that these are mechanical devices. Mechanical devices will fail on occasion. We have improved the reliability. We have improved the efficiency, with Joint Direct Attack Munitions. We have improved the ease of delivery, to make it far easier for aircrews to get that weapon to the right place and then release it, to get it to the target by itself. But still, weapons will in fact malfunction to some degree.

...Not all damage and not all collateral damage is caused by friendly fire. And clearly, our adversaries in the past, Milosevic, Hussein as well, have taken advantage of collateral damage or damage that has been a consequence of adversary fire, And you simply have to ask a question; all those bullets going up into the sky, they come down someplace. And the missiles go up that miss targets; they come down some place and they cause damage as well. So we just have to be cautious about assuming that if something happened, it necessarily was a consequence of direct coalition activity.

...There is a great myth about high altitude and accuracy. The argument that I have to be low-altitude to hit a target is false. It is patently false. Joint Direct Attack Munition actually is far more accurate at high altitude than it is at low altitude, because it has more time to get to the target. Laser-guided munitions, depending upon the weather; if I have cloud decks, then laser-guided munitions can create some problems. But altitude, when you see air crews up at 15,000 or 20,000 feet, in most instances, or even higher, that is not affecting in the vast majority of cases their ability to create the desired effect on a desired target.

...And the other thing I think we need to be cautious about: we're going into an operation, a surface combat operation if we potentially go into Iraq, which we have not seen in a very long time in this country. We have seen and we have developed fairly established and critical procedures to mitigate collateral damage using air operations. And quite frankly, as much as airmen have chafed—airmen of all the services have chafed under those rules and restrictions, we

have learned a very great deal in how to do our jobs better. We have not had as much experience in these issues on the ground.

...We ...have provided our air crews—or our personnel who are doing the planning for these military operations a set of tools that have simply not existed before. Some are collateral damage mitigation tools, some are the ability to sit at a single computer.

I had the ability even in Enduring Freedom to sit at a computer and go from a one to a million scale map using a track ball, go all the way down to a one to 250,000 scale map and then five-meter imagery and one-meter imagery, all with a track ball on a computer. And that capability gave a lieutenant that was working for me in collateral damage—he could come up with a collateral damage assessment in some cases in minutes by just—by attack P reporting a target at an area just with a set of coordinates.

So, some of these tools—if you add to that our fly-out capabilities that we have and things like Power Scene, that I think Fox News just showed on TV the other day, which gives the ability for air crews as well as ground forces to go through a mission and rehearse a mission to see what they expect to see.

...We have improved munitions. As I mentioned, the Joint Direct Attack Munition...is working and it is working better than we ever anticipated. ...that is a significant capability in enabling more efficient and effective operations, because now, most of my platforms can go after multiple targets in a single pass.

Sensor Fused Weapon will probably be employed for the first time in this operation. Sensor Fused Weapon is an anti-armor personnel which has a triple-redundant dudding mechanism if, in fact, it fails to find a target that it wants to employ. It's a great capability and actually is a far more accurate munition that can get—destroy enemy vehicles, enemy armored forces, even if they're widely dispersed....I believe F-16s and A-10s both carry them, but F-15E—the good news about that weapon is that it's a—the only thing that we changed was the insides. And so it can—basically, anybody who could carry a—or, what we call a tactical munitions dispenser or those cluster munition canisters can be carried—can carry that weapon.

...the way the system works is that it will operate at a—well, we actually have Sensor Fused Weapon with a Wind Corrected Munitions Dispenser, which is the fourth one. Wind Corrected Munitions Dispenser are INS-guided cluster munitions to enable us—cluster munitions were notoriously inaccurate (sic) from 30,000 or 40,000 feet. But these weapons actually get the weapon to the exact point in space that we want it to open up. When that happens with Sensor Fused Weapon, there are 10 internal canisters inside that weapon, each with four munitions. Those canisters deploy, and they have a parachute that slows the rate of descent of the canister and then those four independent munitions pivot out. And those munitions can then independently seek adversary armored vehicles. But if the weapon fails to detonate in the air and it lands on the ground, after a fairly short period of time, each of the submunitions will disarm itself. And at that point, about the only way to make it go off is a blasting cap.

...But those are the types of capabilities that we're fielding. The Navy's improved both their inventories and the capabilities of the Tomahawk since Desert Storm dramatically. And so all of these I think are a fairly good news story.

...I talked about air crew training, things like Power Scene. Again, air crews from all of the services have had to live with and understand the issue of collateral damage over the last decade. And it's improved in our training programs, it's improved in our documentation, in how we train those air crews from the ground up as well as, as I mentioned, all of the Joint Terminal Air—TAC Controllers and all the services who do controlling from surface combat operations.

...We have improved weapons assessment and tracking. We now have the ability basically to track every weapon as it's released, or reported back to the air operations center so we can build a detailed map of expenditures post-conflict, which is a really good thing to do if I—because, in fact, we used this capability in Allied Force. The Germans were going into a destroyed Serbian military camp to set up as their point of operations when they moved the peacekeepers into

Kosovo, and we were able to give the Germans a detailed map of expected munitions that we expended and the potential duds that might be in that area. Very helpful if one talks about post-conflict and post-conflict clean-up.

...we've done some tremendous effort in this area. It's not perfect. It's not going to make wars bloodless. But I think that the capabilities that the Air Force has fielded, that the other services have fielded, what we've done in training has also dramatically improved.

... When you start trying to target individuals, the world gets really complicated really fast. And quite frankly, your ability to do something like that is—especially with an adversary who has specifically made it hard for his own people to target him, it becomes very difficult. But I think—my point would be, is that because we now have the ability to go after these target systems as a whole, I can now go after what I want to attack as opposed to going after all the air defenses.

... every bomber we have in the inventory can kill multiple—in many cases, it least 12-plus targets, 12 to 24 targets, every bomber in the inventory. Every—or the majority of the Navy's F-18s have the ability of using joint direct attack munitions to kill two, three or four targets in a single mission. Our F-15s and -16s likewise have a similar capability.

So—and everybody out there, if you're not dropping PGMs, you're probably not close to the fight. I mean, there are a few airplanes that are a little bit less capable, but the vast majority of the Air Force and Navy's inventories are PGM-capable weapons either through laser-guided munitions or joint direct-attack munition. And so, we have to remember, in the Gulf War, only 9 percent of the munitions dropped were precision-guided. As well, only 2 percent of the sorties—the 117s flew only 2 percent of the sorties, yet they struck 53 percent of the targets in the target deck.

And so if we examine that capability, this—if that capability that was resident or perhaps airplanes that were only 2 percent of the sorties, 36 airplanes, and with the hundreds we have now, my capability is dramatically—and I cannot underscore that—it is dramatically improved over the (percent ?) I had in the Gulf War.

... the weapons are tracked in this system—since we don't have right now—I would like to have a networked weapon that told me where it hit. That would be really a perfect world. And then it gets right back over the datalink architecture into the air operations center, and then two seconds after it hit, I knew what happened. We're still a few years away from that. But I think that they could probably make that assessment fairly quickly.

Most of those assessments initially are going to be done through air crew reporting upon when they come back from MISREP, and then we have to calculate those numbers and try to make those complete assessments.

But again, I think that even over the end of Allied Force, and even over Enduring Freedom, the capabilities and tools we've given to the men and women in the air ops centers, as well as the connectivity and interconnectivity we have between the land and maritime and air components—commands, has given us a lot greater degree of flexibility where somebody in General MacEwen's (sp) headquarters—"I need some information"—and—(snaps fingers)—we can get it to them quickly.

... ACC is the air component—or we provide forces through 9th Air Force to Central Command. And we work—since the majority of our 9th Air Force under General Moseley, is the air component to Central Command. We are there, what we call an Air Force forward—or the commander of the Air Forces—General Moseley commands all U.S. Air Force personnel in the region. And we provide complete support to him and his planning and Central Command planning efforts.

So that there's a lot of stuff that takes place at Tampa, but there's also a lot of specific challenges that General Moseley asks for some help on, and then we at Air Combat Command have put together some really, really talented people into some dark rooms and wouldn't let them out until they came up with some solutions. So we are at this point supporting General Moseley and supporting General Franks in anything that they need.

...The first question, the strike package I showed you earlier that went into Basra that had the 41 aircraft that went to Basra. I mean, they were SA-6s and SA-2s and SA-3s and Crotales and Rolands. And not much of that stuff is alive at Basra anymore. We have—I mean, having lived over the no-fly zones for the last 12 years, it is a significantly less hostile place than it was in northern and southern Iraq on the opening night of the Gulf War. And that simple fact will make the jobs of our men and women, the air crews that are out there doing this, a whole lot easier. And, and it's important to note, that control of the skies that we will have almost from the outset over the southern and northern regions of the country enable our surface combat forces to exploit more quickly, more effectively, more rapidly.

The Pattern of Effects-Based Bombing During the War

When the war actually took place, the coalition used some 1,800 aircraft to deliver some 20,000 strikes. One key to the way in which effects-based bombing was actually implemented is that coalition targeting capabilities had improved to the point where they could target and strike Iraq ground forces in near real time. This allowed coalition forces to concentrate on Iraq's military forces, and particularly on the Iraqi Republican Guards forces, while they were maneuvering outside populated areas.

US and British official sources differ slightly as to the number of strike sorties flown during the Iraq War, although the general scale and nature of these strikes is consistent from source to source. In an analysis presented by Lt. General T. Michael Mosley, the commander of coalition air operations during the war, he stated that some 1,800 aircraft delivered some 20,000 strikes, and that 15,800 of these were directed against Iraqi ground forces versus 1,800 against the Iraqi government, 1,400 against Iraqi Air Force and Air Defense Command targets, and 800 against suspected sites, forces, and installations that might have weapons of mass destruction or surface-to-surface missiles. This meant that 80% of the coalition air strikes hit at Iraqi ground forces, 9% were directed against Iraqi government targets, 7% against Iraqi Air Force and Air Defense Command targets, and 4% against targets like suspected sites, forces, and installations that might have weapons of mass destruction or surface-to-surface missiles.

Lt. General Mosley did confirm, however, that there were serious problems in some aspects of the situational awareness provided by the coalition's IS & R assets in targeting, and in the battle damage assessment process. There were also differences between US Air Force and US Army officers over how to best plan the strikes, and attack helicopters and artillery were rarely integrated into any form of effects-based operations. This limited the ability to develop a truly joint doctrine for effects-based bombing in the target category where the coalition carried out 85% of its strikes, and as is noted elsewhere, it meant that the coalition could not accurately assess the effect of its strikes on these targets.

As the previous analysis of BDA, and the detailed GAO analysis of these issues has shown; these problems in intelligence and operations were at least as serious in the case of Iraqi government targets, Iraqi Air Force and Air Defense Command targets, and targets like suspected sites, forces, and installations that might have weapons of mass destruction or surface-to-surface missiles. While no quantified data are yet available, it is clear from interviews that many of the strikes against Iraqi government targets did not do the damage originally estimated during the war, hit targets whose nature and value to the Iraqi war effort had not been accurately estimated, or hit targets that had been largely evacuated.

The data on the allies' ability to characterize and achieve the necessary damage against Iraqi Air Force and Air Defense Command targets are more uncertain, but a number of strikes have proved to have been directed against low value or empty targets. Allies were able to locate and hit some surface-to-surface missiles, but it has been confirmed that virtually all of the suspect chemical, biological, and nuclear targets had no weapons and did not provide an imminent threat. It is also clear that unless a target involved high levels of visible activity or radio frequency emission, there was little way to assess even the broad impact of the "effect" of strikes on these targets.

Effects-Based Operations, Civilian Casualties, and Collateral Damage

If one looks at the patterns of bombing by target category, a maximum of 10-12% of the sorties were delivered against targets that are normally close to populated areas.³⁹ In practice, the number that risked civilian casualties and collateral damage was far smaller, in part because of both high-level policy and joint coalition review.

Lt. General Mosley also stated that all strikes that the allies estimate would put more than 30 civilians at risk had to be approved by US Secretary of Defense Donald Rumsfeld. According to Mosley, only around 50 such strikes were proposed and all were approved by Secretary Rumsfeld. British and Australian senior officers add, however, that the US did propose additional strikes during command discussion, and that they were "redlined" by the British and Australians.

There are no reliable estimates of casualties for the war, which reflects critical failure in current IS & R capabilities; IS & R capabilities deal largely with places and things, not people, whether the issue is targeting or BDA. It is clear from the range of estimates to date, however, that the United States and the UK inflicted negligible civilian casualties and collateral damage in comparison with previous wars. As has been noted, a estimate made in late June stated that hospital records indicated up to 3,240 dead civilians, including 1,896 in Baghdad, and the possibility of thousands more.⁴⁰ Again, the lowest estimate seems to be 1,100-2,355.⁴¹ The most credible low-end estimate is 1,500 civilian dead.⁴²

These are still tragic losses. But they are remarkably small for so intensive an air campaign in a country of some 24 million people, and they compare with Iraqi claims of some 2,278 civilian dead in the Gulf War of 1990, where the United States did not invade Iraq and there was no fighting in Iraqi cities. They also include casualties from Iraqi anti-aircraft fire, Iraqi fire directed at coalition troops, and all other causes and do so despite the fact that Iraqi forces made extensive use of civilian facilities to shelter Iraqi military forces and equipment.

Intelligence and True Precision Air Strike Capability

While no battle damage data are publicly available, and reliable battle damage data are not available at any level of classification, it is clear from the previous history of the war that the evolution of precision air strike technology had greatly improved Coalition capabilities in carrying out these strikes by the time the Iraq War began. Even in the Gulf War, only a small number of aircraft like the F-117, F-111, and F-15E were properly equipped for advanced precision strike missions. In the Iraq War, virtually all U.S. aircraft had the avionics necessary to make use of a wide variety of precision weapons by acquiring targets, illuminating them when necessary, using GPS guidance, and acquiring targeting coordinates from the ground. To put these differences in perspective, only one out of five strike aircraft could launch laser-guided bombs in the Gulf War; all strike aircraft could launch laser-guided bombs in the Iraq War.⁴³

The onboard sensors and computer systems on these aircraft were much more capable both in executing preplanned strikes and in the dynamics of acquiring and killing. The integration of intelligence assets into target planning and the speed of execution made precision strikes more effective. All-weather coverage was better, and while the term “all-weather” will probably always seem at least somewhat ironic in air combat, field reports so far indicate that it was a far more realistic description in the Iraq War than in previous conflicts.

A combination of national IS & R UAVs and better sensor aircraft, systems like the E-8C, and improved infrared and radar sensors interacted with better command and control to allow the effective use of both better delivery platforms and better precision weapons. For example, experimental use was made of the E-8C JSTARS to target Iraqi armor even under sandstorm conditions. Dust and sand did present problems in some cases. Still, the widespread dissemination of laser illuminators to ground forces and SOF units allowed them to call in precision close air support, as did giving them GPS targeting capability.

Understanding the True Meaning of Precision

This scarcely means that the air and missile campaign achieved anything approaching “perfect war.” Enough pilot and post-strike reports are available to show that precision is still relative despite all of these advances. The U.S. and British briefings shown during the war provided television footage of weapons that virtually all hit the correct target. In practice, however, there are still major problems in the IS&R effort, and significant numbers of targets were mischaracterized.

Some of the broader intelligence issues involved in targeting have been discussed earlier. The British Ministry of Defense report on the lessons of the war describes the following range of issues involving air and precision weapons targeting:⁴⁴

Planning for the air campaign included the development of a list of potential targets that would help the coalition to achieve its overall objectives. Over 900 potential target areas were identified in advance. All targets were derived from the campaign plan and were selected to achieve a particular military effect (such as the degradation of Iraqi command and control systems). Operating within parameters agreed by Ministers, Commanders taking targeting decisions had legal advice available to them at all times during the conflict and were aware of the need to comply with international humanitarian law, the core principles of which are that only military objectives¹ may be attacked, and that no attack should be carried out if any expected incidental

civilian harm (loss of life, injury or damage) would be excessive in relation to the concrete and direct military advantage expected from the attack. Extensive scientific support including detailed computer modeling was used in assessing potential targets. Strong coordination between the MOD, the Permanent Joint Headquarters (PJHQ) at Northwood and the in-theatre National Contingent Command helped ensure coherent target planning (a lesson from previous operations). The Department for International Development was also consulted on key humanitarian infrastructure issues. The process for approving all targets for UK aircraft,

Targeting for submarine-launched cruise missiles or for coalition aircraft using UK facilities was conducted with appropriate political, legal and military oversight at all levels. We also influenced the selection and approval of other coalition targets.

... The campaign also showed that coalition aircraft needed to be able to identify and target mobile, camouflaged and underground assets and facilities and to achieve discrimination in urban areas. This requires improvements in data transfer, tactical reconnaissance and high definition imagery systems to deliver shorter sensor to shooter times for time-sensitive and 'find and destroy' missions. The operation also highlighted that the integration of Close Air Support aircraft requires further refinement and practice. It demonstrated the advantages of multi-role aircraft and long-range, high payload platforms. Unmanned Aerial Vehicles have the potential to play an increasing role in the joint battle, both for surveillance and strike and may offer opportunities against time sensitive targets.

...Future targeting work will concentrate on improving precision and reducing the time taken to guide weapons on to targets including weapons fired from the sea and long-range, indirect land systems.

It is also important to note that the accuracy of precision weapons quoted in most technical sources is based on the average distance from the target hit by 50 percent of the weapons fired—assuming a perfect target location, a perfect launch, and perfect functioning of the weapons system through the final guidance phase. In the real world, this means that roughly half of the weapons fired are less accurate, but there is no statistical definition of their accuracy of the other half of the weapons fired. Data on the real-world average performance of weapons under operational conditions are sometimes available, but are generally classified.⁴⁵ Moreover, the combination of perfect targeting, perfect launch, and perfectly functioning weapons assumed in producing such accuracy data is rarely possible.

The United States and its allies compensated for this reality by establishing rules of engagement that sought to prevent the launch of weapons under uncertain conditions, particularly when they might produce collateral damage. Nevertheless, "precision" did not mean that many weapons were not fired at the wrong target, or selected in ways where the munition had the wrong effect, or launched under the wrong conditions, and/or that they did not fail in some way in flight.

There also are enough pilot and combat reports to show that major failures of the control surfaces on guided weapons sometimes resulted in the weapon striking far from its intended target, regardless of the target coordinates used to launch the weapon and the potential accuracy of its guidance system. To put this in perspective, it often took several weapons to achieve a kill or the required level of damage—rather than the one kill per weapon generally shown in official briefings.

Even so, it is clear that the real-world targeting, launch, and weapons performance of precision weapons was generally much more accurate than it had been in Kosovo or the Gulf War. It is also important to note that briefings and battle damage assessment tend to

focus on achieving catastrophic damage or enduring functional kills of the target. The Coalition often did achieve these effects, but they are only part of the impact of precision warfare.

The psychological impact of near misses and of watching precision kills on other nearby targets is extremely high. It is quite clear from postwar Iraqi accounts that it is not necessary to achieve the desired degree of damage to have forces evacuate a building or desert their equipment. Moreover, the high levels of attrition sometimes claimed against targets like the major weaponry in Republican Guard units—50 percent, 70 percent, and even 90 percent—are scarcely necessary to force the disintegration of the unit as a functioning warfighting entity. Losses of only 15-20 percent have been enough to achieve such results in previous wars, although the level of damage required varied sharply by military force and unit. The fact that BDA cannot quantify the impact of precision on morale, desertions, and the willingness to fight does not mean that even “misses” are not of vast importance in terms of their real-world military effects.

The Scale and Nature of the Coalition Effort

The Coalition dropped a ratio of 19,948 precision-guided weapons, plus nearly 9,251 unguided weapons, to none.⁴⁶ While sources disagree on the exact number and the precise period that should be used to make the count, U.S. forces alone fired at least 19,269 guided weapons. Precise comparisons of these totals with those of the Gulf War and Afghan War are again difficult because the counts vary according to source even within the individual military services, and because guided weapons differ sharply by type. For example, some counts put the total number of guided weapons fired by the Coalition in the Gulf War at 10,468, while others are in the 9,000 range; and the USAF Gulf War Airpower Survey provides detailed annexes that only list 8,644.⁴⁷

If the Gulf War Airpower Survey data are used, 5.8 percent of the weapons dropped by the United States in the Gulf War were precision-guided, versus 68 percent in the Iraq War. However, most estimates indicate 8–9 percent of the munitions in the Gulf War were precision-guided versus 70 percent for the Iraq War.⁴⁸ Again, sources vary. The munitions involved were very different. The USAF Gulf War Airpower Survey states that 4,086 laser-guided bombs were used in the Gulf War. This compares with 8,618 in the Iraq War plus 6,542 of the new JDAM GPS-guided weapons. However, the United States used 3,065 Hellfires in the Gulf War versus only 562 in the Iraq War, and it used 5,296 Mavericks in the Gulf War versus 918 in the Iraq War.

What is even more striking are anecdotal reports on the extent to which the air effort focused on the support of ground forces. One report from an Air Force general claims that of the 19,948 precision weapons used against Iraqi aimpoints, 15,592, or 78 percent, were used in direct support of Coalition ground forces.⁴⁹ Once again, counting methods make it difficult to verify such figures or compare them with previous wars. But the Gulf War Air Power Survey indicates that the figure for the Gulf War would only be 55.5 percent—although this was a total of 23,340 strike missions out of a wartime total of 42,420.⁵⁰ The data NATO provided on the war in Kosovo indicate that NATO flew 987 strike missions by D+50 and that a maximum of 30.7 percent were flown against Serbian ground grounds.⁵¹ (The data for the Afghan conflict are lacking, but the target base other

than ground forces was very limited. As a result, the percentage of strikes against Taliban and Al Qaida ground forces was almost certainly extremely high.)

In any case, such numbers tell only part of the story. What is truly important is that the Coalition was able to combine a broad reliance on precision-guided weapons with major advances in avionics, IS&R, and command and control capability and (1) conduct an “effects-based” campaign directed primarily at Iraq ground forces in a joint operation with Coalition ground forces; (2) strike at other targets like the Iraqi leadership, Iraq’s command and control assets, its potential weapons of mass destruction and delivery systems, and its air force and surface-to-air missiles; and (3) use such assets to allocate fighters and helicopters to perform on-call missions using precision weapons.

Intelligence and In-Flight and Rapid Targeting and Retargeting: Time-Sensitive Strikes

The Iraq War also demonstrated that C4I/BM and IS & R assets are advancing to the point where they can support in flight retargeting and near-real time operations. While the technical details are unclear, the United States seems to have flown some 156 time-sensitive missions against leadership, missile, and WMD targets that involved rapid retargeting in periods from minutes to two hours. According to USCENTAF, these strikes were allocated as follows:⁵²

<u>Location</u>	<u>Terrorist</u>	<u>Leadership</u>	<u>WMD</u>	<u>Total</u>
South	2	40	66	108
West	0	2	19	21
North	2	8	17	27
Total	4	50	103	156

A special Time Sensitive Target cell in the Combined Air Operations Center (CAOC) in Saudi Arabia used intelligence data to “find, fix, track, target, engage, and assess” such strikes: to direct attacks with laser- or GPS-guided weapons, analyze battle damage, and integrate time-sensitive operations with other air operations.

It helped plan the rapid strikes on Saddam Hussein and the Iraqi leadership on March 19/20 and April 7.⁵³ The strike on March 19/20 took about three hours from the intelligence report to an execution that involved two F-117 fighters firing 2,000-pound bombs and four ships launching 40 Tomahawk missiles. This included approval from Washington of what one commander called a “pop up” target.⁵⁴ The target cell also made the first use of the EGBU-27 one-ton penetrating bomb, which uses a mix of GPS and inertial guidance.

The aim point for the underground shelter that was attacked was not a visible structure, and intelligence had to rapidly estimate a point some 100-200 feet from the nearest structure. As a result, all four bombs dropped were spread out in an effort to hit and destroy the underground structure in something approaching a square with points at 50-foot intervals. The attack had been considered for several days but only in an “on again, off again” kind of contingency planning. When the order came, detailed strike planning was authorized at 1:30 a.m. and executed by 5:30 p.m. A planning effort that would have

taken some four hours during the Gulf War took 30 minutes in the Iraq War. Total mission preparation took two hours and execution two more.⁵⁵

The Time Sensitive Target cell also directed a strike by F-16s using 500-pound laser-guided bombs on the home of General Ali Hassan al-Majid (“Chemical Ali”) on April 4. On April 7, it took about 45 minutes from intelligence to strike for a B-1B raid that dropped four 2,000-pound GPS guided bombs on a building where intelligence indicated that Saddam Hussein and his sons might be meeting, and 30 minutes on April 10 to call in a B-1B to drop JDAMs in an attempt to kill Hussein’s half brother, Barzan Ibrahim Hasan al-Tikriti.

This rapid retargeting capability enabled the United States to respond to active intelligence rather than bomb predetermined or fixed targets by the numbers. For the first time, it deprived enemy leaders of the sanctuary they had enjoyed in terms of the slow response time between acquiring intelligence indicators and actually being able to strike.

Numerous other missions included the growing use of Special Forces to confirm and illuminate targets that could be struck with precision weapons, or to identify high-priority targets that led to the retargeting of aircraft as they approached the battlefield.

The Coalition also launched some 686 additional strikes at “dynamic targets.” These included high mobile and otherwise important targets using “re-rolled” airborne aircraft. There were 243 such strikes in the south, 271 in the west, and 172 in the north.⁵⁶

This ability to rapidly target and retarget can be improved significantly in the future with better communications, procedures, software, and equipment. The Marine Corps, for example, has developed procedures to allow forces on the ground to see the spot that aircraft are targeting with the LITENING, and to verify the image of a target captured by an aircraft’s avionics. Such advances may well change retargeting to add a new degree of both precision and protection against friendly fire. The ability to retarget cruise missiles in flight will add another dimension to such capabilities.

At the same time, at least the Marine Corps found serious problems in the overall timeliness of the targeting and sortie allocation process. Although its lessons reports note advances in time-sensitive strikes and find that the “kill box” system ensures the availability of on-call air support, at least one report—the report on the lessons of the war by 1 Marine Division—finds that much still needs to be done:⁵⁷

...Target tracking and assessment was extremely difficult during OIF. There was no reliable and responsive process or means to determine whether Air Interdiction (AI) targets on the PTL were serviced and successfully attacked during and after ATO execution. The impact was that targeting personnel/LNOs could not consistently and reliably provide the necessary feedback to MSC commanders that their AI target nominations were being serviced or not. Further, there was no consistent or reliable method for the MSCs and Force Fires to track their target nominations on the DS ATO. Ostensibly due to system constraints, TBMCS would not accept the MEF Target Reference Number from the PTL. Hence when the ATO was published there was no easy way to associate the target reference number (TRN) with the assigned aircraft mission number on the ATO. The customer would have to cull through the ATO searching for other data elements like BE number, location or target description that matched the TRN. Often the ATO did not consistently list the BE numbers, locations and/or target descriptions.

...The system constraint and inability of TBMCS to accept and record a MEF TRNs needs to be corrected. If this system issue can’t be corrected then an alternative consideration is to allow the MEF to assign aircraft mission numbers from a block of pre-designated mission numbers. These

mission numbers would link each target number on the PTL and would serve as the common data element that all levels could track and monitor, from target nomination through assessment.

During OIF the 72-hour deliberate targeting process did not keep pace with the dynamics of the battlefield. The key reason was due to the fact that the planning to execution cycle was too long and the process did not react quickly enough to changes in the scheme of maneuver. As a result, the AI shaping effort often did not focus on the enemy forces I MEF would actually fight in 48 hours.⁵⁸ Another factor that caused the 72-hour targeting cycle to lag execution was the speed of which the Division executed their scheme of maneuver. This speed of execution was never really appreciated or understood by the MEF future planners. Hence the maneuver briefs provided at the targeting boards and other forums were typically lagging by at least 24 hours (sometimes 48 hours.) Finally, the Synchronization Working Group conducted each evening did not sufficiently address changes in the SOM as we attempted to validate the Prioritized Target List (PTL). The expectation at the SWG was that the SOM and the results of the Intelligence collections effort would drive the validation /update of the PTL.⁵⁹ If this was the purpose and intent of the SWG, it never really happened.

Shorten the 72-hour Targeting Cycle. Pushing the targeting planning cycle closer to execution will help keep the PTL more current and relevant during ATO execution.⁶⁰ Require the MSC Liaison Officers to brief their respective schemes of maneuver in detail at all of the Targeting forums vice the MEF Future Operations planner. The LNOs through their constant dialogue with their G3 and FSCs have the most current information /changes.... new target nominations may need to be added to the PTL that were not approved on the Battle Field Shaping Matrix (BSM)(briefed 48-72 hours earlier), but clearly need to be serviced.

It is also clear that such retargeting capabilities need to be better integrated into attack helicopter and artillery operations. They also need to be integrated into many aspects of operations, such as FBCB2 system described earlier. Near real-time threat data are critical to the kind of “net” the US Army and Marine Corps are seeking to develop for their future combat systems.

Intelligence and the Impact of Space Warfare

Space is scarcely a traditional fundamental of war, but it has been a fundamental ever since the United States first made use of satellites for intelligence purposes. In the Iraq War, the United States also used space for battle management, for communications, to locate its forces and guide its weapons, and to perform a wide range of other missions. It built upon the lessons of the Gulf War and Afghan War and on progress in worldwide communications dating back to the days of Vietnam.

At the same time, the Iraq War was the first large-scale war in which the United States could fight with 24-hour continuing intelligence satellite and sensor coverage over the battlefield, as well as the first major conflict where it could take advantage of full 24-hour coverage by global positioning satellite (GPS) system.

It is not possible to address most of the intelligence issues affecting space platforms in an unclassified report. There were an number of intelligence-related space operations, however, that can be discussed in unclassified form.

Overall Coalition Superiority

The United States and Britain did not have total dominance of space. Iraq had access to satellites for television transmittal during much of the war and was able to use friendly Arab satellite media to make its case. It had purchased large amounts of commercial satellite photography both directly and through various fronts before the war, and it could make commercial use of the global positioning satellite system.⁶¹

The Coalition had so great a superiority in every area of space, however, that Iraq's capabilities were trivial in comparison. The United States was able to build upon the lessons of both the Gulf War and the war in Afghanistan, and although the strengths and weaknesses of its space-centered efforts may remain classified for years, it is clear that major progress was made. One press report indicates that the United States made use of more than 50 satellites during the war, including the two dozen satellites in the GPS system.

Space provided a wide range of intelligence, targeting, and battle damage assessment capabilities. It was the key to effective command and control and to netted global military communications. The range of space-based communications and sensor assets, and the vast bandwidth the United States could bring to managing global military operations, allowed it to achieve near-real-time command and control and intelligence collection, processing, and dissemination. At the same time, GPS allowed U.S. and British forces to locate friendly and enemy forces and both target and guide weapons. The United States also made use of satellites to locate missile launches, predict their target, and provide warning.⁶² USCENTAF reports that U.S. infrared satellites detected some 26 Iraqi missile launches, 1,493 static events, 186 high-explosive events, 40 hook bursts, and 48 ATACMs events.⁶³

Evolving Space into Jointness

At the operational level, a decade of command experience by U.S. Air Force, Army, and Navy commanders who stressed joint operations had helped transform the space

operations community from a secretive scientific-based one to a specialized cadre integrated with air, land, and sea combat forces.

Some of this success may stem from organizational changes made in 2002. Previous commanders of the Air Force Space Command (AFSPC) also served as commander in chief of the U.S. Space and the North American Aerospace Defense commands, splitting their time among the three. On April 19, 2002, General Lance W. Lord was made a full-time commander of AFSPC. General Lord summarized the role of space in the Iraq War as follows:⁶⁴

During the Gulf War, milspace was in its formative stages. We only had 16-17 GPS satellites back then [for example]. That was a rudimentary capability compared to what we have now....[Our] people are deployed throughout the Centcom [Central Command] Area of Responsibility...and are part of the Expeditionary Air Force, that's for sure.

One place you see [milspace] capabilities come to bear is in the Combined Air Operations Center at Prince Sultan AB in Saudi Arabia. We have a space team on duty round-the-clock in the CAOC, helping coordinate GPS, intelligence, surveillance, reconnaissance, weather, and communications—all the things “space” is capable of doing.

It makes sure “space” is fully integrated into any campaign planning and operations [now], and will be fully integrated into any future [war] operations.... I think they're growing, and we're out there, spreading the word that we're part of the team....We're really hitting our stride [now]. It's getting better all the time.

One article described the transformation as one from “space geeks” to “space-smart” officers in an environment where enlisted troops worked closely with traditional warfighters in Combined Air Operations Centers (CAOCs). Air strike planners regularly obtained advice and inputs from military space experts on how to ensure that a number of GPS satellites would be in view over a target area, particularly when GPS-aided weapons were to be delivered. The same was true of coordination in using satellite-derived weather information and imagery of target areas and in conducting network-centric operations and using space-based communication links.

These changes did much to break down the intelligence rivalries, compartmentation, and emphasis on “keeping the secrets” that badly hurt the space effort during the Gulf War—although preliminary conversations indicate that they scarcely solved the problem.⁶⁵ There is still a need to redefine “jointness” so that the entire Intelligence Community plays a suitable role in warfighting. Agencies like the CIA, NRO, and NSA may be civilian – and certainly has many other tasks and responsibilities – but they are also a critical part of modern joint and netcentric warfare. Good answers need to be found to fully integrating them into modern military operations, and into joint commands. Moreover, field reports indicate that there are still too many barriers at every level in the chain to the properly flow and dissemination of information because of security classification. As one warfighter put it, “security officers are supposed to be on our side, not on the side of the enemy.”

The US Army has also been slower than the Air Force to fully integrate space into its operations. It has updated some of its space policy as a result of the Iraq War, updating a policy dating back to 1994. It has been slow, however, to develop effective tasking arrangements for imagery satellites with the NRO, and some Army experts feel it has been slow to seek more secure GPS technology.⁶⁶

Space, Intelligence, and Communications

The space effort in the Iraq War benefited from improved communications, integration, data processing and analytic methods, and command and control at every level. National, theater, and tactical intelligence had much better integration, processing, and dissemination than during the Gulf War, building on the lessons of that conflict and Afghanistan. As in the Gulf and Afghan Wars, however, space was particularly important to military communications. Work by the Marine Corps Systems Command (MCSC) on the lessons of the war illustrates just how vital space communications were to the Coalition's success:

Interoperability of various Communications equipment was an issue in all C3 vehicles and COCs (Tanks, LAR, AAVs). Marines were overwhelmed with the high number of varied communications equipment they were expected to use. Routinely, communicators, operations officers, and commanders found themselves in information overload as they received information over too many different networks (e.g., an LAV Marine was connected to the intercom via his CVC headset, receiving information on a personal intra squad radio (requiring him to remove his helmet to talk), while also (depending on the particular LAVs configuration) "working" 2-3 man portable radios to communicate with other units (PVC 5 for SEALs, PRC 148 for fellow Marines, etc.) and "monitoring" two laptops). This situation was exacerbated in C3 vehicles where I personally saw that every "shelf" was taken up by a radio and seat spaces and floor spaces were taken up with open computers for communications devices such as Blue Force Tracker, MDACT, or Iridium phones. Marines recounted numerous instances where units would call via radio to verify that a message was received over MDACT, while the receiving unit had just put the MDACT aside to monitor BFT since a previous unit had called asking about the receipt of a digital photo over BFT. Consolidation of communications assets/capabilities is an issue that requires review at the institutional level. Commanders want one box that provides multiple capabilities and that is simple and easy to use.

Overwhelmingly, units were in agreement that communications architecture required an overhaul. There were too many different devices that provided redundant capabilities. Additionally, units never seemed to receive enough of *one* communications asset, forcing them to rely on a "hodge-podge" of assets that were not consistent throughout the force. (E.g., some units had only MDACT for digital communication while another unit had only Blue Force Tracker. These units could not talk to each other unless they went through a third party or used a courier system.) A specific case occurred between LAR S-2 and the Div G-2 while attempting to send pictures from the Dragon Eye to Division HQ G-2. The S-2 had BFT readily available while the G-2 did not. The G-2 needed to "borrow" the commander's BFT to receive these messages or simply wait for a courier with a MEMOREX disk to arrive with the pictures. Time lost often rendered the pictures irrelevant in this fast-paced fight. As the Operations Officer from 1st LAR stated, "the communications architecture is broken and the interoperability of various communications assets is virtually non-existent."

...The only consistently reliable means of communication was "SATCOM." In this fast-paced war, if a communications system was not functioning quickly, alternative methods were employed. This was a specific problem of the EPLRS radio (which relies on Line of Site (LOS)). With units constantly moving over various terrain, LOS was not possible. Accordingly, any system connected to the EPLRS radio proved unreliable (e.g., MDACT, AFATDS, etc.). The only systems consistently praised by the Marines were the Blue Force Tracker (SATCOM—though unsecure) and Iridium Phones (SATCOM). These systems provided reliable communications at all times. In many instances these systems were the sole means of communication.

Many Marines noted MDACT, which has a larger bandwidth and greater capability for sending electronic information, was marginalized by its dependence on the EPLRS (LOS) radio. As one commander stated, "Satellite Communications is simply the way of the future and the Marine Corps needs to start focusing on that." Rumor suggested the Army "gave" the Marine Corps

satellite time [*note: I believe the USMC contracted bandwidth prior to crossing the LD*] in order to use the BFT; had this not been the case, the Marine Corps would have found itself fighting, in several instances, without tactical communication.

The Ongoing Evolution of Space

The United States and Britain made use of numerous communications satellites and about half a dozen electro-optical and signals intelligence satellites. A press report indicates that the National Reconnaissance Office (NRO) employed three advanced “KH-11”-type visible and infrared imaging satellites and 2–3 “Lacrosse”-type all-weather imaging radar satellites that proved especially effective in spotting armored movements and whose data were used in conjunction with data from the E-8C JSTARS. At least one of these satellites could image the battlefield every 2–3 hours, and they made some 12 passes per day. A total of some 33,500 personnel at 21 U.S. sites and 15 foreign locations were involved in the overall space support effort.⁶⁷

Press reports, however, can only hint at the overall architecture and capabilities of U.S. space systems and how rapidly they are evolving. As a result, there is no way to quantify or describe recent and planned changes in U.S. space capabilities in detail. Unclassified discussions of the increase in satellite imagery (PHOTINT) coverage and capability simply cannot be grounded in reality, although the level of resolution and “24/7” persistence of coverage has clearly changed radically. The same is true of any effort to provide an unclassified analysis of the much more complicated problems of assessing the trends in space-based electronic intelligence (ELINT) and signals intelligence (SIGINT).

What is clear is that advances in data processing and the ability to develop complex “mosaics” of all forms of space intelligence are now being mixed in near-real-time with improved airborne platform coverage of imagery, ELINT, and SIGINT and processing of human intelligence (HUMINT), data from ground units like Special Forces, and open sources. The end result is a new form of space-centered joint intelligence that has led to a massive improvement in situational awareness and targeting capability that is one of the keys to precision warfare and rapid maneuver.

At the same time, those involved in operating and upgrading U.S. space systems are among the first to say that space warfare is still in its early days. Much of the ability to net, process, and utilize space capabilities remains relatively primitive compared to its potential; the human factors and ergonomics of space exploitation remain crude; and joint warfare is only beginning to exploit the potential of space-centered warfare.

The Evolving Capabilities of JSTARS

The Joint Surveillance and Target Attack Radar System is also a symbol of the rapidly evolving role of IS & R jointness in the air-land battle. A technical description of the aircraft is in many ways a technical description of the new IS&R, C4I, and battle management techniques that shape the evolving U.S. approach to war.

JSTARS Capabilities

JSTARS is a joint development project of the U.S. Air Force and U.S. Army that provides an airborne, stand-off range, surveillance and target acquisition radar and command and control center.⁶⁸ It was used experimentally in the Gulf War. In September 1996, JSTARS was approved for full-rate production for 14 aircraft, the last of which was delivered in August 2002. The first of three more aircraft was delivered in February 2003, and the USAF plans to acquire a total of 19.⁶⁹ The fully operational JSTARS was used for the first time to support peacekeeping operations in Bosnia-Herzegovina and during the Kosovo crisis.

The aircraft provides ground situation information through communication via secure data links with air force command posts, army mobile ground stations and centers of military analysis far from the point of conflict. It provides a picture of the ground situation equivalent to that of the air situation provided by AWACS. JSTARS is capable of determining the direction, speed, and patterns of military activity of ground vehicles and helicopters. The aircraft has a flight endurance of 11 hours or 20 hours with in-flight refueling.⁷⁰

The radar system uses a 24-foot antenna installed on the underside of the aircraft, which is mechanically swiveled and pointed to scan in elevation, and scans electronically in azimuth to determine the location and heading of moving targets. The main operating modes of the radar are wide-area surveillance, fixed-target indication, synthetic aperture radar, moving target indicator, and target classification.

JSTARS aircraft have 17 operations consoles and one navigation/self-defense console. A console operator can carry out sector search focusing on smaller sectors and automatically track selected targets. Fixed high-value targets are detected through synthetic aperture radar (SAR). Signal processing techniques are implemented through four high-speed data processors, each capable of performing more than 600 million operations per second. Processed information is distributed via high-speed computer circuitry to tactical operators throughout the aircraft.

JSTARS has secure voice and datalinks to the Army's ground command and communications stations and to the Air Force command centers. Voice communications systems include 12 encrypted UHF radios, 2 encrypted HF radios, 3 VHF encrypted radios with provision for Single Channel Ground and Airborne Radio System (SINCGARS), and multiple intercom nets.

The digital datalinks include a satellite communications link (SATCOM), a surveillance and control datalink (SCDL) for transmission to mobile ground stations, and Joint Tactical Information Distribution System (JTIDS). The JTIDS provides tactical air navigation (TACAN) operation and Tactical Data Information Link-J (TADIL-J) generation and processing. The Cubic Defense Systems SCDL is a time-division

multiple-access datalink incorporating flexible frequency management. The system employs wideband frequency hopping, coding, and data diversity to achieve robustness against hostile jamming. Uplink transmissions use a modulation technique to determine the path delay between the ground system module and the E-8C aircraft.

The aircraft will become significantly more effective in the future. The U.S. Air Force has awarded a contract to develop the next generation JSTARS as part of the Radar Technology Insertion Program (RTIP). The new, much more powerful radar will be an electronically scanned 2-D X-band active aperture radar that will have a helicopter detection mode and inverse synthetic aperture (ISAR) imaging capability, as well as MTI (moving target indicator) mode, allowing real-time imaging of moving objects.

In 1997, the U.S. Air Force awarded two contracts for a computer replacement program to take advantage of the latest commercial off-the-shelf technology (COTS). The program integrates new Compaq AlphaServer GS-320 central computers that are significantly faster than the original system. The programmable signal processors will be replaced and a high-capacity switch and fiber-optic cable will replace the copper-wired workstation network. The Computer Replacement Plan (CRP) has completed EMD testing and the first upgraded aircraft was delivered in February 2002.

Integrating JSTARS into Joint Warfare and Intelligence

There are many accounts in informal reports from U.S. Army and USAF forces in the theater as to the value of JSTARS during the Iraq War. The best formal account comes from the report on the lessons of the war by 1 Marine Division:⁷¹

The presence of a JSTARS CGS at the Division had a tremendous positive effect for integrating this information into a comprehensive intelligence picture. The ability for the Div G-2 and Army CGS operators to work side-by-side allowed us to use the system in unconventional ways with tremendous tactically useful results. There was a critical requirement to monitor the potential movements of these enemy divisions in order to allow the 1st Marine Division move deep into the enemy battle space quickly.

No other collection asset provided the wide area all weather coverage of the battle space that the JSTARS did with the MTI radar. Critical to our ability to use the capabilities of the JSTARS was the interface provided by the JSTARS Common Ground Station. The equipment allowed us to interact in real time with the collection platform and focus on our critical requirements and process the collection data into usable and actionable intelligence products. The soldiers who operated the system proved equally as critical as the equipment in processing, interpreting and translating operational requirements to the collection platform. Because they were close to the point of decision, these JSTARS operators shared the sense of urgency and 'can-do' attitude. They worked aggressively to find ways to answer questions instead of deflect them. When other platforms failed or were unavailable the CGS JSTARS combination ensured that we were not blind on the battlefield. JSTARS showed us enemy traffic over allegedly "no go" terrain, gave us estimated speeds of advance for our own forces by evaluating enemy speeds over that terrain, proved which bridges supported traffic, etc.

The Marine Corps needs to invest the JSTARS MTI system and trained operators for provision down to the Division level...The Marine Corps needs to invest in the development of doctrine to request and employ the JSTARS MTI system. Need to acquire CGS systems and trained operators for provision down to the Division level with appropriate adjustment to the Division T/O and T/E.

It is noteworthy that the Marine Corps report again stresses the need for trained personnel, and for an effective tactical interface to make use of IS&R assets. It is much easier to improve collection and sensor platforms than it is to integrate their output into

effective war-fighting capability.

Intelligence and Unmanned Aerial Vehicles (UAVs)

UAVs emerged as a greatly enhanced asset for both operations and intelligence. While no detailed sortie data are available on the Coalition's use of UAVs, the nature and importance of the data they collected, or the specifics of the role they played in joint operations, it is clear that they had a major impact. The Coalition used more than a dozen types of UAVs in the conflict, building on the U.S. success in using such systems in Afghanistan.⁷²

The UAVs included larger systems like the Predator, Global Hawk, and the Pointer, the three systems the United States used in Afghanistan. The United States had used the Pioneer in the Gulf War. In the Iraq War, the Coalition also made use of new tactical systems like the U.S. Army Hunter and Shadow, the Marine Corp's Dragon Eye, and the USAF Force Protection Surveillance System. The change was particularly important in the case of field commanders, who had only one type of UAV available in the Gulf War but had 10 types available in the Iraq War.⁷³ Both the US military services and the Britain Ministry of Defense concluded that the value of these UAVs was one of the major lessons of the war.⁷⁴

The Predator

The upgraded RQ-1 Predator UAV carries the Multispectral Targeting System (MTS) with inherent AGM-114 Hellfire missile-targeting capability, and integrates electro-optical, infrared, laser designator, and laser illuminator into a single sensor package. The Predators cannot carry MTS and a synthetic aperture radar, or SAR, simultaneously. The aircraft can carry and employ two laser-guided Hellfire anti-tank missiles with MTS.

The Predator has a cruise speed of around 84 mph (70 knots), and a maximum speed of up to 135 mph. It has a range of up to 400 nautical miles (454 miles), a ceiling of up to 25,000 feet (7,620 meters), and a payload of 450 pounds (204 kilograms). Its ability to loiter for up to 24 hours at altitudes of up to 15,000 feet also allowed it to support the ground battle and to be used to call in systems like the AC-130 gunship, A-10, and Tornado.

The Predator was flown to support virtually every major mission in the war, providing imagery day and night of a quality that under optimal conditions allows the user to distinguish between military civilian personnel at distances up to three miles. Some 15 Predators flew during the war, roughly one-third of the total fleet, and they flew more than 100 missions. These included joint missions such as using an RC-135 Rivet Joint electronic warfare aircraft to locate the area of an Iraqi surface-to-air missile and then sending a Predator to find the target and send back its precise coordinates. Even when not armed with Hellfire missiles, the Predator served as an effective means of improving targeting and strike reaction times.

An armed version of the Predator, the MQ-1, fired more than 12 Hellfire missiles against Iraqi targets during the course of the war.⁷⁵ The US also equipped some Predators with Stinger air-to-air missile. It did so because a Predator had also flown a mission several months before the war in which an Iraqi Mig-25 fired two air-to-air missiles and shot down the Predator. The Predator had, however, been able to fire two Stinger air-to-air missiles in response and transmit video images of the engagement. While this encounter

showed that the Predator was vulnerable in spite of its relatively small visual and radar profile, it also showed that unmanned aerial combat vehicles (UCAVs) could be given a limited self-defense capability.⁷⁶

The Global Hawk

The Global Hawk Unmanned Aerial Vehicle (UAV) provides joint battlefield commanders with near-real-time, high-resolution intelligence, surveillance, and reconnaissance imagery. It cruises at extremely high altitudes and can survey large geographic areas with pinpoint accuracy to provide information about enemy location, resources, and personnel. Once mission parameters are programmed into the Global Hawk, the UAV can autonomously taxi, take off, fly, remain on station capturing imagery, return, and land. Ground-based operators monitor UAV health and status and can change navigation and sensor plans during flight as necessary.

The aircraft has a wingspan of 116 feet (35.3 meters) and is 44 feet (13.4 meters) long. It can range as far as 12,000 nautical miles, at altitudes up to 65,000 feet (19,812 meters), flying at speeds approaching 340 knots (about 400 mph) for as long as 35 hours. During a typical mission, the aircraft can fly 1,200 miles to an area of interest and remain on station for 24 hours. Its cloud-penetrating Synthetic Aperture Radar/Ground Moving Target Indicator electro-optical and infrared sensors can image an area the size of Illinois (40,000 nautical square miles) in just 24 hours, and it can image some 200–300 sites on a single sortie. Through satellite and ground systems, the imagery can be relayed in near-real-time to battlefield commanders.⁷⁷

The Global Hawk operated at higher altitudes than the Predator, and its radar imagery allowed it to function even during sandstorms. One aircraft was deployed, and it flew missions every day of the war. It operated out of the United Arab Emirates (UAE) and was controlled from Beale Air Force Base in California. It was used for time-sensitive targeting, which was coordinated through the CAOC in Saudi Arabia. The synthetic aperture radar proved to be particularly useful in targeting even static ground forces, like elements of the Medina Division that were still in revetments.⁷⁸

The Dragon Eye

The Dragon Eye is another small UAV designed to provide threat detection for small units. The Marines deployed 20 Dragon Eyes and 10 ground stations with the 1st Marine Division, and the U.S. Army used the Hunter in a similar role with V Corps.⁷⁹ The Dragon Eye is a fully autonomous, back-able, hand-launched UAV that can provide an “over-the-next-hill or building.” Its operating altitude is between 300 and 500 feet, and it has a video-link range in excess of five kilometers. The payloads are capable of real-time high-resolution day color and low-light black/white imaging. Its electric motors provide a low noise signature, and its small wingspan makes it very difficult to detect. The air vehicle’s battery provides up to 60 minutes of flight time and has a flight weight of approximately five pounds. It can be assembled and launched by a two-man team in approximately 10 minutes. The aircraft is programmed via a seven-pound ruggedized handheld computer that is capable of flight planning, flight monitoring, and storage of air vehicle-transmitted video. The aircraft’s flight profile is GPS waypoint guided, each waypoint allowing for various linear and orbiting search patterns and altitudes. The aircraft’s flight profile can be updated or changed in flight.⁸⁰

Marine Corps Lt. Gen. Earl B. Hailston, the commander of the Marine Forces in USCENTCOM, described the role of Dragon Eye and other UAVs as follows:⁸¹

I would tell you right off the bat...that things that we were most pleased with are...intel on the battlefield, ready intel to the commander, so that he can see over the hill in front of him and then control—have more control, anyways, on his future.

We were very, very pleased with the capability of the Predator, on how it worked across the field, across the area. We had very, very good success with ATARS on the F-18s. And we enjoyed the same success with the Harrier and its Lightning pods.

And as far as Dragon Eye, this is a very good story in that we launched the—our VMU units were running artillery strikes for us. We could get over the top of forces out in front of our lead elements and actually control artillery strikes onto the enemy.

So I think those that allowed us better command and control on the battlefield really worked out exceedingly well. We were also doing much better in our communications in that we've recently put into the field the Smart-T comm [communication] suite, which has kept us in solid comms across the battlefield, from some of our headquarters that still were in Kuwait and here, and certainly within Iraq.

The value of the Dragon Eye is illustrated by an incident on April 4, when an aircraft spotted a large Iraqi Army formation moving out of Baghdad under the cover of darkness. The data were passed to the Marine Combat Operations Center, which displayed them as a real-time stream of information. It provided grid coordinates that were passed on to Marine F/A-18s and AV-Bs, which attacked the Iraqi formation in a virtual “turkey shoot.” BDA later claimed some 80 vehicles destroyed.⁸² As the same time, a field report by the Marine Corps Systems Command illustrates the problems inherent in introducing a new system into the field and makes clear that small UAVs with “soda straw” coverage were scarcely the answer to every tactical problem:

Dragon Eye ~ Division HQ G-2's Dragon eye was used for a week, prior to crossing the LD. However, prior to crossing the LD the computer went down and there was no maintenance plan in place. (note: there was a maintenance plan in place. It is not clear, however, how much of this plan the operators were aware of). Thus, the HQ G-2 did not utilize the system. However, the week that the Dragon Eye was used it received favorable comments. Extensive analysis and feedback was received from 1st LAR's S-2 section on the Dragon Eye. They used this system daily throughout the war. Overall the system was highly regarded and the S-2 section was extremely happy to have it as a tool for their intelligence gathering.

The system's outer shell was characterized as “flimsy” and not durable enough. The harsh sandy environment immediately caused excessive wear. The rubber bands used for launch of the system consistently broke. Users stated that at least 10-15 extra launching bands were needed to be fielded with the system. There was no maintenance plan in case of an item breaking. CLS was discussed and immediately disregarded. Contracted civilians were not desired in the battle-space. Training for the Dragon Eye was minimal and all Marines desired more detailed training. They hoped that this training would be incorporated at the schools and throughout the fleet.

Batteries were a critical vulnerability of the dragon eye. Not only did the battery run out, but finding a replacement battery in a timely manner was nearly impossible. The battery used was company specific. Marines desired a rechargeable battery or as a second choice a battery that was easily purchased on the open market.

Night use of the dragon eye was poor. An infrared camera would be a usable addition to the dragon eye. Also some kind of infrared strobe would be helpful, especially in locating the dragon eye upon landing. Marines had trouble finding the small “plane” when it returned from a mission, especially at night.

The range of the dragon eye was acceptable, but as always, more was desired. A desire for retrans was voiced in order to extend the range. Overall, a recurring concern was communication from the ground with the system. The operators found that the signal received on the computer often “cut out” and no video feed was received. At times the operator desired to abort the mission; however, he could not “contact” the Dragon Eye. When the system was up and running the video resolution was very clear and easy to read/decipher. However, Marines found the 10km range somewhat insufficient; ideal would be a range of 20km. The current altitude of the system was also found to be insufficient. For clearer pictures and easier deciphering the Marines desired the system to be capable of being flown as low as 100ft. Flight duration (currently 1 hour) was also insufficient; ideal desired time would have been 2 hours.

Finally, the laptop had a few features that could have been a bit more “user friendly.” The method of looking at numerous pictures at one time was very cumbersome and needs to become more “user friendly” (i.e., double click on one icon to open a picture vice filtering through various tool bars). Also, the laptop needs to be plugged in; a rechargeable battery option would be good for an infantry Marine in the field. On a “positive note,” the size and weight of the Dragon Eye were considered ideal. If given the choice of keeping the current capability and thus maintaining size and weight or increasing the capability/technology with the result of a dramatically heavier and larger machine the Marines overwhelmingly would choose the former.

The Shadow and the Raven

The US Army also made added use of UAVs. The Army used a small short-range UAV called Pointer at the unit level. The Pointer is designed as a tactical reconnaissance vehicle with onboard camera (color, or IR day/night vision). It relays live video images to the pilot and mission navigator, to a video recorder, or even to other remote ground receivers. It has GPS in its standard version, and some seem to have had chemical and biological weapons detection sensors. It has a flight duration of 1.5 hours, an airspeed of 29-80 km/hour (22–50 mph), and a patrol radius of 8 km (5 miles).⁸³

The Army may also have made use of the Raven, a six-pound, smaller version of the Pointer that was rushed into service for the first time for use in Afghanistan,⁸⁴

The Army did introduced a new UAV called the Storm Shadow 200 at the brigade level. It was used after the 4th Infantry Division deployed, and flew 800 hours worth of missions during the Iraq War. It also used a large UAV called Hunter at the corps level. The Hunter is being modified as aUCAV as a result of the lessons of Afghanistan and Iraq. It will be adapted to fire the BAT or brilliant anti-tank munition, Hellfire, Stinger, and possibly the 2.75” rocket.⁸⁵

The UAV Tactical User Interface

As with most other transitional systems, there were important issues in making effective use of UAVs. Informal U.S. Army and USAF reporting tends to concentrate on a lack of adequate assets and problems in the user interface. The report on the lessons of the war by 1 Marine Division provides a more detailed perspective, and the need to develop more effective forces becomes particularly clear when several of the lessons drawn are examined together.⁸⁶

After crossing the Line of departure, the Division received very little actionable intelligence from external intelligence organizations. The Division had to assemble a coherent picture from what it could collect with organic and DS assets alone.

The nature of the battlefield, the extreme distances, high operational tempo and lack of a coherent response from a conventional enemy all made it difficult for an external agency to know what was

tactically relevant and required by the GCE commander. The Byzantine collections process inhibited our ability to get timely responses to combat requirements with the exception of assets organic to or DS to the Division. This made the Division almost exclusively reliant on organic or DS collection assets. The Division found the enemy by running into them, much as forces have done since the beginning of warfare. The Pioneer worked great when the bureaucracy between the VMU and the Division G-2 could be negotiated, but the lack of a habitual relationship and adequate rehearsal time limited our ability to do so. A superb example of a successful UAV system was the Dragoneye, which was fielded to selected Battalions and allowed to collect against the commander's priorities, locations, and schedule without interference from higher headquarters.

On a fluid high tempo battlefield, a highly centralized collections bureaucracy is too slow and cumbersome to be tactically relevant. The best possible employment option is to push more assets in DS to the lowest tactical level and increase available organic collections.

... Generally, the state of the Marine Corps' tactical intelligence collection capability is well behind the state of the art. Maneuver units have limited ability to see over the next hill, around the next corner, or inside the next building.

Supporting intelligence collectors (VMU, P-3AIP, ATARS, Theater and National level assets) were great for developing deep targets, subject to the prioritization of higher headquarters (Division and higher.) Navigating the labyrinth of collection tasking processes proved too difficult in most cases to get reporting on Division targets, and certainly for Battalion-level collections. For the amount of money spent on an ATARS POD, could be handsomely equipped with a suite of motion sensors, digital imaging equipment with zoom lenses, laser range finders, small UAVs, thermal imagers, robotic sensors and other tactically focused intelligence collectors.

The Marine Corps has a tremendous void in its intelligence collection capabilities at the echelon that needs it the most.

...Despite heavy focus and planning for Visual Aerial Reconnaissance (VAR) and numerous attempts to request support during the war, the actual output of the process was disappointing.

The G-2, 3d MAW produced an outstanding VAR plan and methodology. In execution, however, it was clear that the Wing operators and aircrew did not have an appreciation for how important their efforts were in driving the Division's efforts and saving lives. More training and rehearsals of this concept would likely improve the collections. This should be routine for aircrews to assist the GCE by providing much-needed aerial perspective. The DASC could have facilitated ad-hoc VAR requests on an individual sortie basis, by ensuring collection of the VAR NAIs based on their knowledge of an aircraft's position in the battlespace. An entire intelligence function was left out by the DASC and its capabilities to route conventional air platforms over areas of interest in the Division battle-space.

Understanding and advocacy for GCE requirements greatly diminishes outside the shouting radius of the GCE commander. More work has to be done to institutionalize the VAR process in the MAGTF in order for it to live up to its potential.

1st Marine Division successfully employed the Pioneer Unmanned Aerial Vehicle (UAV) in the role of fire support sensor. Success in this area was limited only by competition with the UAV's primary mission as a collections asset.

The UAV proved to be a very valuable observer, facilitating the proactive attack of enemy high payoff targets. It's ability to loiter on station and "adjust" fires real time ensured desired effects on target and provided real time Battle Damage Assessment (BDA). In what may have been the best example of the Division's employment of the UAV in the aerial observer role, the Division Target Information Officer coordinated with G-2 Collections to have the UAV confirm the locations of the Division's preplanned targets for one of the artillery preparations on G-day. The mission flew within 2 hours of fire support plan execution and four targets in the plan were refined. UAV was again overhead as the preparation was fired before being re-tasked in Direct Support (DS) of one of the Regimental Combat Teams (RCTs). While the UAV was still in DS of the Division, the TIO

was able to observe secondary explosions confirming the destruction of at least one of the targets in the fire plan.

The UAV was not employed to refine preplanned targets prior to the execution of subsequent fire support plans, largely due to competing requirements for employment of the asset. To employ the UAV effectively as a fire support acquisition platform requires dedicated UAV sorties. OIF experience argues for a robust capability that can provide 24-hour coverage to both the Division and one Regimental Combat Team (RCT) (the Main Effort).

Tactics, techniques, and procedures (TTPs) for the employment of UAVs as a fire support sensor have not been formalized. The Division's experience in OIF suggests that:

- The TIO should be the interface between Fires and the UAV payload operator. The payload operator is the observer.
- Remote Receive Terminals (RRTs) are required at both the Division and RCT.
- A direct communications link is required between TIO and UAV payload operator. In OIF, this was accomplished using internet chat.

... As the Marine Corps acquires a replacement for the Pioneer UAV, it should buy enough systems to dedicate platforms to target acquisitions as well as to collections. In the interim, I MEF should support training opportunities that allow the Division to integrate UAV into live fire training and afford VMU's payload operators opportunities to adjust fires onto targets.

It is not clear just how much the U.S. Army and allied ground forces suffered from the same problems as the Marine Corps. There are enough anecdotal reports to suggest, however, that providing effective imagery to the actual warfighter remains a major problem and that there is a tendency to favor higher echelons of command even if the requirement is less time-sensitive and tactically oriented.

As a result, broad examination may be needed of the extent to which warfighting intelligence is tailored to meet the time-sensitive needs of the user on the ground, and UAVs offer a potential way of providing cost-effective direct support to ground combat units. Certainly, the Marine Corps analysis reiterates many other comments that indicate that jointness and netcentric warfare become much less effective at the battalion level and lower.

UAV Procurement and the UAV Road Map

The success of UAVs is indicated by the fact that the United States issued a new UAV "road map" on March 18, 2003, just before the Iraq War. The road map laid out the development and use of unmanned aerial vehicles and unmanned air combat vehicles over the next 25 years based on the lessons of Afghanistan. The road map called for significant advances in UAVs in dealing with missions like the suppression of enemy air defenses. It called for better interoperability and standardization, for improved ability to manage air corridors and deconflict the use of UAVs/UCAVs (unmanned combat aerial vehicles), and for more rapid advances in UCAVs.⁸⁷ The road map also called for an increase in the number of UAVs supporting global military operations from around 90 in 2003 to 350 by 2010.⁸⁸

After the Iraq War, the United States issued plans to increase funding for UAVs from \$1.3 billion in FY2003 to \$1.7 billion in FY 2004, and to \$2.5 billion in FY2005.⁸⁹ This includes funding for 16 faster and better armed Predator Bs—a procurement justified by experience in Afghanistan as well as in Iraq—and about \$500 million for the

development of much larger versions of the Global Hawk, including a maritime surveillance version. The goal is to have 27 Global Hawks by 2007 and to eventually create a total force of 51, at an average cost of \$57 million each. At the same time, the United States is stepping up its research effort in creating much more advanced unmanned combat aerial vehicles.

HUMINT, Training, Staffing, and the Human Dimension

One of the more striking aspect of the material reviewed for this analysis is how often the analyses of the lessons of the Iraq War focus on technology, IT architecture, and procedures, and how rarely it focused on the need to provide adequate staffing and training, a dn to supplement technical IS & R assets with HUMINT. They are equally weak in addressing the issues of human intelligence (HUMINT), and the ability of terrorists and insurgents to adapt in ways that counter many of the advantages of US forces. As a result, many emerging intelligence requirements are understated, and the capabilities of netcentric warfare and high technology IS&R assets are exaggerated.

The Problem of Training

As the GAO points out, this is a critical weakness in preparing for virtually every area of modern warfare, and one that is recognized within the Department of Defense.⁹⁰

DOD officials also cited the need for high quality, realistic training to help personnel at all levels understand and adapt to changes in the operating environment brought about by the move to a networked force using advanced technologies. For example, officials noted that large increases in the pace of operations and the volume of information associated with more integrated force networks have overwhelmed commanders and other personnel at times. Further, increased networking and other changes have fostered a more centralized style of management, with senior leaders increasingly involved in operations.

At the same time, network-centric operating concepts are distributing information to lower and lower organizational levels, raising the potential for increased autonomy for small units and individual soldiers. However, training has not kept pace with these changes. For example, the Joint Forces Command reported that the lack of realistic training undermined intelligence and surveillance management and other operational-level capabilities during Operation Iraqi Freedom.

Consistent with DOD's basic tenet that a force must train as it will fight, DOD officials called for improved training to match the scale and tempo of actual operations. Similarly, the Defense Science Board reported that the changing operating environment will have unintended consequences that will require personnel to adapt to increasing cognitive demands at even the most junior levels. However, according to the Board, current training is not adequate to prepare DOD personnel to cope with these demands.

To ensure that these problems do not continue to inhibit realization of the full promise of DOD's strategy, we are recommending that DOD take steps to provide more standardized operating information for use during joint combat operations, formulate a plan to address problems with battlefield damage assessments, develop a unified battlefield information system to improve assessments of combat effectiveness, and develop realistic joint training to help commanders and personnel adapt to the changing operating environment.

Ironically, the problem of training and staff has become even more apparent as the US has become involved in counterterrorist and counterinsurgency operations. These require far more manpower intensive activity, far more area and language expertise, and even tighter integration of intelligence activity in ways where intelligence is fully integrated into tactical operations.

The Problem of HUMINT and Adequate Staff

The Iraq War has also shown that for all of its advances in technology, the US requires more extensive resources in traditional areas of human intelligence or HUMINT, and more analytic and collection resources. The full depth of the problems the US intelligence community encountered in trying to staff the Iraq War is highly classified. It is clear, however, that at the peak of the war, most of the analysts dealing with HUMINT activity had little or no experience in dealing with Iraq, and many had never dealt with the Middle East. This was as true in the CIA as it was in the field, and still seems to be true after more than a year of counterinsurgency activity following the fall of Saddam Hussein.

US and Western capabilities to conduct operations requiring extensive area knowledge and language skills are inherently limited. Similarly, high technology IS&R assets have not proved to be a substitute for HUMINT sources and analytic skills, although they can often aid HUMINT at both the operational and analytic level. If any comprehensive plans exist to deal with such issues, they have not been made public.

Some aspects of the HUMINT mission in Iraq and future wars may be impossible to accomplish with US resources alone. During most of the counterinsurgency phase of the "war after the war," the US has tried to carry out the mission of developing effective human intelligence (HUMINT) on its own, rather than in full partnership with the Iraqis.

This ignored one of the critical lessons of Vietnam. Rather than see the need for effective Iraqi intelligence collection and analysis -- and to rely on Iraqis for the lack of area and language skills and understanding of local political and tactical conditions -- the US tried to create a network of informers and local contacts and carry out analysis on its own. The US simply does not have the capability in terms of expertise and access to suddenly improvise a largely autonomous HUMINT effort as a substitute for partnership with an intelligence organization run by local allies.

Threat Approaches to Netcentric Warfare and Intelligence

One key intelligence lesson of the Iraq Conflict and the other conflicts in the region is that terrorist and insurgency forces can often create their own form of netcentric warfare and IS&R, and one which the US is not yet prepared to counter. The domestic and foreign insurgents in Iraq have shown that they can create informal distributed networks—either deliberately or accidentally: Like drug dealers before them, Islamist extremists and insurgents have learned enough about COMINT and SIGINT to stop using most vulnerable communications assets, and to bypass many – if not most – of the efforts to control cash flow and money transfers.

The use of messengers, direct human contact, and more random methods of electronic communication are all cases in point. At the broader level, however, insurgents in Iraq seem to have adapted to having cells and elements operate with considerable autonomy, and by loosely linking their operations by using the media and reporting on the overall pattern of attacks to help determine the best methods and targets.

Smuggling, drug sales, theft and looting, and direct fund transfers also largely bypass efforts to limit operations through controls on banking systems, charities, etc. Under

these conditions, a lack of central control and cohesive structure may actually be an asset – allowing highly flexible operations with minimal vulnerability to roll-up and attack.

The existence of parallel, and not competing, groups of hostile non-state actors provides similar advantages and has the same impact. The fact that insurgent and Islamist extremist groups operate largely independently, and use different tactics and target sets, greatly complicates US operations and probably actually increases the overall effectiveness of Iraqi and other insurgents.

Adapting Intelligence to Learn from Iraq's Insurgents and Terrorists

More generally Intelligence must adapt to doing a better job of anticipating and analyzing the details of how Iraq's insurgents have adapted to the "war after the war," and the broader lessons emerging from asymmetric warfare in the region. US policymakers, military planners, and intelligence analysts all need to do a far better job of understanding how America's current and potential opponents have adapted to impact of the Gulf War, Afghan conflict, and Iraq War.

The cumulative military lesson that they seem to have learned from all these conflicts is to avoid fighting the US and its allies on their own terms, and in direct "conventional" conflicts.

There are two important corollaries to these lessons:

- First, current and potential opponents know they must avoid the development, deployment, and use of weapons of mass destruction in ways that can be targeted. They must seek to avoid overt military forces where US preemption, deterrence, defense, and retaliation, can be an effective and politically justifiable response.
- Second, both regional hostile states and hostile movements understand that no amount of effort to adopt US tactics, weapons and technology, training methods, and readiness standards can significantly limit US capabilities to defeat conventional military forces and concentrated guerrilla forces in the foreseeable future. Traditional methods of modernization and force improvement can do nothing to significantly reduce the probability of defeat.

At the same time, the Iraq War has taught the region a far less advantageous set of lessons in regard to its capabilities for other forms of conflict. It has shown that it does not fully understand the extent to which it is involved in a broad political, psychological, and ideology conflict in the region. It has shown that it is incompetent and inept in political, psychological, and information warfare, and self-deluding and ethnocentric in evaluating its own performance. It has shown that its advantages in defeating conventional forces do not extend to dispersed asymmetric warfare, and that it is currently vulnerable to strategic overstretch in trying to carry out "Phase IV" and stability operations in even one major contingency.

The US cannot ignore regional opponents -- whether states or movements -- who learn from current conflicts, and then attempt to "mirror image" its military strengths. They can still kill, and sometimes quite effectively. Such regional opponents, however, cannot win. However, the US needs to worry far more about opponents who learn from the

whole mix of regional conflicts – including political and ideological struggles – and then attempt to exploit America’s very real combination of political and military weaknesses.

It is the political and ideological type of threat, and not the current tactical battles against organized insurgents, Islamists, or hostile factions, that is the critical challenge today in Afghanistan and Iraq. It is also the threat that will play out over at least 5-10 years in both countries, even if pluralistic and modern regimes do eventually emerge. If the US does not understand this reality, and act upon it accordingly, political and ideological forces will ensure that insurgents and instability will endure long after an active US military presence has ended.

Hostile states and movements have learned more than enough to make political, ideological and asymmetric warfare an enduring threat. It is clear from the actions of Al Qaida, the Taliban fighters, and Iraqi insurgents that regional fighters and terrorist movements are flexible and adaptive enough so that the threats posed by terrorist, extremist, and other hostile movements are certain to mutate and evolve for at least several decades.

US military victories in political, ideological, and psychological conflicts can only be tactical at best. Unless the US comes to understand that it is fighting a region-wide political, ideological, and psychological conflict, and adapts to fight this struggle on a continuing and much more realistic basis, it risks winning military engagements and losing the real battle. Unless the US makes stability and nation building a goal and course of action from the first day of planning, then throughout the course of combat, and from the “stabilization” phase to a true peace, its so-called revolution in military affairs will be a tactical triumph and a grand strategic failure.

The Need for Intelligence to Cover the Detailed Lessons Opponents Have Learned from the Iraq War and Other Current Conflicts

Any effort to speculate on how the lessons of the Iraq War and other recent wars that will shape the behavior of Middle Eastern states, Islamic extremists, and hostile movements through 2020 is necessarily speculative. There are some 22-26 countries in the Middle East, depending on who is defining the region. They are all very different, and several will probably experience major political upheavals, and or learn form new wars of their own in the coming years.

The current obsession with Al Qaida disguises the fact Islam and Islamist extremism is splintered and composed of many different and constantly changing elements whose behavior is often highly localized and shaped by the political and military situation in a given country. Other movements may emerge as hostile to the US because of the Israeli-Palestinian and Iraq conflicts, hard-line Iranian hostility and the broadly based anger in the Arab world.

At the same time, it is possible to describe on some of the more lessons that hostile states and movements seem to have learned from recent and ongoing conflicts, particularly the Afghan and Iraq wars. Such lessons can be divided into four main groups:

- Lessons learned by hostile states affecting their regular military or “conventional forces;”

- Lessons learned by hostile states or movements regarding asymmetric warfare;
- Lessons learned by Islamist extremist and other hostile movements; and
- Lessons learned regarding proliferation.

Hostile States and “Conventional Forces”

Like other regions of the world, Middle Eastern military forces are in rapid transition. The Middle East and North Africa is a region of some 22-24 countries, almost all of which have some mix of serious internal security problems, ongoing conflicts and/or serious external threats. They all pay close attention to wars in their region, and particularly to both military developments in the US and the level of US success and failure in the Gulf War, Afghanistan, and Iraq. The Arab-Israeli conflict is also a major force shaping regional perceptions, and Arab forces and Iran pay close attention to both how Israel fights and shapes its forces and how it uses US weapons and technology.

Anyone who has visited Arab and Iranian military facilities knows that they have extensive libraries of US military publications, as well as Western and Israeli military literature. They make use of US and Western arms suppliers and technical services, and a considerable amount of material is translated or provided in English in Arab and Iranian military publications. At least in friendly countries, this includes material on force transformation, the revolution in military affairs, asymmetric warfare, netcentric warfare, and counterterrorism, and a significant number of officers provide the experience they learned training in the US. Both Iran and Syria have military publications that regularly excerpt such US and Western material.

With the exception of Egypt, Israel, and Jordan, however, the ability to study such lessons is rarely the ability to act upon them with any great effectiveness. There is a considerable debate over the reasons why most regional countries are slow to react and make effective use of new technology and tactics. There is no debate over the fact that changes in tactics and technology are rarely balanced or efficient, and the end result is typically erratic and unpredictable.

Factors Driving the Pace of Regional Military Modernization

Moreover, as is the case in much of the world, intelligence needs to adapt to the fact that many of the changes taking place in post-Iraq War regional conventional forces are driven by factors that have little to do with the lessons of post-Cold War conflict that relate to the US.

- Many countries have been fighting a war on terrorism and against Islamist extremism far longer than the US. They have developed their own approaches to such conflicts, and are inherently better equipped than the US to deal with the political, psychological, and information aspects of such threats, as well as better able to make use of human intelligence and internal security methods.
- Proliferation is a long-standing problem that has scarcely been solved by Iraq's defeat and Libya's roll-back of its efforts. While proliferation is partly a counter to US conventional military strength, the quiet arms race between Israel and Syria (and Egypt to some degree) dates back to the 1950s, and long before the US played a high profile military role in the region. Iran's efforts began when the main threat was the Soviet Union and that were revitalized by the Iran-Iraq War. Iran sees the US as a threat, but also focuses on Israel. Indian and Pakistan proliferation have also acted to stimulate change in the region.

- Nations react to their own wars. Morocco is fighting the Polisario, which many Moroccan military officers see as a proxy for Algeria. Algeria has long been involved in its own civil war. Libya confronts a low-level insurgent threat in the Green Mountain area. Egypt is still dealing with the threat posed by the AIG and other radical elements. Israel is fighting the Palestinians and is a central focus of Egyptian, Jordanian, Lebanese, and Syrian military planning. The Gulf states have only begun to adapt to the fall of Saddam Hussein, and focus on the potential threat from Iran and the ongoing threat of Islamist extremism. Yemen still has serious internal stability problems, and the Sudan has a seemingly endless aptitude for civil conflict.
- Middle Eastern states face steadily growing pressures on their military budgets because of limited economic development, population growth, and a youth explosion that demands services and jobs. While it is not readily apparent, the total military spending of Middle Eastern and North Africa states dropped from \$96.3 billion in 1985 to \$60.5 billion in current US dollars in 2001 and \$57.9 billion in 2002. During this same period, total active military personnel dropped from 3.3 million to 2.4 million. Some countries – such as Egypt, Israel, and the UAE – have the aid or wealth to continue to recapitalize their present force structure. In broad terms, however, spending on arms imports has changed radically and few countries can afford to make radical increases in their investments in advanced weapons and technology except in the face of the most urgent threat.

Period (\$US Current Billions)	1987-1990	1991-1994	1995-1998	1999-2002
Arms Deliveries	79.4	47.1	30.8	35.7
New Arms Orders	93.3	58.7	63.9	46.6

Source: Richard F. Grimmett.

- These resource problems are further compounded by the fact that many countries now have long backlogs of deliveries – most dating back to the aftermath of the first Gulf War -- and are already experiencing serious conversion and absorption problems, compounded by maintenance, sustainability, and training problems. This does not mean countries cannot change. In fact, the MENA region placed \$13.1 billion worth of new orders for arms imports during 1995-1998 and \$27.0 billion during 1999-2002. This, however, does mean that there are growing limits to what most countries can do.
- The states most likely to be hostile to the US suffer from a number of serious problems in force modernization that other MENA countries do not. They have lost the Soviet Union as a source of technology and cheap or free arms. They have often been subject to sanctions or political limits to their purchases of arms, they have mismanaged their economies and have limited resources, and they have often been slow adopters of new tactics and technology. At the same time, they have maintained far larger force structures than they can afford to maintain, modernize, train, and sustain. The following data on arms transfers illustrate this point, and it is striking that two traditional threats – Iraq and Libya – are no longer hostile in the past sense of the term.

Period (\$US Current Billions)	1987-1990	1991-1994	1995-1998	1999-2002
<u>Iran</u>				
Arms Deliveries	7,800	3,900	2,100	700
New Arms Orders	10,200	2,700	1,700	1,000
<u>Iraq</u>				
Arms Deliveries	16,500	*	*	*
New Arms Orders	10,500	*	*	200
<u>Libya</u>				
Arms Deliveries	2,900	500	100	300
New Arms Orders	3,500	200	200	800
<u>Syria</u>				
Arms Deliveries	5,200	1,400	400	400
New Arms Orders	5,600	900	500	300

Note: * = less than \$50 million.
Source: Richard F. Grimmett.

In any case, one needs to be careful about assuming that nations act in predictable and well structured ways, act on the basis of military lessons, or act in ways that lead to predictable scenarios and forms of war fighting. Conflict and escalation are rarely deliberate in ways that are predictable in peacetime or carried out by “rational bargainers” in a mutually transparent environment. In the real world, events tend to be far more random and chaotic than strategic analysts would like to believe.

The Iranian Case Study

The remaining threat countries – Iran and Syria – differ sharply in their response to these realities. It is clear that Iran has done a better job of learning from the recent US, British, and Israeli experience. Its military literature focuses much more clearly on the lessons to be learned from such experience, and includes Russian and Chinese analysis as well as Western analysis. Iran clearly understands its vulnerability to the kind of attack the US led in Iraq and Afghanistan and that it cannot compete at the conventional level.

At the same time, Iran so far has not been able to react to many of the lessons it learned during the Iran-Iraq War, much less later conflicts. It sought advanced surface-to-air missile defenses like the S-300 as early as the late 1980s. It also tried to modernize its air fleet, sought more advanced armor, and to upgrade and replace its ships in ways it could not afford and/or could not obtain the arms it wanted. It has tried to compensate by developing its own production capabilities, but these have severe limits. While Iran seems to have developed several modernization plans since the Iran-Iraq War, and to have at least discussed major deals with Russia and other potential suppliers, it so far has been unable to offset the overall aging and deterioration of its conventional forces--much less react effectively to the lessons provided by the Iraq and Afghan conflicts.

The end result is that Iran has selectively purchased systems tailored more to asymmetric warfare than direct conventional conflict, slowly modernized its armor, and bought limited “fixes” of items like electronics, precision guided and advanced weapons, and RPVs. It has also increased its passive defense measures like shelters, concealment, and dispersal. These are all steps Iran began as early as the third year of the Iran-Iraq War, however, and the lessons of recent wars seem to have largely changed the focus of such efforts rather than their character.

The Syrian Case Study

Syria’s military modernization has faced much more severe financial pressures than Iran’s – partly because Syria is only a minor oil exporter and partly because of its unpaid debt for past arms to the FSU. The Syrian armed forces also seem more rigid and less adaptive than those of Iran, and more focused on traditional areas of force improvement like tanks and anti-armored weapons, more advanced surface-to-air missiles, and maintaining force size and mass.

Like Iran, Syria has bought limited “fixes” of items like electronics, precision guided and advanced weapons, and RPVs. Syria has attempted to upgrade its T-72 tank force, and create better mechanized infantry. It has attempted to work around the inherent limits of its aging mix of radars, SAMs, and C⁴I facilities with some better radars and “black box” fixes. It has obtained some of the most modern FSU anti-tank guided weapons.

Once again, however, it is unclear from recent Syrian actions that Syria is doing more than simply modifying lessons it learned about conventional force improvements that it learned during its limited participation in the Gulf War and by watching Israel. Syria has focused thereby on allowing its overall force structure to deteriorate more so than has Iran on tank buys, advanced ATGMs, and light to medium weight surface-to-air missiles. It seems to have become more static, defensive, and mass-oriented at a time Israel should have taught it all it needed to know about the need for a more modern approach to warfare without any Syrian attention to the US. Even Syria's elite Republican Guard, Special Forces, and attack helicopter units seem to reflect a relatively slow rate of adaptation of new tactics, weapons, and technology.

Other Arab "Wild Cards"

Any regional analysis of the risks posed by the lessons of the Iraq War should note that several countries friendly to the US have done a much better job of improving some aspects of their conventional forces than Iran and Syria, and so could pose a much more serious threat if they ever become hostile. Egypt and Jordan are case in point. Saudi Arabia and the UAE have also paid close attention to the lessons of the conflict, and still have significant discretionary resources to make major arms buys.

Reinforcing the Lessons of the Past

Each new conflict reinforces the lessons taught regarding the importance of a major qualitative edge in technology, tactics, training, readiness, and sustainability. The lessons of "precision," "speed," synchronicity," "maneuvering" and all of the other buzzwords of the revolution in military affairs, may be reinforced by advances in IS&R capabilities, jointness, and netcentric warfare. However, they are scarcely new.

The response of hostile states is evolutionary. Syria, for example, has used Lebanon as a proxy for war with Israel since 1970. It has used various Palestinian extremist and terrorist movements as proxies for at least as long. Iran has been using Lebanon as a proxy since the early 1980s, and first made major use of a revolutionary movement against a state at the time of the Shah – when the Shah used the Kurds against Iraq with US backing.

Finding alternatives to direct military confrontation with the US has a long history. At least part of the Iranian effort to build-up a major capability for asymmetric warfare in the Gulf is a product of the "tanker war," although the Iran-Iraq War did at least as much to drive Iran to build-up the naval branch of the Iranian Revolutionary Guards, strengthen its capability to operate off islands near the main shipping channels, acquire mines and anti-ship missiles, and buy submarines. Similarly both Iran and Syria found that transfers of money and weapons to Shi'ite movements in Lebanon could be effective counters to the US presence there after 1982, and ways of forcing a costly proxy war on Israel that still threatens Israel's northern front.

Both countries have a long experience with "wars of intimidation" in which saber rattling or quiet threats are used to achieve objectives in dealing with their neighbors without active conflict. Iran has used such techniques off and on, and with some skill, against its Southern Gulf neighbors under two totally different types of regimes since the British withdrawal from East of the Suez. Syria quietly pressured Saudi Arabia for aid using

such methods from the 1960s onwards. The game board and the color and shape of the pieces may change, but not the essence of the game.

Similarly, there is nothing new about the effort to acquire long-range missiles and weapons of mass destruction as possible counters to superior conventional strength and US and Israeli possession of nuclear weapons. The Shah attempted this as a counter to the Soviet Union in the 1970s, and Khomeini revitalized a program directed against Iraq, Israel, and the US in the 1980s. Syria has sought weapons of mass destruction since the 1960s, and its missile forces date back to the late 1960s.

The Iraqi Insurgency and US and Western Military Vulnerabilities

Many current US and Western vulnerabilities to asymmetric warfare emerged before the Cold War was over, and were being discussed in the Middle East long before the Afghan Conflict. These vulnerabilities may be summarized as:

- **Sudden or surprise attack:** Power projection is dependent on strategic warning, timely decision making, and effective mobilization and redeployment for much of its military effectiveness.
- **Saturation and the use of mass to create a defensive or deterrent morass:** There is no precise way to determine the point at which mass, or force quantity, overcomes superior effectiveness, or force quality — historically, efforts to emphasize mass have been far less successful than military experts predicted at the time. Even the best force, however, reaches the point where it cannot maintain its “edge” in C⁴I/battle management, air combat, or maneuver warfare in the face of superior numbers or multiple threats. Further, saturation may produce a sudden catalytic collapse of effectiveness, rather than a gradual degeneration from which the Israeli Defense Force could recover. This affects forward deployment, reliance on mobilization and reliance on defensive land tactics versus preemption and “offensive defense.”
- **Taking casualties:** War fighting is not measured simply in terms of whether a given side can win a battle or conflict, but how well it can absorb the damage inflicted upon it. Many powers are highly sensitive to casualties and losses. This sensitivity may limit its operational flexibility in taking risks, and in sustaining some kinds of combat if casualties become serious relative to the apparent value of the immediate objective.
- **Inflicting casualties and collateral damage:** Dependence on world opinion and outside support means some nations increasingly must plan to fight at least low and mid-intensity conflicts in ways that limit enemy casualties and collateral damage to its opponents.
- **Low-intensity and infantry/insurgent dominated combat:** Low-intensity conflict makes it much harder to utilize most technical advantages in combat — because low-intensity wars are largely fought against people, not things. Low-intensity wars are also highly political. The battle for public opinion is as much a condition of victory as killing the enemy. The outcome of such a battle will be highly dependent on the specific political conditions under which it is fought, rather than RMA-like capabilities.
- **Hostage taking and terrorism:** Like low-intensity warfare, hostage-taking and terrorism present the problem that advanced technology powers cannot exploit their conventional strengths, and must fight a low-level battle primarily on the basis of infantry combat. HUMINT is more important than conventional military intelligence, and much of the fight against terrorism may take place in urban or heavily populated areas.
- **Urban and Built-Up Area Warfare:** Advanced military powers are still challenged by the problems of urban warfare. In spite of the performance of US forces in the Iraq War, cases like Fallujah and Sadr’s urban operations have shown that truly pacifying a hostile city or built-up area can be extremely difficult. It also is not clear what would happen if a more popular regime -- such as the government of Iran -- tried to create an urban redoubt. Moreover, most western forces are not trained or equipped to

deal with sustained urban warfare in populated areas during regional combat — particularly when the fighting may affect large civilian populations on friendly soil.

- **Extended conflict and occupation warfare:** Not all wars can be quickly terminated, and many forms of warfare — particularly those involving peacekeeping and peace-enforcement — require prolonged military occupations. The result imposes major strains on the US politically, economically, and militarily.
- **Weapons of mass destruction:** The threat or actual use of such weapons can compensate for conventional weakness in some cases and deter military action in others.
- **Proxy warfare and false flags:** As the Lockerbie case demonstrated, states can successfully carry out major acts of terrorism through proxies without having their identity quickly established or suffering major military retaliation. Al Khobar is a more recent case where Iran's full role still remains uncertain and no retaliation has occurred. Similarly, the various charges that Iraq was the source of the first World Trade Center attack, and the conspiracy theories that follow, indicate that false flag operations are feasible. So do the number of terrorist incidents where unknown groups or multiple groups have claimed responsibility, but the true cause has never been firmly established.
- **HUMINT, area expertise, and language skills:** US and Western capabilities to conduct operations requiring extensive area knowledge and language skills are inherently limited. Similarly, high technology IS&R assets have not proved to be a substitute for HUMINT sources and analytic skills, although they can often aid HUMINT at both the operational and analytic level.
- **Attack rear areas and lines of communication:** The US talks about “swarm theory” and discontinuous battlefields, but Iraqi regular and irregular forces quickly learned—as Iraqi insurgents did later—that US rear area, support, and logistic forces are far more vulnerable than US combat elements. Such “swarming” may be slow, if irregular forces are not in place, but potential opponents understand this and can fight discontinuous battles of their own.
- **Political, ideological, and psychological warfare:** As has been discussed earlier, the US is vulnerable to such attacks on the grounds of ethnicity, religion, its status as a superpower active in the region, and its ties to Israel. Ironically, some can exploit its ties to moderate and conservative regimes on the grounds it fails to support reform, while others can exploit its efforts to advance secular political and economic reforms on the grounds they are anti-Islamic.

While most of the vulnerabilities on this list are not new, intelligence analysis must react to the fact that Post Cold War struggles like the Afghan and Iraq conflicts have made hostile and potentially hostile states focus more seriously on such vulnerabilities. In fact, they have made them the only options that offer some hope of deterrence and victory, particularly if they can be used in ways that do not lead the US to attack with large scale military forces.

It is important to note that it is extremely difficult for states to exploit any mix of such vulnerabilities successfully *in actual military combat* if the US has a serious strategic stake in a conflict. Some of these vulnerabilities do reduce US ability to use military power quickly and decisively against some targets. Some increase the intensity of conflict and the cost in dollars and casualties to the US.

At the same time, they do not provide any hostile or potentially hostile state with a clear way of defeating the US *if* the US determines that stakes are worth escalating to decisive military action. No Middle Eastern state is now strong enough to exploit such “lessons” successfully in major conflict.

Moreover, such efforts can sharply increase the cost of combat to regimes that use them, as well as to the US, and greatly increase the risk the US will escalate to removing the regime involved -- if this is not part of the original war plan.

This may not, however, mean that the states will necessarily avoid force. It can rather an incentive to support violent extremist groups and use them as proxies, to carry out covert attacks, and/or to attempt false flag operations.

Iraq's Islamist Extremist and Other Hostile Movements

Iraq's insurgents and foreign volunteers have shown that hostile movements face fewer problems in exploiting such vulnerabilities than states. The Afghan and Iraq conflict have shown they can hide and disperse, and are willing to take serious losses to achieve an ideological or political goal. The course of the Iraq and Afghan conflict, the Israeli-Palestinian conflict, and a host of terrorist incidents have all shown how difficult it is to deter and defeat true ideologues, those who are willing to be “martyrs,” and those who believe their cause is predetermined to win and will survive even if they and their movement are destroyed.

More narrowly focused non-state actors may also emerge as a rising threat to the US. The most immediate examples are movements like the Hezbollah, PIJ, and Hamas, because of US ties to Israel. The US also can also become the target of operations by more secular groups – as was the case with hard-line Palestinian groups in the 1960s and 1970s.

Winning by Losing

In fact, one of the most important aspects of Post Cold War conflict in the Middle East is not what Islamist and other extremist movements have learned from the US, or what new tactics they have adopted, but rather the change in their character from relatively clearly defined pragmatic political goals, and an emphasis on survival, to behavior based on eschatological warfare.

As a result, even the most successful US strikes and tactical victories can often be turned into reasons for calling the US an enemy, getting media coverage hostile to the US, and recruiting new cadres. At risk of a terrible pun, post-cold War conflicts and terrorism have shown that the US is culturally vulnerable to eschatological warfare, and has serious trouble in countering extremist ability to climb the “eschatological ladder.”

Mutate, Disperse, and Fragment

Hostile movements have learned they can survive and even enhance their capabilities if they mutate, disperse, and fragment. The current debate over whether Al Qaida still exercises central control, or has “franchised.” other movements using its name is largely irrelevant. It has done both in the past and it is almost certainly doing so now. Moreover, Salafi and other violent Islamist movements have shown they can mutate and evolve long after their initial cells and organizations are broken up.

Intelligence Coverage of the Tactical Lessons Enemies Have Learned

Iraq's insurgents and foreign volunteers have also shown that hostile non-state actors, like hostile states, learn from a full range of sources and not just from the US. It is clear that regional Islamist extremist and insurgent movements constantly study the history of past terrorist/asymmetric warfare/unconventional warfare attacks, and have long memories. They remember a long menu of options, and often try to repeat past successes. The

movement also learned long ago to only keep repeating successful tactics until they fail, to then use surprise where possible, and to take innovative risks. One does not have to be a Middle East or modern guerilla warfare expert to understand that analysts who insist that terrorist and insurgent movements cannot rapidly change their tactics, or are unwilling to use drastic forms of surprise, are part of the problem and not the solution. One only has to read Sun Tzu.

As a result, when it comes down to the tactical lessons that Islamist extremist and other hostile movements have learned from Post Cold War conflicts, there are many cases where they have really just adapted old tactics in fighting with the US and its allies.

The US often misinterprets the end result, simply because Americans do not have the same collective memory as states and movements in the region. Hostile actors can draw on a long historical menu of past tactics and their results, and adapt them to specific tactical circumstances. The US often ignores both the existence of this menu and the adaptiveness of its opponents, and the end result is often surprise where no surprise should take place.

Political, Psychological, and Information Warfare Lessons

There are so many case examples of “lessons” that mix pre and post Cold War lessons and methods of struggle that it is only possible to touch upon some of the more specific lessons involved. In broad terms, such lessons can be divided into two sets: those that affect political, psychological, and information warfare; and those that affect the way in which terrorist and insurgent movements attack or fight US forces in the field:

- **Co-opt the middle; create links to more moderate and popular causes:** Linking extremist action to popular causes, like the Israeli-Palestinian conflict has become a more common tactic in large part because the conflict has continued to escalate and has had such visibility. Many movements, however, have found additional ways to broaden their base. These include creating humanitarian and political wings; claiming to be pro-democracy and reform, attacking failed governance and corruption; calling opponents anti-Islamic; or invoking terms like Crusader, Zionist, imperialist, etc.
- **Exploit Arab satellite television as well as traditional media:** Islamist movements, Palestinian groups, and many others, have learned how to capture maximum exposure in regional media, use the Internet, and above all exploit the new Arab satellite news channels. In contrast, US officials often confuse their occasional presence with successful impact.
- **Maintain a strategy of constant attrition, but strike hard according to a calendar of turning points and/or at targets with high political, social, and economic impact:** Insurgents and Islamists in Afghanistan and Iraq (and in the Israeli-Palestinian conflict and other regional struggles) have learned the importance of a constant low-level body count and creating a steady climate of violence. This forces the US into a constant, large-scale security effort and ensures constant media coverage.

At the same time, insurgents and Islamists have shown a steadily more sophisticated capability to exploit holidays, elections and other political events, and sensitive targets both inside the countries that are the scene of their primary operations and in the US and the West. Attacks on Kurdish and Shi'ite religious festivals, and the Madrid bombings are cases in point.

Terrorists and insurgents know that such targeted and well timed attacks can successfully undermine the Israeli-Palestinian peace process and can help drive the Israeli-Palestinian conflict. A handful of terrorists in Hamas and the PIJ, and the Israeli who killed Rabin, effectively defeated both Israel and the Palestinian Authority. Dramatic incidents of violence in Beirut and Somalia have also created political and psychological conditions that have helped catalyze US withdrawal.

- **Push “hot buttons:” Try to find forms of attack that provoke disproportionate fear and “terror” force the US and its allies into costly, drastic, and sometimes provocative responses:** Terrorists and insurgents have found that attacks planned for maximum political and psychological effects often have the additional benefit of provoking over-reaction. Hamas and the PIJ exploited such tactics throughout the peace process.

The US response to the attacks on the World Trade Center and Pentagon led to US over-reactions – particularly at the media and Congressional level – that helped alienate the Arab and Islamic worlds from the US. At a different level, a limited Anthrax attack had a massive psychological impact in the US, inflicted direct and indirect costs exceeding a billion dollars, drew immense publicity, and affected the operations of a key element of the US government for several weeks.

- **Game Western and outside media:** Use interview access, tapes, journalist hostage takings and killings, politically-led and motivated crowds, drivers and assistant to journalists, and timed and targeted attacks to attempt to manipulate Western and outside media. Manipulate US official briefings with planted questions.
- **Externalize the struggle:** Bring the struggle home to the US and its allies as in the cases of the World Trade Center, Pentagon, and Madrid. Get maximum media and political impact. Encourage a “clash between civilizations.” Avoid killing fellow Muslims and collateral damage. Appear to be attacking Israel indirectly. Undermine US ties to friendly Arab states.
- **Use Americans as proxies:** There is nothing new about using Americans as proxies for local regimes, or attacking them to win support for ideological positions and causes. There has, however, been steadily growing sophistication in the timing and nature of such attacks, and in exploiting softer targets such as American businessmen in the country of operations, on striking at US and allied targets in other countries, or in striking at targets in the US. It is also clear that such attacks receive maximum political and media attention in the US.
- **Attack UN, NGO, Embassies, and Aid and foreign business operations:** Attacking such targets greatly reduces the ability to carry out nation building and stability operations to win hearts and minds. Attacking the “innocent,” and curtailing their operations or driving organizations out of country has become an important focus of insurgents and Islamist extremist attacks.
- **“Horror” attacks, atrocities, and alienation:** Whether or not the tactics were initially deliberate, insurgents in Iraq have found that atrocities like desecrating corpses and beheadings are effective political and psychological weapons for those Islamist extremists whose goal is to divide the West from the Islamic world, and create an unbridgeable “clash of civilizations.”

Experts have long pointed out that one of the key differences between Islamist extremist terrorism and previous forms of terrorism is that they are not seeking to negotiate with those they terrorize, but rather to create conditions that can drive the West away, undermine secular and moderate regimes in the Arab and Islamic worlds, and create the conditions under which they can create “Islamic” states according to their own ideas of “Puritanism.”

This is why it serves the purposes of Islamist extremists, as well as some of the more focused opponents of the US and the West, to create massive casualties and carry out major strikes even if the result is to provoke hostility and anger. The goal of Bin Laden and those like him is not to persuade the US or the West, it is rather to so alienate them from the Islamic and Arab world that the forces of secularism in the region will be sharply undermined, and Western secular influence can be controlled or eliminated. The goal of most Iraqi insurgents is narrower – drive the US and its allies out of Iraq – but involves many of the same methods.

Seen in this context, the more horrifying the attack the better. Simple casualties do not receive the same media attention. They are a reality of war. Killing (or sometimes releasing) innocent hostages does grab the attention of the world media. Large bombs in crowds do the same, as does picking targets whose innocence or media impact grabs headlines. Desecrating corpses, beheadings, and similar acts of violence get even more media attention -- at least for a while.

Such actions also breed anger and alienation in the US and the West and to provoke excessive political and media reactions, more stringent security measures, violent responses and all of the other actions that help provoke a “clash of civilizations.” The US and the West are often provoked into playing into the hands of such attackers.

At the same time, any attack or incident that provokes massive media coverage and political reactions, appears to be a “victory” to those who support Islamist extremism or those who are truly angry at the US – even though the actual body count is often low, and victory does not mean creating stronger forces or winning political control. Each such incident can be used to damage the US and Western view of the Arab and Islamic worlds.

- **Keep “failed states” failed. Attack nation building and stability targets:** There is nothing new about attacking key economic targets, infrastructure, and aspects of governance critical to the functioning of the state in any effort to disrupt its economy, undermine law enforcement and security, and encourage instability. The Al Qaida and Taliban attacks on road works and aid workers; Iraqi insurgent and Islamist attacks on aid workers and projects; and their role in encouraging looting, sabotage, and theft does, however, demonstrate a growing sophistication in attacking stability efforts and tangible progress in aid and governance. These tactics also interact synergistically with the above tactics.
- **Confuse the identity of the attacker; exploit conspiracy theories:** Insurgents and Islamists have learned that a mix of silence, multiple claims to be the attacker, new names for attacking organizations, and uncertain levels of affiliation both make it harder for the US to respond. They also produce more media coverage and speculation.

As of yet, the number of true false flag operations has been limited. However, in Iraq and elsewhere, attacks have often accompanied by what seem to be deliberate efforts to advance conspiracy theories to confuse the identity of the attacker or to find ways to blame defenders of the US for being attacked. In addition, conspiracy theories charging the US with deliberately or carelessly failing to provide an adequate defense have been particularly effective.

- **Shelter in Mosques, Shrines, high value targets, and targets with high cultural impact:** Again, exploiting facilities of religious, cultural, and political sensitivity is not a new tactic. However, as operations against Sadr and in Fallujah have shown, the tactics raise the media profile, create a defensive deterrent, and can be exploited to make the US seem anti-Islamic or to be attacking a culture and not a movement.
- **Exploit, exaggerate, and falsify US attacks that cause civilian casualties and collateral damage, friendly fire against local allies, and incidents where the US can be blamed for being anti-Arab and anti-Islam:** Terrorists and insurgents have found they can use the media, rumor, and conspiracy theories to exploit the fact the US often fights a military battle without proper regard to the fact it is also fighting a political, ideological, and psychological war.

Real incidents of US misconduct such as the careless treatment of detainees and prisoners, and careless and excessive security measures are cases in point. So too are careless political and media rhetoric by US officials and military officers.

Bin Laden, the Iraqi insurgents, etc., all benefit from every Western action that unnecessarily angers or frustrates the Arab and Islamic worlds. They are not fighting to influence Western or world opinion; they are fighting a political and psychological war to dominate Iraq and the Arab and Islamic worlds.

Intelligence Coverage of Lessons About Methods of Attack and Combat

There is no tight dividing line between tactics focused on the political and psychological nature of war and military tactics. Individual Islamist extremist and insurgent movements are also generally highly “localized” in character and adapt to the specific conditions they must operate it. However, some of the major adaptations that insurgents and terrorists are making in terms of warfare and modes of attack include:

- **Mix Crude and sophisticated IEDS:** Hezbollah should be given credit for having first perfected the use of explosives in well structured ambushes, although there is nothing new about such tactics -- the Afghans used them extensively against the Soviets. Iraq has, however, provided a unique opportunity for insurgents and Islamist extremists to make extensive use of IEDs by exploiting its mass stocks of arms. The Iraqi attackers have also learned to combine the extensive use of low grade IEDs, more carefully targeted sophisticated IEDs, and very large car bombs and other devices to create a mix of threats and methods that is much more difficult to counter than reliance on more consistent types of bombs and target sets.
- **Suicide bombs:** The use of such tactics has increased steadily since 1999, in part due to the high success rate relative to alternative methods of attack. It is not always clear that suicide bombing techniques are tactically necessary outside struggles like the Israel-Palestinian conflict, where one side can enforce a very tight area and perimeter, and point target security. In many cases, timed devices might produce the same damage.

Events in Iraq have shown, however, that suicide bombers still have a major psychological impact and gain exceptional media attention. They also serve as symbols of dedication and commitment, can be portrayed as a form of Islamic martyrdom, and attract more political support and attention among those sympathetic to the cause involved.

At the same time, regional experts must be very careful about perceiving such methods of attack as either a recent development or as Islamic in character. For instance, Hezbollah used suicide bombings in the 1980s, with an attack on the US Embassy in Beirut in 1981 and in six attacks in 1983 killing 384 people-- including 241 US Marines. Moreover, Hindu terrorists and the Tamil Tigers made extensive use of suicide bombings long before the Palestinians. In fact, Hindu terrorists still lead in the amount of suicide bombings committed by a particular group. The Tamil tigers have carried out 168 such attacks since 1987 versus 16 for the Hezbollah versus Israel (1983-1985), 44 for the Palestinians (1999-2004), and 28 for Al Qaida (1999-2004). A profiling of the attackers in some 168 attacks also found that only a comparative few could in any sense be called religious fanatics rather than believers in a cause.⁹¹

- **Attack LOCs, rear area, and support activity:** Iran and Afghanistan have shown that dispersed attacks on logistics and support forces often offer a higher chance of success than attacks on combat forces and defended sites, and makes the fight wars based on "deep support" rather than "deep strikes" beyond the FEBA.
- **Better use of light weapons and more advanced types:** While much will depend on the level of insurgent and Islamist extremist access to arms, Iraq and Afghanistan have seen a steady improvement in the use of systems like mortars and anti-tank weapons, and efforts to acquire Manpads and ATGMs. The quality of urban and road ambushes has improved strikingly in Iraq, as has the ability to set up rapid attacks, and exploit the vulnerability of soft skinned vehicles.
- **Create informal distributed networks—deliberately or accidentally:** Like drug dealers before them, Islamist extremists and insurgents have learned enough about COMINT and SIGINT to stop using most vulnerable communications assets, and to bypass many – if not most – of the efforts to control cash flow and money transfers.

The use of messengers, direct human contact, and more random methods of electronic communication are all cases in point. At the broader level, however, insurgents in Iraq seem to have adapted to having cells and elements operate with considerable autonomy, and by loosely linking their operations by using the media and reporting on the overall pattern of attacks to help determine the best methods and targets.

Smuggling, drug sales, theft and looting, and direct fund transfers also largely bypass efforts to limit operations through controls on banking systems, charities, etc. Under these conditions, a lack of central control and cohesive structure may actually be an asset – allowing highly flexible operations with minimal vulnerability to roll-up and attack.

The existence of parallel, and not competing, groups of hostile non-state actors provides similar advantages and has the same impact. The fact that insurgent and Islamist extremist groups operate

- largely independently, and use different tactics and target sets, greatly complicates US operations and probably actually increases overall effectiveness.
- **Adapt technology to terrorism and insurgency; GPS as an aid to dispersal, hideouts, rendezvous, smuggling and caches – “virtual garrisons in the sand”:** GPS coordinates provide a way of creating caches and coordinate points in mountain and desert areas with little of the complexity and confusion experienced in past conflicts. What were once largely special forces methods are now common place insurgent methods.
 - **Make cities and towns urban sanctuaries and defensive morasses:** Iraqi and Palestinian insurgents have both found that cities with supportive and/or accepting populations can be made into partial sanctuaries and centers for defensive fighting and ambushes, and that tactical defeat can normally be dealt with by dispersal and hiding among the civilian population. Such tactics combine well with attacks on local authorities and security forces friendly to the US, efforts to block nation building at the local, and efforts to exploit religion, ethnicity, tribalism, etc.
 - **Use of tunnels, shelters, mountain areas, and friendly groups and territories:** If Iraq has been the area training hostile insurgents and Islamist extremists in urban warfare and MOBA, Afghanistan and Western Pakistan have provided virtually the opposite set of lessons. So far, it is important to note that insurgents and terrorists have learned that IS&R assets normally have only had a significant impact on their traditional advantages in knowing the terrain and concealment when they are deployed in very high densities in local areas, and there is a significant hostile troop presence on the ground.
 - **Use neighboring states as partial sanctuaries:** While scarcely a new tactic, the Taliban and Al Qaida have repeated a standard lesson of guerrilla warfare and have expanded their area of operation into Western Pakistan and Central Asia, expanding the area of operations beyond national boundaries and creating a partial sanctuary. Iraqi insurgents have used cross border operations and taken advantage of the difficulties in securing the Syrian, Iranian, and Saudi borders. The Vietnamese used the same tactic in Cambodia and Laos, however, and so have many other insurgent forces. The idea of securing a nation based on securing the territory within its tactical boundaries is often a tactical myth.
 - **Exploit weaknesses in US battle damage assessment (BDA) and damage characterization capabilities:** Al Qaida, the Taliban, Iraqi insurgents, and other Islamist extremists have all learned that US intelligence is optimized around characterizing, counting, and targeting things, rather than people, and the US has poor capability to measure and characterize infantry and insurgent numbers, wounded, and casualties. They exploit these weaknesses in dispersal, in conducting attacks, in concealing the extent of losses, and in manipulating the media by claiming civilian casualties and collateral damage.
 - **Carry out sequential ambushes:** Increasingly carry out complex mixes of sequential ambushes to draw in and attack US and Allied responders to the initial or previous follow-on attacks.
 - **Exploit slow US reaction times:** Learn to exploit the delays in US response efforts, and rigidities in US tactical C⁴I behavior, to attack quickly and disperse.
 - **Exploit fixed US patterns of behavior:** Take advantage of a US tendency to repeat tactics, security, movement patterns, and other behavior; find vulnerabilities and attack.
 - **Use “resurgence”:** Disperse under pressure or when defeat seems likely. Let the US take an “empty” city or objective. “Resurge” when the US tactical presence declines.
 - **Use Incident numbers and tactics that strain or defeat US intelligence, surveillance and reconnaissance (IS&R) assets:** There is no question that assets like RPVs, aircraft, SIGINT systems, etc. can provide significant capability *when they are available*. It is unclear whether it is deliberate or not, but the geographic spread and daily incident count in Iraq indicates that insurgent movements and actions often reach numbers too large to cover. In fact, the US averaged some 1,700-2,000 patrols per day during May 2004. While it is nice to talk about netcentric warfare, it is a lot harder to get a big enough net.

Hostile movements also have learned that the US has far less ability to track and characterize irregular forces, insurgent/terrorist teams, and urban and dispersed infantry than forces using mechanized weapons or significant numbers of vehicles. Blending into the civilian population has worked well for local insurgents and Islamists in both Afghanistan and Iraq, and they seem to be learning that they can exploit rules of engagement where the US and its allies do not have soldiers or agents on the ground to perform targeting and IFF functions. As valuable as IS&R assets are, they do not provide some critical kinds of situational awareness with any reliability.

These lessons do, however, need to be considered in light of the fact the Hezbollah was able to use carefully structured ambushes, bombs, and other methods of attack to counter a much denser system of IS&R assets in South Lebanon. In practice, IS&R has proved to be a major aid to, and not substitute for, troop presence and active HUMINT.

- **Choose a vulnerable US center of gravity:** Deny the US a large, cohesive enemy while attacking small or dispersed elements of US and friendly forces, facilities, or targets.
- **Counter US IS&R capabilities by adapting new techniques of communication and interaction:** The steady leakage of details on US and allied intelligence collection methods has led Islamist extremist and terrorist movements to make more use of couriers and direct financial transfer; use electronic communications more safely; screen recruits more carefully, disperse better, and improve their hierarchy and cell structure.
- **Counter US IS&R assets with superior HUMINT:** Developments in Iraq indicate that the US faces a repetition of its experience in Vietnam in the sense that as various insurgent factions organize, they steadily improve their intelligence and penetration of organizations like the CPA, CJTF-7, the Iraqi government and security forces, and the Iraqi factions backing nation building.

The fact that the North Vietnamese had a decisive advantage in HUMINT, particularly once the US began to pull out, is often ignored in studies of the Vietnam War, as is the fact that the USG in Washington ignored repeated warnings from intelligence officers in the US embassy and PACOM that the hostile HUMINT network was vastly larger than the US would officially admit, and included many supposedly safe and loyal sources supporting the Embassy, US units, and the US media.

This became all too clear after the fall of Saigon. The HUMINT penetration was near total, the number of agents was about three times what the USG officially acknowledged, and an almost incredible number of drivers and others supporting the media turned out to have some ties to the North Vietnamese. Many other Vietnamese were loyal to the US – and we abandoned them when we pulled out. Loyalty was a very mixed bag.

Like Vietnam, Iraq is a warning that hostile HUMINT sources are often pushed into providing data because of family ties, a fear of being on the losing side, direct and indirect threats, etc. In Iraq's case, it seems likely that family, clan, and ethnic loyalties have made many supposedly loyal Iraqis become at least part time sources, and that US vetting will often be little more than either a review of past ties or checks on the validity of data being provided. The end result may be an extremely high degree of transparency on US, other Coalition, Governing Council, and every other aspect of US operations. This will often provide excellent targeting data on key US and allied officials, events, etc. It can include leverage and blackmail, and vulnerability data, as well as warning of US and other military operations. Dual loyalty and HUMINT penetration of Iraqi security and military forces may be the rule, rather than the exception.

Overarching Lessons

No lists of this kind can begin to be complete, or serve as a basis for predicting future changes. Rather, they portray the fact that military planning and intelligence must fully recognize that hostile movements are adaptive, they learn from experience, they find new ways to fight asymmetrically, and they find new US and allied vulnerabilities over time. It is also a further illustration of the fact that guerrilla wars can rarely be won by

battles of military attrition if the guerrilla movement has a strong political and ideological component and is not defeated in political and ideological terms.

If there are any broad counter lessons that the US policy, military, and intelligence communities should learn from such changes in Post-Cold War tactics, the first is that US efforts to use political, psychological, and information warfare are at least as critical as US military operations in direct combat.

Second, and more importantly, the concepts of Phase IV, “stability,” and “nation building” the US employed during the first states of the wars in Afghanistan and Iraq were fundamentally wrong and self-defeating. Such activities were perceived as phased, secondary priorities that essentially wasted skilled manpower and resources. Winning the war was given a far higher priority than winning the peace. They should have been seen as having more ultimate strategic importance than defeating “conventional” enemy and insurgent forces.

The US should have made shaping hearts and minds a key priority from the start of combat. The US should also have carried out stability operations from the first day of combat, and understood that only successful Phase IV, “stability,” and “nation building” operations can achieve successful grand strategic results against determined and highly motivated Islamist extremists and other insurgents with strong popular support.

The US and the West must understand they are fighting a region-wide political and ideological struggle at the same time they are fighting conflicts in Iraq and Afghanistan. They must do everything possible to avoid being trapped into helping to create a real “clash of civilizations.” The US and the West must reach out to Arab and Islamic moderates and intellectuals, to strengthen ties to friendly regional regimes, and concentrate on defeating the real enemy: Islamist extremists, terrorists, and insurgents who are just as much the enemy of reform and progress in their own countries and cultures as they are of the US and the West.

British Intelligence Lessons of the Iraq War

The British Ministry of Defense report on the lessons of the Iraq War does not go anything approaching the level of detail on intelligence issues available from US sources, but still have several important passages of both the role of intelligence, and the problems in creating effective interoperable C⁴I/BM systems. Many of the issues raised duplicate or supplement the previous analysis drawn on the basis of US experience. The British report does, however, provide a number of important insights, and provides crucial insight into a close ally's need for the US intelligence community to be ready to support it in common operations:⁹²

Broad Lessons on Intelligence

3.9 Intelligence played an invaluable part in every aspect and at every level of this campaign. This activity ranged from analysis of the intentions of the Iraqi regime to the specific targeting of individual military units, and the integration and analysis of information from a wide diversity of technical and other sources. The tempo and effects produced by land, sea and air operations were directly attributable to the quality, availability and timeliness of the intelligence provided, which was significantly and critically enhanced by access to US and other coalition sources. However, Iraq had been subject to 10 years of significant intelligence effort since the end of the 1991 Gulf Conflict. The intelligence preparation challenge was therefore less than would be required for a new theatre. Key vulnerabilities and vital points were well known, allowing precision effects to be applied early on in the campaign.

3.10 First Reflections emphasised the challenge to intelligence organizations posed by the significant increase in the demand for intelligence and the need to service the requirements of rapid, decisive and multi-layered campaigns. We concluded that: there was a need to review our structures and specialist and deployed manning to ensure their suitability and resilience to meet this challenge; greater connectivity between national and allied elements and access to robust communications was required; the era of Network Enabled Capabilities demanded an increased tempo of intelligence; human intelligence, linguistic, imagery and technical skills were of particular importance; commanders and staff at every level needed to be capable of accessing and contributing fully to the intelligence process; and mechanisms were required to ensure that the full range of battlefield effects could be analyzed as soon as they occurred.

Cultural Knowledge and Language Training

9.33 The ability to communicate with the local Iraqi population was critical to the success of the operation, resulting in a requirement for large numbers of interpreters throughout. The Department will review the provision of interpreters for future operations. By recording the training which personnel (including Reserves) have undertaken in particular languages and cultures, good quality interpreters could be more easily sourced at short notice. This would enhance the UK's overall military capability in future operations.

Post Conflict Planning and Intelligence

11.1 Detailed planning for the post-conflict phase took place in parallel with the contingency planning for combat operations. Indeed, the military campaign was designed specifically with the coalition's post-conflict objectives in mind: for example, offensive operations were carefully targeted to ensure they had the least possible impact on Iraq's civil infrastructure. However, in the run up to the launch of the operation, it was important to avoid giving the impression that conflict was inevitable, as we still hoped for a diplomatic solution to the crisis. Contingency planning for a post-conflict Iraq was particularly sensitive as it necessarily had to start from the assumption that a conflict would eventually take place. In consequence, involvement in the initial stages of this planning was restricted to a relatively small group within Whitehall. The Cabinet Office initially took the lead in co-ordinating work on post-conflict planning and reconstruction, but as the work grew this responsibility was increasingly transferred to the Foreign and Commonwealth Office. Post-conflict planning faced many complications as it was difficult accurately to predict what conditions would exist in post-Saddam Iraq. In particular, the degree to which Iraqi administrative structures would remain to provide a ready framework for continuity and the extent to which the international community would engage were unknown. It was only after the fall of the regime that the

extent of Ba'ath party domination of nearly all aspects of the Iraq state and society became clear. The impact of the sudden collapse of the regime was enormous, with the removal not just of top officials, but the whole of senior and most of middle management. The sudden liberation of a population that had suffered under such a long-ruling and viciously repressive regime also led to outbreaks of anarchy, looting and crime. These effects significantly complicated the post-conflict task.

11.3 At the end of the combat phase of the operation, coalition forces occupied the key cities and towns in a country with an estimated population of some 24 million people, and a total land area of over 437,000 square kilometres. Prior to the conflict a major concern had been that conflict might precipitate a humanitarian crisis, possibly as a consequence of large-scale refugee flows or disruption to essential services such as water and food distribution. Coalition plans took close account of this concern. The UK Government consulted UN agencies, the US and others in preparing to deal with a range of possible humanitarian crises.

11.5 In the event there was no humanitarian disaster. A combination of coalition preparedness and the sheer speed of the operation meant that a humanitarian crisis did not have time to develop; in most areas, for example, the fighting passed so rapidly that there simply was no time for significant refugee flows to become established. There was some disruption of essential services and UK forces were involved in the delivery of emergency supplies of water - and to a much lesser extent, food - early in the conflict. However these were short-term requirements and small in scale when viewed in the context of the size of Iraq.

11.6 Although a humanitarian crisis was avoided, coalition forces have faced major post-conflict challenges. The most immediate and visible was the period of looting that, in places, followed the defeat of Iraqi forces but in others, crucially, was concurrent with continuing combat. Looting was not unexpected, but the scale of the problem was greater than envisaged and particularly difficult for forces to address while still committed to combat operations.

11.7 Furthermore, Iraq had faced years of neglect under Saddam. Despite Iraq's oil wealth and relatively high levels of education, its people endured serious poverty. The population largely depended on food handouts; the agricultural sector operated far below capacity; almost a third of children in the centre and south suffered chronic malnutrition; and the under-five mortality rate was 131 per 1,000 live births. Chronic under-investment in essential services had also taken its toll on power and water distribution systems. More than half of Iraqis living in rural areas had no access to safe water, and deaths from diarrhea and acute respiratory infections accounted for 70 per cent of child mortality. Hospitals, clinics, sanitation facilities and water treatment plants all suffered from chronic lack of maintenance

11.8 Most aspects of government and administration had been centrally controlled from Baghdad. The almost wholesale collapse of the Iraqi administration presented coalition forces with a triple challenge of simultaneously securing, administering and rebuilding the country. The continued absence - for a variety of reasons including political concerns and the uncertain security environment - of a number of the normal participants in post-conflict reconstruction (various NGOs, development agencies, etc) meant that the military had to combine their primary role of providing security with reconstruction tasks. While this military involvement in reconstruction has been successful, it has placed a greater burden on them than would be ideal, and contributed to the need for force level adjustments.

Problems in Net Centric Warfare

3.7 The UK's Communications and Information Systems (CIS) infrastructure could not easily support the information exchange requirements of the Iraq operation. UK forces had to rely on a variety of different communications systems connected by numerous gateways and interfaces. Integration of these capabilities was reliant on the procurement of additional equipment under UOR action and the initiative and skill of deployed personnel. Some gateways could not manage the volume of information traffic generated, inhibiting communication and information exchange between the UK Maritime, Land and Air contingents. The limited degree of interoperability between UK and US CIS also had an impact on the ability to support coalition planning and operations in a high tempo environment, though maritime UK/US interoperability was good. At the tactical level, however, UK Bowman Personal Role Radio equipment was a considerable success, enabling effective command and control at section and platoon level. Indeed, the US Marines purchased some 5000 sets. Clansman, the UK's current main tactical communications system which is due to be replaced by Bowman from 2004, also proved reliable on this operation, despite past difficulties.

3.8 Inadequate support for deployed CIS equipment placed a considerable burden on the units operating it, and substantial reliance was placed on contractor support in the UK. The operation also highlighted shortfalls in CIS training in a number of areas, such as web-based technology.

Intelligence and Targeting

6.3 The UK assisted in the development of a list of over 900 potential coalition targets to overwhelm the Saddam Hussein regime and its security forces and to degrade the command and control capacity of the Iraqi Armed Forces. These targets included key military installations, weapon sites, command and control centres, notable regime targets and communications networks. The targeting plan was determined with precise military effects in mind, utilizing the minimum proportionate force necessary for each target, and seeking as far as possible to avoid civilian casualties or damage to Iraqi infrastructure. Recent lessons from Afghanistan and other operations enabled a coherent plan to be refined through close co-ordination between US Central Command planners, MOD and the Permanent Joint Headquarters (PJHQ) in the UK and our National Contingent Commander in the Gulf. Significant targeting authority was delegated to commanders in theatre. However, all UK targets were defined within parameters agreed by Ministers, and legal and political advice was available to those approving targets at all levels. Where potential targets fell out with the delegations, they were submitted through PJHQ to MOD's targeting organization, who presented them for approval to Ministers for approval. As well as approving all targeting operations that were prosecuted using UK assets, or conducted from UK bases, on a number of occasions the UK influenced US specific target plans, highlighting the close UK/US relationship throughout this operation.

6.4 Clear parameters were set for the operational use of UK forces to guide the actions of commanders and individuals alike. These covered matters such as strategic level targeting direction down to specific instructions to troops on the ground on the use of personal weapons. For this operation, significant delegated powers were given to in-theatre commanders, enabling them to make rapid military decisions, including the authority rapidly to attack time sensitive targets as intelligence became available. The rigorous targeting process minimized damage to the main Iraqi infrastructure.

6.5 During any operation the relative priorities of targets are continually reassessed, a key factor in which is an evaluation of the effectiveness of previous attacks. Surveillance and

reconnaissance platforms as well as satellite imagery are a major source of this intelligence. However, although these sources were useful in previous operations when the intent was to destroy fixed installations, during this operation increased emphasis was placed on creating particular effects – possibly not destruction – and a significant proportion of targets were also mobile. Current surveillance and reconnaissance systems have limited capability in these areas and further work is required to address this shortfall for future operations.

6.14 The CAS effort was also hampered by the inability to provide sufficiently accurate co-ordinates for mobile targets. The majority of land forces plot target positions on maps, rather than using GPS equipment. Furthermore, GPS information on mobile targets provided by land forces was sometimes quickly out of date, underlining the need for pilots to reconfirm mobile targets by sight before committing to an attack. In order to conduct this type of 'seek and destroy' mission, additional aircraft were fitted with targeting designation systems - the Thermal Imaging and Airborne Laser Designation (TIALD) pod. Thirty such pods were deployed for this operation, and work is in hand to determine the utility of data-linking the imagery to ground stations and other aircraft. The TIALD pod was also used extensively during the campaign as a 'non-traditional' surveillance and reconnaissance tool in order to monitor potential Iraqi SCUD sites and tank positions.

Intelligence, Surveillance, and Reconnaissance

6.15 The capability of RAF Tornado GR4 (fitted with the new RAPTOR pod) and Canberra PR9 aircraft to provide high quality imagery in near-real time was highly valued by the coalition. Another asset used for 'non-traditional' surveillance and reconnaissance was the Nimrod MR2 (which is normally used in the maritime arena). These aircraft supported operations in western Iraq, providing a radio relay capability as well as surveillance and reconnaissance information.

6.17 RAF E-3D airborne early warning aircraft (AWACS) worked seamlessly with US Air Force E-3s to provide continuous coverage of one of the four AWACS orbits, throughout the warfighting phase of the

operation. Air surveillance assets were also provided by the Royal Navy. The Sea King Mk7 Air Surveillance and Control System performed well using its Searchwater 2000 radar, normally used over water, to provide battlefield surveillance and target cueing for UK land forces. The radar was able to detect moving enemy vehicles, which could then be attacked by Lynx helicopters. At times, the Sea King provided the only dedicated stand-off sensor coverage

6.18 Extensive use of Unmanned Air Vehicles (UAVs) enabled the coalition to conduct unrelenting operations, often in heavily defended areas such as those around Baghdad. Although the UK's Phoenix UAV, a first generation system, had a more limited capability than the US systems, it played an important and highly valued role in support of UK land forces, and demonstrated the increasingly key role UAVs may play in the joint battle as they become more capable. In all, Phoenix UAVs made a total of 138 flights during the operation. Of these flights, 23 ended in either the air vehicle being lost or damaged beyond repair, with a further 13 suffering damage that was repairable. The majority of losses were due to the technical problems of working in such an extreme climate. Phoenix was mostly used to locate targets for attack, and during the first few days of the campaign it operated almost 24 hours a day. Subsequently, the system was used mostly at night to maximize the resolution of its thermal image sensor.

Intelligence, Interoperability, and Coalition Warfare

7.1 Given the scale of its force contribution, the US inevitably led the planning for the campaign against Iraq. First Reflections described how, although the UK did not make final decisions on the composition and deployment of its force packages until early 2003, we were able to work closely with the US and influence the campaign from initial planning to execution. This was achieved through high-level political contacts and regular dialogue at official level, as well as by the presence of embedded UK officers in key US headquarters.

7.2 The US is expected to continue to play a leading role in world affairs for the foreseeable future and remain the predominant military superpower. If the UK is to join the US in future operations, we shall need to continue to be close to US policy-making and planning and, subject to affordability, be able to operate with its technological dominance and military doctrine. This will require a clear understanding of, and involvement in, emerging US military and political concepts and doctrine. To this end, it will be essential to continue to sustain liaison with high levels in the Pentagon and key US headquarters.

7.3 Different groups of nations will continue to contribute to international and regional security in response to rogue states, terrorism and trans-national threats. In this context, UK forces, in addition to working with the growing coalition of nations now in Iraq, are likely to continue their current deployment pattern in support of NATO, EU and UN operations. However, the UK may also have to operate with unfamiliar partners and address consequent problems with force packaging, standardization of procedures and equipment, and Combat identification (Combat ID). In this context, the significant contribution by UK Defence and Liaison staffs overseas, including Defence Attachés, to the planning and prosecution of the Iraq operation, underlined the importance of understanding the particular national sensitivities and objectives of allies and other nations.

7.7 It is probable that any future UK medium- or large-scale war-fighting operation will be fought in a US-led or -backed coalition. Working with the US in a coalition brings political, diplomatic and military advantages, including the aggregation of capabilities, flexible war-fighting options and the sharing of intelligence and risk. UK forces need to be commanded, structured, equipped and trained with this in mind. Although the UK cannot afford to match US capability on a pro rata basis, it should be possible to achieve congruence by optimizing key existing and emerging capabilities. UK forces' ability to work alongside US forces was fully tested in Iraq and many of the ensuing lessons concern interoperability issues, particularly communications. However, the first step towards interoperability is to ensure doctrine is coherent and relevant to US-led operations. For example, the ease with which 1(UK) Armored Division integrated with the US 1st Marine Expeditionary Force was helped by similar doctrine, and the RAF's ability to integrate seamlessly with the US Air Force reflected 12 years of operating together in the no-fly zones over Iraq.

7.8 The overwhelming success of 'rapid, decisive operations' can be characterized by the combination of effects-based warfare and network centric warfare – a system of war-fighting that provides the best tools for the job, in the shortest time and with the greatest effect. The use of fast-moving, heavy effect forces, utilizing 'smart technology', near real-time day and night shared situational awareness and network

solutions, linked to on-station or long range air power, was validated in Iraq. The US ability to combine land and air operations and support them from the sea and from friendly bases at very high tempo enabled the mix and impact of joint assets to be adjusted to operational need or the unexpected, across the whole theatre of operations. The characteristics of speed, simultaneity, multiple choice of effects and precision seem to offer solutions to situations in which time is of the essence in achieving operational objectives by the use of force, and where the ability to influence rapidly the perception, will and behavior of an opponent may be critical. This wide choice, effects-based approach is likely to dominate US doctrinal development and will require potential partners to adjust their force structures if they are to maintain congruence and contact with an accelerating US technological and doctrinal pre-eminence.

7.9 The planning and conduct of the Iraq operation was facilitated by the close professional relationship that has developed between the US and UK, not only as leading members of NATO, but also through numerous bilateral and institutional contacts, and the benefits of training and operating together over many years (see paras 9.29 and 9.37). Some UK personnel deployed on the operation had trained regularly with the US and had developed a thorough understanding of US military culture and ethos, as well as their equipment, training and doctrine. This understanding partly offset the differences between UK and US military cultures and equipment.

Intelligence and Combat Identification

7.10 Combat ID enables military forces to distinguish friend from foe during operations, enhancing combat effectiveness while minimizing the risk of accidental engagement of friendly or allied forces, otherwise known as fratricide or 'Blue-on-Blue' incidents. The range of measures taken to provide protection for operations in the Gulf was described in First Reflections. Regrettably a number of fratricide incidents occurred which are under investigation. Experience in this and previous campaigns and the prospect of future operations of increasing pace, intensity and complexity indicate that efforts cannot be relaxed in this key area. MOD policy on Combat ID emphasizes that minimizing the risk of fratricide requires a combination of improved tactics, techniques and procedures, enhanced situational awareness and target identification devices. While our aim is to provide UK forces with as effective a Combat ID system as possible, regrettably no system is 100% failsafe, no matter how sophisticated the technology. Moreover, solutions must be interoperable with likely allies.

Australian Intelligence Lessons of the Iraq War

Like the British report on the lessons of the Iraq War, the Australian official analysis does not provide as much detail as the mix of official US sources. The Australian report is equally useful, however, in reinforcing some key US lessons, and in providing key insights into the need to achieve interoperable C4I/BM capability with a close ally.⁹³

Value of Inter-Departmental (Agency) Co-ordination.

The Government's response to the growing crisis had implications far beyond Defence. Inter-departmental mechanisms were critical to ensuring a 'whole-of-government' approach to diplomatic efforts to disarm Iraq. The Deputy Secretary Strategic Policy, Shane Carmody, and the Vice-Chief of the Defence Force, Vice-Admiral Russ Shalders, were given prime responsibility for inter-departmental coordination through the Strategic Policy Coordination Group.

This Group included representatives from the Departments of Prime Minister and Cabinet, and Foreign and Affairs and Trade. It met fortnightly during the second half of 2002. In early 2003, responsibility for Iraq policy matters was transferred to a new body – the Iraq Coordination Group (ICG). The ICG was chaired by the Department of the Prime Minister and Cabinet and included representatives from a range of Commonwealth departments and agencies (including the Departments of Defence, Foreign Affairs and Trade, Attorney-General's, Treasury, and Finance and Administration, and the Office of National Assessments).

In addition, an Iraq Task Force, comprising representatives of all relevant government departments and managed by the Department of Foreign Affairs and Trade, met frequently from September 2002, including throughout the war and subsequently, to exchange information and coordinate whole-of-government policy advice. These inter-departmental links and related task groups from other departments ensured the coordination of Defence planning and broader Government policy.

Inter-departmental information sharing and cooperation is critical to support a coordinated whole-of-government response. Defence will continue to emphasize inter-departmental coordination when responding to future needs.

Whole of Government Response: Inter-departmental information sharing and cooperation is critical to support a coordinated whole-of-government response. Defence will continue to emphasize inter-departmental coordination when responding to future security challenges.

Interoperability

The benefits of continuing high levels of inter-operability with our friends and allies, especially the US, is a major factor in successful coalition operations. Defence will continue to develop international relationships and its ability to operate with allies and partners. A specific area for development includes information-sharing on Command and Control and Information systems. Development of personal networks will be promoted through exchange and liaison officer programs to facilitate intelligence sharing and to allow speedy resolution of coalition operation issues. Operational deployment of Australian officers already on exchange with overseas forces presented some legal and administrative challenges which are also being addressed.

Need for Close Coalition Relations to Achieve Interoperability

By August 2002, our joint operations planning staff had developed a good understanding of contingency plans being developed by the US for use if a peaceful solution could not be achieved. They began developing appropriate options for the Government to consider should Australia decide to join US military action against Iraq.

Inter-Personal Networks. Liaison officers placed in US headquarters contributed significantly to the success of the planning process. Many had trained or served on exchange postings in the United States. Their effectiveness demonstrated the importance of personal relationships for developing and maintaining the levels of trust and inter-operability necessary for effective coalition operations. Defence will review personnel exchange postings to ensure they provide the best opportunities to support relationships with our

partners and allies.

Rapid Equipment Acquisition: All operations differ in some way and the requirement for additional specialist equipment is often identified in the planning stages of an operation. Defence is developing a rapid acquisition policy based on successful procedures used in these operations. The policy addresses stewardship, through-life-support, and financial management.

Lessons Relating to C4I/BM

. During Operation Bastille, Australia retained control of our forces at all times, while still working effectively within the Coalition (as has also been the case throughout Operations Falconer and Catalyst). Chief of the Defence Force (CDF), General Cosgrove, retained full command of all Australian Forces. To ensure effective overall strategic direction of our efforts in Iraq, he received briefings and advice on an almost daily basis from Defence's Strategic Command Group (SCG).

Command Procedures: Improvements in communications technology assisted effective high-level command arrangements throughout the operation. Defence will continue to pursue appropriate technology to maintain and improve its co-ordination of operations.

To operate successfully in coalition, the Australian forces in the Middle East Area of Operations needed to operate under the operational control of Coalition component commanders. This arrangement let Coalition commanders assign specific tasks to ADF forces while they remained under their Australian commanding officers at unit level. Although ADF force elements worked toward the overall Coalition combat plan, there were processes in place to ensure that Australian forces were always employed in accordance with Australian Government policies.

Royal Australian Air Force (RAAF) and special forces officers were placed in the Coalition Air Operations Centre to ensure that targets assigned to ADF units were appropriate and lawful. Australian Commanders had ADF legal officers to advise them on the laws of armed conflict during the process of allocating targets. Australia received targets on the US-developed strike lists but assessed them according to Australia's own legal obligations. Several target categories were subject to Australian Ministerial approval before they could be engaged. Australian pilots could, and on occasion did, abort missions to avoid the risk of unintended casualties if their target could not be clearly identified from the air. These arrangements, complemented by the training and professionalism of our personnel, worked very smoothly.

Communications: Although communications were successful between Australia and the Middle East, and within the area of operations, they were sometimes hampered by insufficient bandwidth. The ADF will review communication bandwidth to ensure adequate provision for operational growth.

Intelligence and Surveillance

Intelligence and surveillance information is essential to networked combat operations in modern warfare. Investments and advances in the integration and networking of intelligence, surveillance and operational information must be actively promoted within the Defence Organization.

Unmanned Aerial Vehicles

Unmanned aerial vehicles (UAVs) were force multipliers through all phases of combat operations. The Defence Organization intends to move quickly to develop and integrate UAV capabilities into ADF doctrine, planning and operations.

Networking and Connectivity

Networked military operations contributed to Coalition success with shared information, intelligence and situational knowledge identified as crucial success factors. Defence will continue developing its Network Centric Warfare capacity through training, doctrine, equipment acquisition and capability enhancements.

Targeting Procedures

Defence modified procedures for approving target planning and attacks at the beginning of Operation

Bastille, making full use of improved communications technology. The speed and effectiveness of the new procedures were demonstrated during operations, and Defence will continue to employ these procedures.

C4I/BM and Force Protection:

Force protection remains a most important factor in modern combat operations and requires effective operational planning and use of all available measures to reduce the risk of casualties. The ADF used various measures to improve force protection, including armored vehicles, body amour, preventative health counter-measures, close air defence on RAN ships, electronic warfare self-protection equipment on RAAF aircraft, and electronic systems indicating the location of friendly forces. Coalition partners' experience reinforced the importance of effective force protection, especially in urban fighting.

Defence will continue to incorporate appropriate force protection measures in operational planning and capability procurement decisions. This will include the appropriate balance of physical and electronic force protection measures, including the use of amour, weapons systems, defensive sensors and a fully integrated battlespace management system to help forces survive and achieve their mission.

The Problem of Intelligence on Iraq's Weapons of Mass Destruction

No one outside the intelligence community can fully assess the quality of intelligence coverage of Iraq's WMD programs. Similarly, no one can fully assess the level of understanding intelligence did or did not have of proliferation in Iran, Israel, Libya, North Korea, and Syria; or of the complex supply chains coming out of key sellers like China, North Korea, Pakistan, and Russia. It is clear, however, that proliferation does pose a critical security challenge to the world, and that there are serious problems in intelligence coverage.

Iraq provides an obvious case study in the problems involved, although it is a case that has become so politicized that few go back to examine the detailed of what the US and British governments said, or the content of UNMOVIC and IAEA reporting. Such an examination shows that most of the content of US and British reporting did, in fact, track closely with the earlier inspection and analysis efforts of UNSCOM. It also shows that most of the content tracked closely with intelligence estimates made long before the war, and that did not differ significantly from those made under the Clinton Administration. Furthermore, interviews with French, German, and other officials indicate that their intelligence services made very similar estimates before the Iraq War.

This does not mean that the Bush and Blair governments did not “spin” intelligence analysis to support their cases for war. In several key cases, relating to Iraqi imports of uranium, the import of aluminum tubes for possible uses in centrifuges, and assessments that Iraqi weapon could be deployed in a matter of minutes, they also went further and used highly suspect material. Nevertheless, most the problem lay in the inability of the intelligence community to assess Iraqi capabilities.

Work is still underway to locate and analyze all the data the war has made available on Iraq's history of proliferation, its imports and domestic programs, its capabilities at the time of the war, and its goals or objectives. It has become clear, however, that the U.S. and British governments had only a tenuous understanding of the threat they faced from Iraqi weapons of mass destruction at the time the Iraq War began—and were unable to characterize the scale of the Iraqi effort they described as a key motive for the conflict—during the period before the war began.¹⁹⁴

Coalition commanders had little intelligence on Iraq's WMD programs and warfighting capabilities as they advanced. A wide range of reports during the war make clear that there were many false alarms—when elements of the advancing forces thought they had found weapons of mass destruction or the facilities to produce them; when Coalition forces donned chemical protection gear they later turned out not to need; or when Coalition commanders, lacking the tactical intelligence support that would give them a clearer picture of the risks involved, had to ignore the risk that Iraq might use such weapons.

Key Points in the U.S. and British White Papers

President Bush, Prime Minister Blair, and many U.S. and British officials made numerous charges before the war that Iraq was actively developing weapons of mass destruction that it had probably deployed combat-ready chemical and biological weapons; that it had an active nuclear weapons program; and that it was developing new delivery systems, including missiles and UAVs. The British government issued two white papers on Iraq, and the United States issued one. U.S. officials like Deputy Secretary of Defense Paul Wolfowitz made additional charges, and Secretary of State Colin Powell presented a detailed briefing to the United Nations setting forth additional U.S. charges against Iraq.

Most of the attention since the war regarding the prewar charges against Iraq has focused on the fact that both British and U.S. speeches and briefings included unvalidated statements that Iraq had sought uranium ore and was ready to use weapons of mass destruction, that the British paper on WMD stated that Iraq could deliver such weapons with only 45 minutes warning, and that one of the British white papers paraphrased unattributed material from a graduate student.

In reality, U.S. and British intelligence made a long series of complex charges, only some of which were properly qualified. To understand the true scale of the intelligence problems involved and the need for improvement in this intelligence, it is necessary to understand that the charges issued in the British Joint Intelligence Committee and CIA white papers involved the following detailed points:⁹⁵

Summary Conclusions

The two governments drew the following general conclusions in their public white papers:

British Summary

Intelligence shows that Iraq is preparing plans to conceal evidence of these weapons, including incriminating documents, from renewed inspections. And it confirms that despite sanctions and the policy of containment, Saddam has continued to make progress with his illicit weapons programs.

As a result of the intelligence, we judge that Iraq has:

- Continued to produce chemical and biological agents;
- Military plans for the use of chemical and biological weapons, including against its own Shia population. Some of these weapons are deployable within 45 minutes of an order to use them;
- Command and control arrangements in place to use chemical and biological weapons. Authority ultimately resides with Saddam Hussein. (There is intelligence that he may have delegated this authority to his son Qusai);
- Developed mobile laboratories for military use, corroborating earlier reports about the mobile production of biological warfare agents;
- Pursued illegal programmes to procure controlled materials of potential use in the production of chemical and biological weapons programmes; tried covertly to acquire technology and materials which could be used in the production of nuclear weapons;
- Sought significant quantities of uranium from Africa, despite having no active civil nuclear power program that could require it; recalled specialists to work on its nuclear program;
- Illegally retained up to 20 al-Hussein missiles, with a range of 650km, capable of carrying chemical or biological warheads;

- Started deploying its al-Samoud liquid propellant missile, and has used the absence of weapons inspectors to work on extending its range to at least 200km, which is beyond the limit of 150km imposed by the United Nations;
- Started producing the solid-propellant Ababil-100, and is making efforts to extend its range to at least 200km, which is beyond the limit of 150km imposed by the United Nations;
- Constructed a new engine test stand for the development of missiles capable of reaching the UK Sovereign Base Areas in Cyprus and NATO members Greece and Turkey), as well as all Iraq's Gulf neighbors and Israel;
- Pursued illegal programmes to procure materials for use in its illegal development of long range missiles;
- Learnt lessons from previous UN weapons inspections and has already begun to conceal sensitive equipment and documentation in advance of the return of inspectors.

U.S. Summary

Iraq has continued its weapons of mass destruction (WMD) programs in defiance of UN resolutions and restrictions. Baghdad has chemical and biological weapons as well as missiles with ranges in excess of UN restrictions; if left unchecked, it probably will have a nuclear weapon during this decade.

- Baghdad hides large portions of Iraq's WMD efforts. Revelations after the Gulf war starkly demonstrate the extensive efforts undertaken by Iraq to deny information.
- Since inspections ended in 1998, Iraq has maintained its chemical weapons effort, energized its missile program, and invested more heavily in biological weapons; most analysts assess Iraq is reconstituting its nuclear weapons program.
- Iraq's growing ability to sell oil illicitly increases Baghdad's capabilities to finance WMD programs; annual earnings in cash and goods have more than quadrupled.
- Iraq largely has rebuilt missile and biological weapons facilities damaged during Operation Desert Fox and has expanded its chemical and biological infrastructure under the cover of civilian production.
- Baghdad has exceeded UN range limits of 150 km with its ballistic missiles and is working with unmanned aerial vehicles (UAVs), which allow for a more lethal means to deliver biological and, less likely, chemical warfare agents.
 - Although Saddam probably does not yet have nuclear weapons or sufficient material to make any, he remains intent on acquiring them.
- How quickly Iraq will obtain its first nuclear weapon depends on when it acquires sufficient weapons-grade fissile material.
- If Baghdad acquires sufficient weapons-grade fissile material from abroad, it could make a nuclear weapon within a year.
- Without such material from abroad, Iraq probably would not be able to make a weapon until the last half of the decade.
- Iraq's aggressive attempts to obtain proscribed high-strength aluminum tubes are of significant concern. All intelligence experts agree that Iraq is seeking nuclear weapons and that these tubes could be used in a centrifuge enrichment program.
- Most intelligence specialists assess this to be the intended use, but some believe that these tubes are probably intended for conventional weapons programs.
- Based on tubes of the size Iraq is trying to acquire, a few tens of thousands of centrifuges would be capable of producing enough highly enriched uranium for a couple of weapons per year.

- Baghdad has begun renewed production of chemical warfare agents, probably including mustard, sarin, cyclosarin, and VX. Its capability was reduced during the NSCOM inspections and is probably more limited now than it was at the time of the Gulf war, although VX production and agent storage life probably have been improved.
- Saddam probably has stocked a few hundred metric tons of CW agents.
- The Iraqis have experience in manufacturing CW bombs, artillery rockets, and projectiles, and probably possess CW bulk fills for SRBM warheads, including for a limited number of covertly stored, extended-range Scuds.
 - All key aspects—R&D, production, and weaponization—of Iraq's offensive BW program are active and most elements are larger and more advanced than they were before the Gulf war.
 - Iraq has some lethal and incapacitating BW agents and is capable of quickly producing and weaponizing a variety of such agents, including anthrax, for delivery by bombs, missiles, aerial sprayers, and covert operatives, including potentially against the U.S. Homeland.
- Baghdad has established a large-scale, redundant, and concealed BW agent production capability, which includes mobile facilities; these facilities can evade detection, are highly survivable, and can exceed the production rates Iraq had prior to the Gulf war.
 - Iraq maintains a small missile force and several development programs, including for a UAV that most analysts believe probably is intended to deliver biological warfare agents.
- Gaps in Iraqi accounting to UNSCOM suggest that Saddam retains a covert force of up to a few dozen Scud-variant SRBMs with ranges of 650 to 900 km.
- Iraq is deploying its new al-Samoud and Ababil-100 SRBMs, which are capable of flying beyond the UN-authorized 150-km range limit.
- Baghdad's UAVs—especially if used for delivery of chemical and biological warfare (CBW) agents—could threaten Iraq's neighbors, U.S. forces in the Persian Gulf, and the United States if brought close to, or into, the U.S. Homeland.
- Iraq is developing medium-range ballistic missile capabilities, largely through foreign assistance in building specialized facilities.

Developments Since 1998

The two countries drew the following more specific conclusions in their white papers in discussing developments after Iraq expelled the UN inspectors in UNSCOM in 1998

British Summary of Developments Since in 1998

- Iraq has a useable chemical and biological weapons capability, in breach of UNSCR 687, which has included recent production of chemical and biological agents.
- Saddam continues to attach great importance to the possession of weapons of mass destruction and ballistic missiles that he regards as being the basis for Iraq's regional power. He is determined to retain these capabilities.
- Iraq can deliver chemical and biological agents using an extensive range of artillery shells, free-fall bombs, sprayers, and ballistic missiles.
- Iraq continues to work on developing nuclear weapons, in breach of its obligations under the Non-Proliferation Treaty and in breach of UNSCR 687. Uranium has been sought from Africa that has no civil nuclear application in Iraq.

- Iraq possesses extended-range versions of the SCUD ballistic missile in breach of UNSCR 687, which are capable of reaching Cyprus, Eastern Turkey, Tehran, and Israel. It is also developing longer-range ballistic missiles.
 - Iraq's current military planning specifically envisages the use of chemical and biological weapons.
 - Iraq's military forces are able to use chemical and biological weapons, with command, control, and logistical arrangements in place. The Iraqi military are able to deploy these weapons within 45 minutes of a decision to do so.
 - Iraq has learnt lessons from previous UN weapons inspections and is already taking steps to conceal and disperse sensitive equipment and documentation in advance of the return of inspectors.
 - Iraq's chemical, biological, nuclear and ballistic missiles programmes are well funded.
- **CIA Estimate of Developments Since 1998**
- Since December 1998, Baghdad has refused to allow UN inspectors into Iraq as required by the Security Council resolutions. Technical monitoring systems installed by the UN at known and suspected WMD and missile facilities in Iraq no longer operate. Baghdad prohibits Security Council-mandated monitoring overflights of Iraqi facilities by UN aircraft and helicopters. Similarly, Iraq has curtailed most IAEA [International Atomic Energy Agency] inspections since 1998, allowing the IAEA to visit annually only a very small number of sites to safeguard Iraq's stockpile of uranium oxide.
 - In the absence of inspectors, Baghdad's already considerable ability to work on prohibited programs without risk of discovery has increased, and there is substantial evidence that Iraq is reconstituting prohibited programs. Baghdad's vigorous concealment efforts have meant that specific information on many aspects of Iraq's WMD programs is yet to be uncovered. Revelations after the Gulf War starkly demonstrate the extensive efforts undertaken by Iraq to deny information.
 - Limited insight into activities since 1998 clearly show that Baghdad has used the absence of UN inspectors to repair and expand dual-use and dedicated missile development facilities and to increase its ability to produce WMD.

Chemical Warfare Program

The two countries drew the following conclusions regarding chemical weapons in their white papers:

- **UK: Chemical Warfare Program**
- Since the withdrawal of the inspectors the JIC has monitored evidence, including from secret intelligence, of continuing work on Iraqi offensive chemical and biological warfare capabilities. In the first half of 2000 the JIC noted 17 reports of intelligence on Iraqi attempts to procure dual-use chemicals and on the reconstruction of civil chemical production at sites formerly associated with the chemical warfare programme.
 - In mid-2001, the JIC assessed that Iraq retained some chemical warfare agents, precursors, production equipment and weapons from before the Gulf War. These stocks would enable Iraq to produce significant quantities of mustard gas within weeks and of nerve agent within months. The JIC concluded that intelligence on Iraqi former chemical and biological warfare facilities, their limited reconstruction and civil production pointed to a continuing research and development programme. These chemical and biological capabilities represented the most immediate threat from Iraqi weapons of mass destruction. Since 1998 Iraqi development of mass destruction weaponry had been helped by the absence of inspectors and the increase in illegal border trade, which was providing hard currency.

- In the last six months the JIC has confirmed its earlier judgments on Iraqi chemical and biological warfare capabilities and assessed that Iraq has the means to deliver chemical and biological weapons.
- Subsequently, intelligence has become available from reliable sources which complements and adds to previous intelligence and confirms the JIC assessment that Iraq has chemical and biological weapons. The intelligence also shows that the Iraqi leadership has been discussing a number of issues related to these weapons. This intelligence covers:
- Confirmation that chemical and biological weapons play an important role in Iraqi military thinking: intelligence shows that Saddam attaches great importance to the possession of chemical and biological weapons which he regards as being the basis for Iraqi regional power. He believes that respect for Iraq rests on its possession of these weapons and the missiles capable of delivering them. Intelligence indicates that Saddam is determined to retain this capability and recognizes that Iraqi political weight would be diminished if Iraq's military power rested solely on its conventional military forces.
- Iraqi attempts to retain its existing banned weapons systems: Iraq is already taking steps to prevent UN weapons inspectors finding evidence of its chemical and biological weapons programme. Intelligence indicates that Saddam has learnt lessons from previous weapons inspections, has identified possible weak points in the inspections process and knows how to exploit them. Sensitive equipment and papers can easily be concealed and in some cases this is already happening. The possession of mobile biological agent production facilities will also aid concealment efforts. Saddam is determined not to lose the capabilities that he has been able to develop further in the four years since inspectors left.
- Saddam's willingness to use chemical and biological weapons: intelligence indicates that as part of Iraq's military planning Saddam is willing to use chemical and biological weapons, including against his own Shia population. Intelligence indicates that the Iraqi military are able to deploy chemical or biological weapons within 45 minutes of an order to do so.
- When confronted with questions about the unaccounted stocks, Iraq has claimed repeatedly that if it had retained any chemical agents from before the Gulf War they would have deteriorated sufficiently to render them harmless. But Iraq has admitted to UNSCOM to having the knowledge and capability to add stabilizer to nerve agent and other chemical warfare agents that would prevent such decomposition. In 1997 UNSCOM also examined some munitions which had been filled with mustard gas prior to 1991 and found that they remained very toxic and showed little sign of deterioration.
- Intelligence shows that Iraq has continued to produce chemical agent. During the Gulf War a number of facilities which intelligence reporting indicated were directly or indirectly associated with Iraq's chemical weapons effort were attacked and damaged. Following the ceasefire UNSCOM destroyed or rendered harmless facilities and equipment used in Iraq's chemical weapons programme. Other equipment was released for civilian use either in industry or academic institutes, where it was tagged and regularly inspected and monitored, or else placed under camera monitoring, to ensure that it was not being misused.
- This monitoring ceased when UNSCOM withdrew from Iraq in 1998. However, capabilities remain and, although the main chemical weapon production facility at al-Muthanna was completely destroyed by UNSCOM and has not been rebuilt, other plants formerly associated with the chemical warfare programme have been rebuilt. These include the chlorine and phenol plant at Fallujah 2 near Habbaniyah. In addition to their civilian uses, chlorine and phenol are used for precursor chemicals that contribute to the production of chemical agents.
- Other dual-use facilities, which are capable of being used to support the production of chemical agent and precursors, have been rebuilt and re-equipped. New chemical facilities have been built, some with illegal foreign assistance, and are probably fully operational or ready for production. These include the Ibn Sina Company at Tarmiyah (see figure 1), which is a chemical research centre. It undertakes research, development and production of chemicals previously imported but

not now available and which are needed for Iraq's civil industry. The Director General of the research centre is Hikmat Na'im al-Jalu who prior to the Gulf War worked in Iraq's nuclear weapons programme and after the war was responsible for preserving Iraq's chemical expertise.

- Parts of the al-Qa'qa' chemical complex damaged in the Gulf War have also been repaired and are operational. Of particular concern are elements of the phosgene production plant at al-Qa'qa'. These were severely damaged during the Gulf War, and dismantled under UNSCOM supervision, but have since been rebuilt. While phosgene does have industrial uses it can also be used by itself as a chemical agent or as a precursor for nerve agent.
- Iraq has retained the expertise for chemical warfare research, agent production and weaponization. Most of the personnel previously involved in the programme remain in country. While UNSCOM found a number of technical manuals (so called "cook books") for the production of chemical agents and critical precursors, Iraq's claim to have unilaterally destroyed the bulk of the documentation cannot be confirmed and is almost certainly untrue. Recent intelligence indicates that Iraq is still discussing methods of concealing such documentation in order to ensure that it is not discovered by any future UN inspections.
- Almost all components and supplies used in weapons of mass destruction and ballistic missile programmes are dual-use. For example, any major petrochemical or biotech industry, as well as public health organizations, will have legitimate need for most materials and equipment required to manufacture chemical and biological weapons. Without UN weapons inspectors it is very difficult therefore to be sure about the true nature of many of Iraq's facilities.
- For example, Iraq has built a large new chemical complex, Project Baiji, in the desert in north west Iraq at al-Sharqat (. This site is a former uranium enrichment facility that was damaged during the Gulf War and rendered harmless under supervision of the IAEA. Part of the site has been rebuilt, with work starting in 1992, as a chemical production complex. Despite the site being far away from populated areas it is surrounded by a high wall with watchtowers and guarded by armed guards. Intelligence reports indicate that it will produce nitric acid, which can be used in explosives, missile fuel and in the purification of uranium.
- Iraq has a variety of delivery means available for both chemical and biological agents. These include: free-fall bombs: Iraq acknowledged possession of four types of aerial bomb with various chemical agent fills including sulphur mustard, tabun, sarin and cyclosarin; artillery shells and rockets: Iraq made extensive use of artillery munitions filled with chemical agents during the Iran-Iraq War. Mortars can also be used for chemical agent delivery. Iraq is known to have tested the use of shells and rockets filled with biological agents. Over 20,000 artillery munitions remain unaccounted for by UNSCOM; helicopter and aircraft borne sprayers: Iraq carried out studies into aerosol dissemination of biological agent using these platforms prior to 1991. UNSCOM was unable to account for many of these devices. It is probable that Iraq retains a capability for aerosol dispersal of both chemical and biological agent over a large area; al-Hussein ballistic missiles (range 650km): Iraq developed chemical agent warheads for al-Hussein. Iraq admitted to producing 50 chemical warheads for al-Hussein that were intended for the delivery of a mixture of sarin and cyclosarin. However, technical analysis of warhead remnants has shown traces of VX degradation product which indicate that some additional warheads were made and filled with VX; al-Samoud/Ababil-100 ballistic missiles (range 150km plus): it is unclear if chemical and biological warheads have been developed for these systems, but given the Iraqi experience on other missile systems, we judge that Iraq has the technical expertise for doing so; L-29 remotely piloted vehicle programme : we know from intelligence that Iraq has attempted to modify the L-29 jet trainer to allow it to be used as an Unmanned Aerial Vehicle (UAV) which is potentially capable of delivering chemical and biological agents over a large area.
- The authority to use chemical and biological weapons ultimately resides with Saddam but intelligence indicates that he may have also delegated this authority to his son Qusai. Special Security Organization (SSO) and Special Republican Guard (SRG) units would be involved in the movement of any chemical and biological weapons to military units. The Iraqi military holds artillery and missile systems at Corps level throughout the Armed Forces and conducts regular

training with them. The Directorate of Rocket Forces has operational control of strategic missile systems and some Multiple Launcher Rocket Systems.

○ **CIA: Chemical Warfare Program**

- Iraq has the ability to produce chemical warfare (CW) agents within its chemical industry, although it probably depends on external sources for some precursors.
- Baghdad is expanding its infrastructure, under cover of civilian industries, that it could use to advance its CW agent production capability. During the 1980s Saddam had a formidable CW capability that he used against Iranians and against Iraq's Kurdish population. Iraqi forces killed or injured more than 20,000 people in multiple attacks, delivering chemical agents (including mustard agent¹ and the nerve agents sarin and tabun²) in aerial bombs, 122mm rockets, and artillery shells against both tactical military targets and segments of Iraq's Kurdish population. Before the 1991 Gulf war, Baghdad had a large stockpile of chemical munitions and a robust indigenous production capacity.
- Although precise information is lacking, human rights organizations have received plausible accounts from Kurdish villagers of even more Iraqi chemical attacks against civilians in the 1987 to 1988 time frame—with some attacks as late as October 1988—in areas close to the Iranian and Turkish borders.
- UNSCOM supervised the destruction of more than 40,000 chemical munitions, nearly 500,000 liters of chemical agents, 1.8 million liters of chemical precursors, and seven different types of delivery systems, including ballistic missile warheads. More than 10 years after the Gulf war, gaps in Iraqi accounting and current production capabilities strongly suggest that Iraq maintains a stockpile of chemical agents, probably VX, sarin, cyclosarin, and mustard.
- Iraq probably has concealed precursors, production equipment, documentation, and other items necessary for continuing its CW effort. Baghdad never supplied adequate evidence to support its claims that it destroyed all of its CW agents and munitions. Thousands of tons of chemical precursors and tens of thousands of unfilled munitions, including Scud-variant missile warheads, remain unaccounted for.
- UNSCOM discovered a document at Iraqi Air Force headquarters in July 1998 showing that Iraq overstated by at least 6,000 the number of chemical bombs it told the UN it had used during the Iran-Iraq War—bombs that remain unaccounted for.
- Iraq has not accounted for 15,000 artillery rockets that in the past were its preferred means for delivering nerve agents, nor has it accounted for about 550 artillery shells filled with mustard agent.
- Iraq probably has stocked at least 100 metric tons (MT) and possibly as much as 500 MT of CW agents.
- Baghdad continues to rebuild and expand dual-use infrastructure that it could divert quickly to CW production. The best examples are the chlorine and phenol plants at the Fallujah II facility. Both chemicals have legitimate civilian uses but also are raw materials for the synthesis of precursor chemicals used to produce blister and nerve agents. Iraq has three other chlorine plants that have much higher capacity for civilian production; these plants and Iraqi imports are more than sufficient to meet Iraq's civilian
- Of the 15 million kg of chlorine imported under the UN Oil for- Food Program since 1997, Baghdad used only 10 million kg and has 5 million kg in stock, suggesting that some domestically produced chlorine has been diverted to such proscribed activities as CW agent production.
- Fallujah II was one of Iraq's principal CW precursor production facilities before the Gulf war. In the last two years the Iraqis have upgraded the facility and brought in new chemical reactor vessels and shipping containers with a large amount of production equipment. They have expanded chlorine output far beyond pre-Gulf war production levels—capabilities that can be

diverted quickly to CW production. Iraq is seeking to purchase CW agent precursors and applicable production equipment and is trying to hide the activities of the Fallujah plant.

Biological Warfare Program

The two countries drew the following conclusions regarding biological weapons in their white papers:

○ **UK: Biological Warfare**

- Since the withdrawal of the inspectors the JIC has monitored evidence, including from secret intelligence, of continuing work on Iraqi offensive chemical and biological warfare capabilities. In the first half of 2000 the JIC noted intelligence on Iraqi attempts to procure dual-use chemicals and on the reconstruction of civil chemical production at sites formerly associated with the chemical warfare programme.
- Iraq has claimed that all its biological agents and weapons have been destroyed. No convincing proof of any kind has been produced to support this claim. In particular, Iraq could not explain large discrepancies between the amount of growth media (nutrients required for the specialized growth of agent) it procured before 1991 and the amounts of agent it admits to having manufactured. The discrepancy is enough to produce more than three times the amount of anthrax allegedly manufactured.
- Iraq had also been trying to procure dual-use materials and equipment that could be used for a biological warfare programme. Personnel known to have been connected to the biological warfare programme up to the Gulf War had been conducting research into pathogens. There was intelligence that Iraq was starting to produce biological warfare agents in mobile production facilities. Planning for the project had begun in 1995 under Dr Rihab Taha, known to have been a central player in the pre-Gulf War programme. The JIC concluded that Iraq had sufficient expertise, equipment and material to produce biological warfare agents within weeks using its legitimate biotechnology facilities.
- In mid-2001, the JIC concluded that intelligence on Iraqi former chemical and biological warfare facilities, their limited reconstruction and civil production pointed to a continuing research and development programme. These chemical and biological capabilities represented the most immediate threat from Iraqi weapons of mass destruction. Since 1998 Iraqi development of mass destruction weaponry had been helped by the absence of inspectors and the increase in illegal border trade, which was providing hard currency.
- In the last six months the JIC has confirmed its earlier judgments on Iraqi chemical and biological warfare capabilities and assessed that Iraq has the means to deliver chemical and biological weapons.
- Subsequently, intelligence has become available from reliable sources which complements and adds to previous intelligence and confirms the JIC assessment that Iraq has chemical and biological weapons. The intelligence also shows that the Iraqi leadership has been discussing a number of issues related to these weapons. This intelligence covers:
 - Confirmation that chemical and biological weapons play an important role in Iraqi military thinking: intelligence shows that Saddam attaches great importance to the possession of chemical and biological weapons which he regards as being the basis for Iraqi regional power. He believes that respect for Iraq rests on its possession of these weapons and the missiles capable of delivering them. Intelligence indicates that Saddam is determined to retain this capability and recognizes that Iraqi political weight would be diminished if Iraq's military power rested solely on its conventional military forces.
 - Iraq has claimed that all its biological agents and weapons have been destroyed. No convincing proof of any kind has been produced to support this claim. In particular, Iraq could not explain large discrepancies between the amount of growth media (nutrients required for the specialized growth of agent) it procured before 1991 and the amounts of agent it admits to having

manufactured. The discrepancy is enough to produce more than three times the amount of anthrax allegedly manufactured.

- We know from intelligence that Iraq has continued to produce biological warfare agents. As with some chemical equipment, UNSCOM only destroyed equipment that could be directly linked to biological weapons production. Iraq also has its own engineering capability to design and construct biological agent associated fermenters, centrifuges, sprayer dryers and other equipment and is judged to be self-sufficient in the technology required to produce biological weapons.
- Almost all components and supplies used in weapons of mass destruction and ballistic missile programmes are dual-use. For example, any major petrochemical or biotech industry, as well as public health organizations, will have legitimate need for most materials and equipment required to manufacture chemical and biological weapons. Without UN weapons inspectors it is very difficult therefore to be sure about the true nature of many of Iraq's facilities.
- Experienced personnel who were active in the programme have largely remained in the country. Some dual-use equipment has also been purchased, but without monitoring by UN inspectors Iraq could have diverted it to their biological weapons programme. This newly purchased equipment and other equipment previously subject to monitoring could be used in a resurgent biological warfare programme. Facilities of concern include:
 - The Castor Oil Production Plant at Fallujah: this was damaged in UK/US air attacks in 1998 (Operation Desert Fox) but has been rebuilt. The residue from the castor bean pulp can be used in the production of the biological agent ricin;
 - The al-Dawrah Foot and Mouth Disease Vaccine Institute: which was involved in biological agent production and research before the Gulf War;
 - The Amariyah Sera and Vaccine Plant at Abu Ghraib: UNSCOM established that this facility was used to store biological agents, seed stocks and conduct biological warfare associated genetic research prior to the Gulf War. It has now expanded its storage capacity.
 - UNSCOM established that Iraq considered the use of mobile biological agent production facilities. In the past two years evidence from defectors has indicated the existence of such facilities. Recent intelligence confirms that the Iraqi military have developed mobile facilities. These would help Iraq conceal and protect biological agent production from military attack or UN inspection.
- Iraq has a variety of delivery means available for both chemical and biological agents. These include:
 - free-fall bombs: Iraq acknowledged to UNSCOM the deployment to two sites of free-fall bombs filled with biological agent during 1990–91. These bombs were filled with anthrax, botulinum toxin and aflatoxin.;
 - artillery shells and rockets: Iraq is known to have tested the use of shells and rockets filled with biological agents. Over 20,000 artillery munitions remain unaccounted for by UNSCOM;
 - helicopter and aircraft borne sprayers: Iraq carried out studies into aerosol dissemination of biological agent using these platforms prior to 1991. UNSCOM was unable to account for many of these devices. It is probable that Iraq retains a capability for aerosol dispersal of both chemical and biological agent over a large area;
 - al-Hussein ballistic missiles (range 650km): Iraq told UNSCOM that it filled 25 warheads with anthrax, botulinum toxin and aflatoxin.;
 - al-Samoud/Ababil-100 ballistic missiles (range 150km plus): it is unclear if chemical and biological warheads have been developed for these systems, but given the Iraqi experience on other missile systems, we judge that Iraq has the technical expertise for doing so;

- L-29 remotely piloted vehicle programme : we know from intelligence that Iraq has attempted to modify the L-29 jet trainer to allow it to be used as an Unmanned Aerial Vehicle (UAV) which is potentially capable of delivering chemical and biological agents over a large area.
- **CIA: Biological Warfare**
 - Iraq has the capability to convert quickly legitimate vaccine and biopesticide plants to biological warfare (BW) production and already may have done so. This capability is particularly troublesome because Iraq has a record of concealing its BW activities and lying about the existence of its offensive BW program.
 - After four years of claiming that they had conducted only “small-scale, defensive” research, Iraqi officials finally admitted to inspectors in 1995 to production and weaponization of biological agents. The Iraqis admitted this only after being faced with evidence of their procurement of a large volume of growth media and the defection of Husayn Kamil, former director of Iraq’s military industries.
 - Iraq admitted producing thousands of liters of the BW agents anthrax, 6 botulinum toxin, (which paralyzes respiratory muscles and can be fatal within 24 to 36 hours), and aflatoxin, (a potent carcinogen that can attack the liver, killing years after ingestion), and preparing BW- filled Scud-variant missile warheads, aerial bombs, and aircraft spray tanks before the Gulf war.
 - Baghdad did not provide persuasive evidence to support its claims that it unilaterally destroyed its BW agents and munitions. Experts from UNSCOM assessed that Baghdad’s declarations vastly understated the production of biological agents and estimated that Iraq actually produced two-to-four times the amount of agent that it acknowledged producing, including *Bacillus anthracis*—the causative agent of anthrax—and botulinum toxin.
 - The improvement or expansion of a number of nominally “civilian” facilities that were directly associated with biological weapons indicates that key aspects of Iraq’s offensive BW program are active and most elements more advanced and larger than before the 1990-1991 Gulf war.
 - The al-Dawrah Foot-and-Mouth Disease (FMD) Vaccine Facility is one of two known Biocontainment Level-3—facilities in Iraq with an extensive air handling and filtering system. Iraq admitted that before the Gulf war Al-Dawrah had been a BW agent production facility. UNSCOM attempted to render it useless for BW agent production in 1996 but left some production equipment in place because UNSCOM could not prove it was connected to previous BW work. In 2001, Iraq announced it would begin renovating the plant without UN approval, ostensibly to produce a vaccine to combat an FMD outbreak. In fact, Iraq easily can import all the foot-and mouth vaccine it needs through the UN.
 - The Amiriyah Serum and Vaccine Institute is an ideal cover location for BW research, testing, production, and storage. UN inspectors discovered documents related to BW research at this facility, some showing that BW cultures, agents, and equipment were stored there during the Gulf war. Of particular concern is the plant’s new storage capacity, which greatly exceeds Iraq’s needs for legitimate medical storage.
 - The Fallujah III Castor Oil Production Plant is situated on a large complex with an historical connection to Iraq’s CW program. Of immediate BW concern is the potential production of ricin toxin. Castor bean pulp, left over from castor oil production, can be used to extract ricin toxin. Iraq admitted to UNSCOM that it manufactured ricin and field-tested it in artillery shells before the Gulf war. Iraq operated this plant for legitimate purposes under UNSCOM scrutiny before 1998 when UN inspectors left the country.
 - Since 1999, Iraq has rebuilt major structures destroyed during Operation Desert Fox. Iraqi officials claim they are making castor oil for brake fluid, but verifying such claims without UN inspections is impossible. In addition to questions about activity at known facilities, there are compelling reasons to be concerned about BW activity at other sites and in mobile production units and

laboratories. Baghdad has pursued a mobile BW research and production capability to better conceal its program.

- UNSCOM uncovered a document on Iraqi Military Industrial Commission letterhead indicating that Iraq was interested in developing mobile fermentation units, and an Iraqi scientist admitted to UN inspectors that Iraq was trying to move in the direction of mobile BW production.
- Iraq has now established large-scale, redundant, and concealed BW agent production capabilities based on mobile BW facilities.

Nuclear Warfare Program

The two countries drew the following conclusions regarding Iraq's nuclear weapons:

UK: Nuclear Warfare

- Since 1999 the JIC has monitored Iraq's attempts to reconstitute its nuclear weapons programme. In mid-2001 the JIC assessed that Iraq had continued its nuclear research after 1998. The JIC drew attention to intelligence that Iraq had recalled its nuclear scientists to the programme in 1998. Since 1998 Iraq had been trying to procure items that could be for use in the construction of centrifuges for the enrichment of uranium.
- It is clear from IAEA inspections and Iraq's own declarations that by 1991 considerable progress had been made in both developing methods to produce fissile material and in weapons design. The IAEA dismantled the physical infrastructure of the Iraqi nuclear weapons program, including the dedicated facilities and equipment for uranium separation and enrichment, and for weapon development and production, and removed the remaining highly enriched uranium. But Iraq retained, and retains, many of its experienced nuclear scientists and technicians who are specialized in the production of fissile material and weapons design. Intelligence indicates that Iraq also retains the accompanying programme documentation and data.
- Intelligence shows that the present Iraqi programme is almost certainly seeking an indigenous ability to enrich uranium to the level needed for a nuclear weapon. It indicates that the approach is based on gas centrifuge uranium enrichment, one of the routes Iraq was following for producing fissile material before the Gulf War. But Iraq needs certain key equipment, including gas centrifuge components and components for the production of fissile material before a nuclear bomb could be developed.
- Following the departure of weapons inspectors in 1998 there has been an accumulation of intelligence indicating that Iraq is making concerted covert efforts to acquire dual-use technology and materials with nuclear applications. Iraq's known holdings of processed uranium are under IAEA supervision. But there is intelligence that Iraq has sought the supply of significant quantities of uranium from Africa. Iraq has no active civil nuclear power programme or nuclear power plants and therefore has no legitimate reason to acquire uranium.
- Intelligence shows that other important procurement activity since 1998 has included attempts to purchase:
 - vacuum pumps which could be used to create and maintain pressures in a gas centrifuge cascade needed to enrich uranium;
 - an entire magnet production line of the correct specification for use in the motors and top bearings of gas centrifuges. It appears that Iraq is attempting to acquire a capability to produce them on its own rather than rely on foreign procurement;
 - Anhydrous Hydrogen Fluoride (AHF) and fluorine gas. AHF is commonly used in the petrochemical industry and Iraq frequently imports significant amounts, but it is also used in the process of converting uranium into uranium hexafluoride for use in gas centrifuge cascades;

- one large filament winding machine which could be used to manufacture carbon fiber gas centrifuge rotors;
- a large balancing machine, which could be used in initial centrifuge balancing work.
- Iraq has also made repeated attempts covertly to acquire a very large quantity (60,000 or more) of specialized aluminum tubes. The specialized aluminum in question is subject to international export controls because of its potential application in the construction of gas centrifuges used to enrich uranium, although there is no definitive intelligence that it is destined for a nuclear programme.
- In early 2002, the JIC assessed that UN sanctions on Iraq were hindering the import of crucial goods for the production of fissile material. The JIC judged
 - Iraq's long-standing civil nuclear power programme is limited to small-scale research. Activities that could be used for military purposes are prohibited by UNSCR 687 and 715.
 - Iraq has no nuclear power plants and therefore no requirement for uranium as fuel.
 - Iraq has a number of nuclear research programmes in the fields of agriculture, biology, chemistry, materials and pharmaceuticals. None of these activities requires more than tiny amounts of uranium, which Iraq could supply from its own resources.
 - Iraq's research reactors are non-operational; two were bombed and one was never completed.
 - ...while sanctions remain effective Iraq would not be able to produce a nuclear weapon. If they were removed or prove ineffective, it would take Iraq at least five years to produce sufficient fissile material for a weapon indigenously. However, we know that Iraq retains expertise and design data relating to nuclear weapons. We therefore judge that if Iraq obtained fissile material and other essential components from foreign sources the timeline for production of a nuclear weapon would be shortened and Iraq could produce a nuclear weapon in between one and two years.

CIA: Nuclear Warfare

- More than ten years of sanctions and the loss of much of Iraq's physical nuclear infrastructure under IAEA oversight have not diminished Saddam's interest in acquiring or developing nuclear weapons.
- Iraq's efforts to procure tens of thousands of proscribed high-strength aluminum tubes are of significant concern. All intelligence experts agree that Iraq is seeking nuclear weapons and that these tubes could be used in a centrifuge enrichment program. Most intelligence specialists assess this to be the intended use, but some believe that these tubes are probably intended for conventional weapons programs.
- Iraq had an advanced nuclear weapons development program before the Gulf war that focused on building an implosion-type weapon using highly enriched uranium. Baghdad was attempting a variety of uranium enrichment techniques, the most successful of which were the electromagnetic isotope separation (EMIS) and gas centrifuge programs. After its invasion of Kuwait, Iraq initiated a crash program to divert IAEA-safeguarded, highly enriched uranium from its Soviet and French-supplied reactors, but the onset of hostilities ended this effort. Iraqi declarations and the UNSCOM/IAEA inspection process revealed much of Iraq's nuclear weapons efforts, but Baghdad still has not provided complete information on all aspects of its nuclear weapons program.
- Iraq has withheld important details relevant to its nuclear program, including procurement logs, technical documents, experimental data, accounting of materials, and foreign assistance.

- Baghdad also continues to withhold other data about enrichment techniques, foreign procurement, weapons design, and the role of Iraqi security services in concealing its nuclear facilities and activities.
- In recent years, Baghdad has diverted goods contracted under the Oil-for-Food Program for military purposes and has increased solicitations and dual-use procurements—outside the Oil-for-Food process—some of which almost certainly are going to prohibited WMD and other weapons programs. Baghdad probably uses some of the money it gains through its illicit oil sales to support its WMD efforts.
- Before its departure from Iraq, the IAEA made significant strides toward dismantling Iraq's nuclear weapons program and unearthing the nature and scope of Iraq's past nuclear activities. In the absence of inspections, however, most analysts assess that Iraq is reconstituting its nuclear program—unraveling the IAEA's hard-earned accomplishments.
- Iraq retains its cadre of nuclear scientists and technicians, its program documentation, and sufficient dual-use manufacturing capabilities to support a reconstituted nuclear weapons program. Iraqi media have reported numerous meetings between Saddam and nuclear scientists over the past two years, signaling Baghdad's continued interest in reviving a nuclear program.
- Iraq's expanding international trade provides growing access to nuclear-related technology and materials and potential access to foreign nuclear expertise. An increase in dual-use procurement activity in recent years may be supporting a reconstituted nuclear weapons program.
- The acquisition of sufficient fissile material is Iraq's principal hurdle in developing a nuclear weapon. Iraq is unlikely to produce indigenously enough weapons-grade material for a deliverable nuclear weapon until the last half of this decade. Baghdad could produce a nuclear weapon within a year if it were able to procure weapons-grade fissile material abroad.
- Baghdad may have acquired uranium enrichment capabilities that could shorten substantially the amount of time necessary to make a nuclear weapon.

The Official Response: The US, British, and Australian Inquires

Even a cursory review of this list of U.S. and British charges about Iraq's WMD capabilities shows that point after point that was made was not confirmed during war or in months of intensive effort following the conflict. Despite all of the advances in their IS&R capabilities, the United States and Britain went to war with Iraq without the level of evidence needed to provide a clear strategic rationale for the war, and without the ability to fully understand the threat that Iraqi weapons of mass destruction posed to U.S., British, and Australian forces. This uncertainty is not a definitive argument against carrying out a war that responded to grave potential threats. It *is* a definitive warning that this intelligence and targeting are not yet adequate to support grand strategy, strategy, and tactical operations against proliferating powers or to make accurate assessments of the need to preempt.

The fact that so many of conclusions have so far proved wrong, including virtually every major conclusions that was used as a justification for war, can scarcely be ignored in discussing the intelligence lessons of the conflict. It has also led to a number of important public inquiries. Three major reports have now been made public on these intelligence assessments of Iraq's holdings of weapons of mass destruction -- or lack of them. One report is from the US, one is from Britain, and one is from Australia. All provide important insights into the intelligence process, but all have serious flaws.

The Senate Select Committee on Intelligence's "Report on the US Intelligence Community's Prewar Intelligence Assessments on Iraq"

No one who reads through the 500-plus pages of the Senate Select Committee on Intelligence's "Report on the US Intelligence Community's Prewar Intelligence Assessments on Iraq," or even simply reads its conclusions, can fail to learn that there are critical problems in US intelligence that go far beyond the Iraq War. Like similar reporting by the House Permanent Select Committee on Intelligence, it outlines critical failures in the way the intelligence community, the CIA, and Director of Central Intelligence do business.

Like the British Butler report, the Senate Select Committee report is also essential reading for anyone interested in arms control and counterproliferation. It provides some of the best real world insights ever made public into the real world problems in collecting and analyzing intelligence on different types of weapons of mass destruction and different delivery systems.

At the same time, the Senate Intelligence Committee report has serious failures. The most glaring such failure is its inability to detect and describe the level of indirect political and policy level pressure on the intelligence community to reach the "right" conclusions.

The report may well be right in concluding that senior officials never interfered directly or acted to politicize intelligence. However, it fails to address the climate of policy-level expectations that indirectly demand one type of answers, the impact of repeated searches for revised analysis, the staff and higher level questions searching for the "right" answers, and the knowledge that policy level recognition affects intelligence careers. This is pressure of a different, but very real, kind. Intelligence officers and managers are only human, and the intelligence community almost always responds to strong user demands and perceptions when an Administration decides that one view is correct.

The report also creates an artificial decoupling of intelligence from the policy maker and user. It does not examine what was done with intelligence products or informal intelligence inputs and support. The failure to fully examine the writings and role of lower level political appointees in the Vice President's office, and the Office of the Under Secretary for Policy in the Office of the Secretary of Defense, means that the report puts the blame on the intelligence community without examining the full range of classified and intelligence-related data that policy-level staff sent to policymakers. The issue of what policy level staff did with intelligence and classified information is just as important as any failings in the intelligence community.

The narrow focus on prewar assessments of weapons of mass destruction, and links between Iraq and terrorism, is even more serious. The report does not address the almost catastrophic failure to accurately assess the problems of security and nation-building in Iraq – a failure duplicated in Afghanistan. It is hard to believe that this omission did not have a political dimension, since the evidence of inept and destructive political interference would have been far clearer.

In fairness, the report also fails to note how many of the problems in the intelligence community's underlying assessment of Iraq developed or grew during the Clinton

Administration. It effectively dodges the responsibility of Administrations from both parties.

Perhaps for similar reasons, the report leaves the current and future situation of US intelligence in limbo. It makes no real analysis of the corrective steps, if any, that have been taken to date. It makes no analysis of the community's plans to fix things in the future. It also fails to adequately link its analysis of the problems in dealing with Iraq to a broader analysis of the performance of the intelligence community in dealing with other countries and problems. Presumably, the same failings affect all of our intelligence work globally in every area, but the report largely brushes over this issue.

There is no sense of history or continuity in the Committee's analysis. As someone who has had to deal with similar intelligence failures in the past, I am struck by the fact that almost all of the major problems and criticisms highlighted in the conclusions could have been written after Vietnam or in describing the CIA's problems in assessing Warsaw Pact conventional forces back in the late 1980s and early 1990s.

Certainly the problems with over-compartmentation and over-classification, failure to explicitly analyze uncertainty, failure to examine alternative approaches and conclusions, repetition and layering of past studies and assessments, failure to share with other agencies are all problems that have been raised repeatedly from the 1970s and 1980s onwards. A failure in preparing for a single war is one thing; twenty to thirty years of similar failures is another.

The report's criticism of the HUMINT in Iraq is devastating, but no effort is made to look at the adequacy of HUMINT in the broader war on terrorism or elsewhere. There also seems to be little understanding of the severe limits on what HUMINT can and can not do, and the illusion that HUMINT can always succeed where national technical means fail. The report would also be more convincing if it explained whether the current HUMINT effort has the money and people it needs, rather than simply asking CIA agents to be more daring.

The Senate report does provide a useful critique of "group think," and the dangers in bureaucratic solidarity. Yet, the report fails to address the impact that US intelligence has on our allies and other outside assessments. Of course many allies agreed with us on our WMD assessment. They have far less independent collection capability than the US, and limited national technical assets. Similarly, outside analysts who rely on declassified US intelligence naturally tend to agree with it. The idea that US failures can be excused because allied and outside analysts often had similar views is ludicrous to the point of absurdity.

More generally, these problems in the actions of the Senate's Select Committee on Intelligence raise serious questions about what the Congress does next. Most of the proposals that members have made to date are likely to do more damage than good. Follow-on efforts to cure the problems in US intelligence by changing the role of the DCI, or simply giving him more control of the intelligence budget, are counterproductive. It is the entire process of collection and analysis that needs fixing, not the organization chart, the top of the chain of command, or budgeting methods. Moreover, creating a stronger "intelligence czar" is the last way to get debate, alternative views, independent efforts at analysis, and honest discussions of uncertainty.

The Butler (Privy Councilors) “Review of Intelligence on Weapons of Mass Destruction

The British Butler Report is a far more professional and competent assessment of the problems in intelligence, and there are portions of the Butler report that indirectly act as a devastating critique of the lack of professionalism in the Senate Select Committee's report, and its lack of scope and relevance:

To be specific, the Butler Report performs task after task that the Senate Select Committee either totally or effectively failed to address. The Butler Report:

- Examines the inherent limits of intelligence collection and analysis and does not tacitly assume intelligence should be perfect.
- Compares the work on Iraq with intelligence collection and analysis on other target countries, in order to help put the Iraq case in perspective.
- Analyzes the actual text of key intelligence judgments by the Joint Intelligence Committee (JIC) relating to Iraq and other relevant British intelligence activities in historical terms and quotes them in depth to show what the intelligence community did and did not conclude over time.
- Traces the history of the intelligence effort in Iraq back to 1990, and examines continuity.
- Shows how the British government used intelligence and tasked the community, particularly in the key period before the war (e.g. p. 72).
- Provides explicitly comparisons of what intelligence said to the government, and how the government used intelligence in its public papers. (pp. 81) -- *Although the report sharply understates the importance of the resulting differences.* (e.g. p. 86 #340)
- Explicitly analyzes the work done by UNMOVIC and the UN to see how good it was, the level of intelligence review, and the degree to which the UN analysis and that of British intelligence agreed. (e.g. pp. 92-93)
- Addresses the linkage between intelligence analysis and the need to examine the legality of the war.
- Looks in depth at the trends in intelligence collection and analysis of WMD activity in terrorist movements.
- Looks at the role of intelligence in dealing with UNMOVIC and UNSCOM, and the extent -- at least in terms of Operation Mass Appeal -- that intelligence attempted to use the UN effort (pp. 120-121).
- Examines how the post-war efforts to collect data on the Iraqi WMD program do and do not track with the intelligence estimates before the war--although the analysis is weak and almost deliberately understates the degree to which the postwar effort has not confirmed prewar estimates (pp., 97-99).
- Examines progress now underway to improve analysis.
- Examines the broad nature of counter-proliferation activity in the UK, and how intelligence fits into the activities of the rest of the British government's counterproliferation activities and organizational elements outside the intelligence community.

In short, any comparison of the two reports shows that the US report was almost designed to focus all of the blame on the intelligence community in ways that ignored the role of policymakers under both the Clinton and Bush Administrations, and that the Senate report is virtually worthless in providing a useful basis for solving the problems in intelligence, and understanding the inherent limits of intelligence. In short, by comparison, the Senate report is both incompetent and unprofessional.

There are some serious problems in the Butler Report as well, and in some ways it seems to be more overtly politicized in avoiding criticism of the government and British intelligence community than the Senate Select Committee report was of the Bush Administration and US intelligence community:

- The Butler Report is far too general, almost deliberately polite, about the problems and limits to the British collection and analysis effort, and the problems in its coverage of given countries.
- The report does not adequately analyze the strengths and weaknesses of British analysis of Iraq's WMD programs over time, and particularly after the UN left Iraq in 1998, and often simply states that the Butler commission staff found them adequate.
- It notes that the JIC does not present alternative or dissenting views to British policymakers without analyzing the dangers of such a process. In areas like p. 67, the report virtually glosses over the failure of the JIC to highlight the acute limits to British coverage and analysis in its reporting to the government, or -- as in the following page -- sharply understates the importance of the differing views of the DIS.
- The report systematically exaggerates the reliability of one-source reports that appeared at precisely the time the policy maker needed such intelligence collection as justification for war (e.g. p. 88, #349).
- It uses language that disguises the failure of the community to objectively tell policy makers the limits to intelligence, and its tendency to provide intelligence to please. (e.g. pp. 72-73).
- The Butler report copies the Senate Intelligence Committee report in failing to see the importance of the policy climate after mid-2002 in putting immense indirect pressure on the JIC and British intelligence community to provide intelligence to please (e.g. p. 75).
- The report fails to address whether the "significant new intelligence" referred to that was used to justify the war involved pressure to find sources that gave a worst case view of Iraqi WMD because of the intelligence community's knowledge that this is what the policy level wanted. Again, intelligence to please (e.g. p. 74).
 - --It glosses over the seriousness of the failure in claiming a 45 minute readiness to launch and the failure to properly assess whether failure mobile biological equipment existed.
- With all deference, the statement that there is no evidence that the British dossier on Iraqi WMD was not designed to make the case for war (p.77, #315-319, and p.113, #461-462), borders on the theater of the absurd. British had already been preparing for war for months.
- The report discusses serious problems in HUMINT sources, but sharply understates their importance, and the scale of problems in SIS analysis and verification (pp. 99-104 and pp.106-109.), although it does raise these points briefly in its conclusions (p.109, #444 and 445).
- The report has similar failings to the US report in never analyzing whether intelligence explicitly looked at UNMOVIC's work or analyzing whether waiting for more inspection was practical. (It does note a failure in this area, p. 116, # 472)
- It never looks at the level of preparation for war at any given time, and the level of intelligence knowledge that decision makers were preparing for, and had decided on, war.??

In one critical area, the Butler report does agree with both the Senate Select Committee report and 9/11 Commission Reports: It finds no meaningful cooperation between Iraq and Al Qaida and Iraq and Islamist terrorist groups(pp. 119-120).

The Flood Report on Australian Intelligence Agencies

The Flood Report on "Australian Intelligence Agencies" is the best of the three official reports for one key reason: It assesses the problems in analyzing Iraqi WMD in the full context of all of the problems in the Australian intelligence community, and not simply in the context of one set of problems. It also examines the role of intelligence in war fighting and the need for operational support, rather than focusing purely on how intelligence can support the senior policymaker.

This is a nearly fatal set of flaws in the US Senate Select Committee report on Iraqi WMD, and the US 9/11 Commission report. They have a tunnel vision approach to fixing intelligence based almost solely on one case. The Butler Report is somewhat better, but it is still narrowly focused.

As such, the Flood Report deserves considerable attention as one of the few contemporary reports on the problems a power with limited resources face in trying to provide global coverage, deal with a crisis outside its main area of operations, and support war fighting. It is also one of the few reports on intelligence written by a real intelligence expert.

At the same time, the Flood Report correctly notes that Australia was in a limited position to provide intelligence analysis of Iraq:

...WMD is an inherently difficult and demanding target, requiring judgments to be made on the basis of information which is nearly always open to a range of interpretations. The fact that many components and facilities associated with WMD have legitimate uses and are therefore characterized as 'dual-use' illustrates these difficulties. During the period of inspections between 1991 and 1998, intelligence agencies had a range of information from often publicly available and reliable sources to supplement covertly acquired intelligence. However, following the withdrawal of inspectors, the volume of available material reduced significantly. In the absence of such corroborating material, and with relatively limited covert collection against Iraqi WMD targets, judgments on Iraq's WMD programmes became very much more difficult to make. Intelligence assessment is almost always inexact - precision is difficult in an endeavor which seeks to discover what others seek to conceal. In the case of Iraq's WMD, these difficulties were acute.

Adding to the problem was the thinness of the intelligence on which analysts were expected to make difficult calls. There was little by way of hard current intelligence available to analysts across the range of WMD capability issues, although the intelligence on Iraq's efforts to deceive inspectors was clearer. Much of the information that was available was equivocal or of uncertain validity. A good deal of it was either reporting of dual-use acquisition activity, inherently difficult to interpret, or human intelligence of uncertain sourcing and reliability. The weakness of the intelligence picture on Iraq was in part due to inadequate collection.

Australian agencies had the added complication of an almost complete reliance on foreign-sourced collection and, on occasion, foreign assessments. Additionally, Australia's focus on its nearer region meant there was limited analytical capacity in relation to Iraq and, while there was better capability in relation to WMD issues, it was still limited when compared to the capacity of US and UK counterparts. And it is in practical terms more difficult for analysts to query and challenge foreign-sourced material, especially when there is little or no alternative input. In general, source descriptions were less than helpful for analysts, tending to be selected from a small group of standard phrases. It is noteworthy in this context that most if not all of the material from Iraqi opposition groups was clearly marked as such, and was treated by Australian assessors with appropriate skepticism.

...ONA and DIO, along with the rest of the international community, failed to judge accurately the extent and nature of Iraq's WMD programmes. And both agencies' assessments about Saddam's intent and capacity to use WMD against US forces, or against those countries who allowed their territory to be used by the US in the event of a US-led invasion, were not borne out. Nevertheless, ONA's and DIO's key judgments on Iraq's WMD capabilities were relatively cautious. They drew the most likely conclusions from the available information, and generally presented them with appropriate qualification. The obverse conclusion - that Iraq did not have WMD aspirations and capability - would have been a much more difficult conclusion to substantiate.

This means that the Flood Report has far less application to the very different types and scale of problems the US faces in carrying out the analysis of proliferation than the

critiques of intelligence in the Butler Report At the same time, some criticisms are made of Australian intelligence that do have general application to the work done in the US:

...the Inquiry also found a number of systemic weaknesses in both assessment agencies which played a role.

The first of these was a failure rigorously to challenge preconceptions or assumptions about the Iraqi regime's intentions. It is natural that analysts approach an issue with a set of expectations and contextual understanding. Analysts are valued for their background in the subject matter under assessment. In the case of Iraq WMD, assessors' preconceptions had a clear logic - they were based on UNSCOM reporting, Iraq's history and perceived strategic imperatives.

But on an issue with such potentially serious policy implications as Iraq's WMD capabilities and the threat posed by Saddam, more rigorous challenging of the assumptions underlying their assessments should have been carried out. While individual analysts almost certainly traveled the ground in their own minds, and managers challenged the bases for particular judgments, there is little evidence that systematic and contestable challenging was applied in a sustained way to analysts' starting assumptions.

There is also little evidence of a consistent and rigorous culture of challenge to and engagement on intelligence reports from collectors, and limited evidence of dialogue on assessed material. There are a number of reasons for the lack of rigorous questioning of sources, including the limited extent to which some raw material influenced key judgments in this case. But the lack of a dynamic dialogue on sources, one indicator of a healthy assessment process, is of concern.

The agencies did not always make clear from the text of their assessments the strength and range of specific information supporting a particular conclusion, as opposed to the judgments of the analyst about the likely behavior and intentions of the Iraqi regime. This lack of clarity can allow readers to infer inappropriate levels of certainty to judgments.

... It is significant that, using similar but not all of the material available to the UK and the US, Australian assessments on Iraq's capabilities were on the whole more cautious, and seem closer to the facts as we know them so far. There was not, as some have charged, a blind adherence to US and UK assessments. The bulk of conclusions drawn by Australia's assessment community on individual pieces of intelligence were sound, and there is evidence of our agencies applying healthy skepticism to the intelligence received on a number of specific issues, in some instances maintaining a different or more cautious line in the face of firm conclusions by allies. This is true on the issues of sourcing uranium from Niger, mobile BW production capabilities, the threat posed by smallpox, Iraqi capability to deliver CBW via unmanned aerial vehicles, and links between Al Qaida, Iraq, and the September 11 terrorist strikes in the US.

There was also a proper place, in intelligence analysis of a topic as potentially threatening as Iraqi WMD, for reporting to cover worst-case scenarios, particularly in the policy context in which the intelligence assessments were being made. It was right for our assessment agencies to focus on the challenges troops might face should they be deployed - and to highlight the worst of a potential adversary's capabilities. DIO's primary duty is to support the safety and success of Australian Defence Force operations. In the case of Iraq's WMD, the intelligence community had the institutional memory of having underestimated Iraq's WMD (especially nuclear) capabilities at the time of the first Gulf War.

- Greater rigor must be applied to the evaluation of sources. Analysts must, in collaboration with collectors, actively assess the reliability of sources.
- More rigor in identifying intelligence gaps is needed. Analysts must consciously identify and then articulate gaps to collectors, rather than accepting without challenge what has been collected.
- Similar levels of rigor need to be applied to allied collection and assessment, both in terms of access to material and challenge to sources and/or judgments, including in areas where Australia has limited technical or regional expertise.

- Where such technical limitations exist, agencies should take remedial action and recruit or develop appropriate technical expertise.
- Incremental 'creeps' of judgment must be avoided. Previous assessments should be restated and any changes highlighted.
- Greater attention must be paid to the language of assessments to ensure that judgments are consistent, that variations to previous assessments are properly identified and that loose language does not inadvertently alter key assessments, or leave them unclear or open to interpretation.

One point that is of particular importance, and that should have been made in both the Senate Select Committee and Butler reports is that:

Another contributing factor was the lack of sufficient integration between the assessments of Iraq's global, regional and domestic considerations and its WMD capabilities and aspirations. While dialogue and sharing of drafts did take place both within and across agencies, the assessments did not reflect an effective synthesis of technical and geopolitical issues. The content and style of the assessments, and discussions with relevant staff, suggest that the process of consultation and clearance across disciplines was less substantive than it might have been. Specifically, there were many assessments which presented fragments of the WMD picture, but few which synthesized technical conclusions about possible Iraqi capabilities with judgments about the regime's likely strategic game plan. Such meaningful interaction between technical and geographic specialists might have tempered the conclusions drawn and helped to challenge assumptions.

One key flaw in the report, however, is all too similar to the flaws in the Senate and Butler reports. The Flood Report states that,

Finally, the Inquiry has found no evidence of politicization of the assessments on Iraq, either overt or perceived. The Inquiry received no indication that any analyst or manager was the subject of either direct or implied pressure to come to a particular judgment on Iraq for policy reasons, or to bolster the case for war. While agencies and their analysts are conscious of the policy environment, both their processes and their cultures and, in ONA's case, its legislation, promote independence of assessment. The Inquiry's conclusion that, on the basis of the available information, ONA and DIO drew the most likely conclusions, is consistent with and supports the finding that there was no evidence of politicization.

The practical problem with such conclusions is that direct pressure to change analysis almost never occurs, and particularly at top policy levels. The problem is whether a climate of demands and expectations exist at the policy level where indirect pressure could affect the judgments of the intelligence community, and whether low and mid-level staff contact takes place that have the same net impact as policy from senior officials. Discussions with US intelligence officers indicate that such pressure certainly did exist in the US, and was compounded by the knowledge that the US was preparing for, and intended to go to, war.

Discussions with British intelligence officers also indicate that much the same pressures may have existed in the UK. This may well have been the case in Australia, but the Flood Report does not address the issue.

Looking Beyond the Reports: Problems in Collecting Data on Iraqi and Other Country WMD Capabilities and Delivery Systems

If one looks at the overall content of the Senate Select Committee, Butler, and Flood reports one also sees more specific lessons regarding the limits of collection capabilities dealing with weapons of mass destruction. Some of these problems are equally apparent

in the UNSCOM, UNMOVIC, and IAEA reports, and it is clear that proliferating nations like Iraq are aware of many of these problems and how to exploit them:

- ***Iraq and other developing powers that are sophisticated enough to proliferate are also sophisticated enough to have a good understanding of many of the strengths and limitations of modern intelligence sensors, the timing and duration of satellite coverage, and the methods used to track imports and technology transfer.*** They have learned to cover and conceal, to deceive, and to create smaller and better disseminated activities.
- ***Intelligence collection relies heavily on finding key imports and technology transfers.*** Such reports, however, only usually cover a small fraction of the actual effort on the part of the proliferating country, and the information collected is often vague and uncertain, in part because importers and smugglers have every incentive to lie and are also familiar with many of the ways to defeat intelligence collection and import controls. When information does become available, it is often impossible to put it in context. Moreover, a given import or technology transfer can often be used in many difficult ways, often ways other than proliferation. Such import data can hint at the character of a proliferation effort, but give no picture of the overall character of the activity.
- ***Even when data are available on given imports or technology transfers, they generally present three serious problems.*** First, there is no way to know the end destination and use of the import and how it is integrated into the overall effort. Second, there is no way to know if it is integrated into an ongoing research and development effort, a weapons production effort, being procured or stockpiled for later use, or simply an experiment or mistake that is never further exploited. And third, since many imports have civilian or other military uses, these so-called “dual-use” imports may have legitimate use. May want to leave paragraph as it was.
- ***In most cases, the problem of technology can be solved through imports or through internal development. The problem of creating effective and well managed programs, however, has often proved to be difficult to near impossible, as has the effort to integrate complex mixes of technology into effective systems.*** Such problems are further compounded in many countries by the fact that the managers or heads of such programs lack the experience to objectively analyze their own efforts or deliberately lie to their political superiors. There are few physical indicators, however, that allow intelligence assessment of how effectively a given effort is managed or the level of systems integration involved. The end result is to encourage “worst case” analysis in the absence of any clear evidence and indicators.
- ***There are few reliable benchmarks or measures of effectiveness.*** Even transparent access to a nation’s efforts to proliferate would often lead to major uncertainties regarding the lethality and quality of its chemical, biological, and nuclear weapons activities, and missile and other delivery programs. For example, the level of quality control in producing key weapons components may be so uncertain that it is impossible to determine the outcome. There may be too few tests to know how good a given country’s efforts are, and it may rely on engineering and simulation methods whose adequacy simply cannot be accurately assessed. It is almost axiomatic that intelligence cannot collect what the proliferator does not know. In most cases, however, there is no transparency in terms of key issues like nuclear weapons design, quality of biological agent development and/or production, quality of chemical agent development and/or production, and missile reliability. Collection requires a level of access that simply is not credible.
- ***There may be no reliable technical parameters for measuring weapons effectiveness.*** Both the weapons development and arms control communities often take technical measures for granted that may have little or no real-world meaning. Collection is based on the assumption that the proliferator knows its level of effectiveness, or that measures developed for assessing Western programs conducted by the standards of developed countries do, in fact, apply to developing countries. The end result often blurs the distinction between collection and analysis but creates the following kinds of problems:
 - ***Nuclear weapons design and effectiveness:*** No proliferating country has conducted an adequate set of weapons tests to fully characterize its weapons or – in most cases – to

allow that country to predict the reliability and yield of its weapons. Countries like India and Pakistan have claimed far higher yields than they have been able to test, and have lied about the yields of the weapons they have tested. Other countries such as Israel are credited with thermonuclear or boosted weapons designs of very high efficiency (and low weight) without any known test data. The level of fissile enrichment is often assumed to meet US weapons grade standards, although material with less than one-third of such enrichment could produce a fissile event. The triggering and HE lens design is assumed to have a given level of quality. In short, virtually every aspect of a weapons design and assessments of its effectiveness may have to be based on country claims or mirror imaging.

- ***Biological weapons design and effectiveness:*** US Army and other studies have indicated that the level of uncertainty surrounding estimates of the lethality of a nuclear weapon can reach two orders of magnitude both because of the inability to know how well a given agent is produced and weaponized, and because of the inherent uncertainties surrounding the use of weapons that have never had large-scale human testing and whose behavior will not mimic natural outbreaks. These problems are compounded by the fact that the method of delivering wet or dry agents has a major impact on lethality; there often is no way to know what strain of disease is being used, and there are virtually no empirical data for estimating the lethality of mixes (or cocktails) of different biological agents delivered at or near the same time. These problems are compounded since the proliferators probably have no realistic basis for estimating the real-world lethality of the weapon being developed or deployed.
- ***Extremely suspect models are used for infectious diseases, usually based on natural outbreaks that may have little relation to military or terrorist use.*** The nominal data used for such estimates usually are not based on statistically relevant historical data in terms of infectivity and lethality, and tend to use point estimates rather than a range based on sigma?. The assumption is made that the disease strain is known or behaves according to prediction. These problems are compounded because the proliferators probably have no realistic basis for estimating the real-world lethality of the weapon being developed or deployed.
- ***Chemical weapons design and effectiveness:*** While chemical weapons are considerably less lethal than biological or nuclear weapons, they present many of the same problems. Without actual testing or empirical experience, lethality estimates are speculative at best, and the problem is compounded by the ability of given countries to handle the complex targeting and meteorological data necessary to achieve high lethality and the sheer randomness of many real world delivery conditions.
- ***Radiological weapons:*** The development of crude contaminates is relatively easy, but the technology for distributing lethal material over a wide area is highly complex and theoretical. Most devices will produce largely Alpha and Beta effects with limited lethality and decontamination problems. If such weapons are improvised, however, the attacker may use virtually any agent at hand, and the end result could be far more lethal. As a result, radiological weapons tend to have a high degree of randomness, where intelligence collection may be impossible.
- ***Missile/aircraft/UAV range-payload:*** The range of a given delivery device is often based on a theoretical calculation based on a nominal payload like 1,000 kilograms (and on the assumption of aerodynamic efficiency). The real world device may be much heavier or lighter, and it is usually impossible to know how much is really the weapon versus other components. A country may never test a real weapon to maximum range or fly such sorties. As a result, range estimates may have little real world validity.
- ***Accuracy vs. reliability vs. targeting:*** both the proliferators and intelligence analysts tend to make estimates that assume the weapon actually works according to design and is properly targeted and then deliveries are the proper point and moment of detonation necessary to achieve the desired effect. The chances of most developing countries doing

this with any consistency – if ever – are negligible. There is no clear way, however, to assess the impact of random error.

- **Misuse of CEP:** Many estimates attempt to apply the term “circular error of probability” (CEP) to collection and assessment. In practice, this term assumes sufficient data exist to estimate where 50% of the weapons go if the entire delivery system and guidance function perfectly. It then describes the length of the radius from the aim point. Quite aside from the fact most developing countries do not test enough to produce empirical CEPs, this measure ignores the fact that half the weapons will go somewhere else in a far more random pattern along the weapon’s vector, and that reliability and targeting may critically degrade actual performance.
- **Warhead/bomb/device design:** The actual weapon or agent is only part of the problem in regards to assessing proliferation. The physical nature of a warhead or bomb can be just as critical. For example, the timing of height of burst and efficiency of dissemination may be more important in terms of real world lethality than the chemical or biological agent used, and will be critical in determining the level of fall out and trade-offs between radiation-thermal-blast in a nuclear weapon. Moreover, reentry effects can have a major impact as can sprayer design.
- **Production capacity verses actual capability.** The theoretical or nominal design production capacity is used because no data are available on actual capability.
- **Deployed forces are active forces, and nominal strength is actual strength.** Although few developing countries come close to achieving high readiness rates, or ever supply all of their combat units with their fully UE or TO&E, they are assumed to be combat ready and have the required or nominal number of launchers/delivery vehicles and weapons.
- **Psychological effects are theoretical or unknown.** Both nations and terrorists may use weapons for demonstrative or psychological effect, but the impact is largely speculative.
- **For proliferating countries, arms control is an extension of war by other means.** The very nature of arms control agreements like the Nuclear Non-Proliferation Treaty (NNPT), Biological Weapons Convention (BWC), and Chemical Weapons convention (CWC) encourages proliferating nations to lie and conceal as effectively as possible. The same is true of supplier agreements like the Missile Technology Control Regime (MTCR) and Australia List, and any form of sanctions. Arms control only encourages compliance among non-proliferators and non-sellers, and current enforcement efforts are too weak to be effective while their provisions effectively license technology transfer to those nations who succeed in lying or concealing.
- **The technology of proliferation generally permits the research and development effort to be divided up into a wide range of small facilities and projects.** Some can be carried out as legitimate civil research. Others can be hidden in civil and commercial facilities. As proliferators become more sophisticated, they learn to create dispersed, redundant and parallel programs, and mix high secret covert programs with open civil or dual-use programs. Chemical, biological, and cruise missile programs are particularly easy to divide up into small cells or operations. However, this is increasingly true of nuclear weapons centrifuge programs, plutonium processing and fuel cycles, and the testing and simulation of nuclear weapons that does not involve weapons grade materials. Many key aspects of ballistic missile R&D, including warhead and launch system design, fit into this category.
- **Iraq and most other proliferators have, in the past, focused on creating stockpiles of weapons for fighting theater conflicts against military forces. These stockpiles require large inventories, large-scale deployments, and generally mixes of training and warfighting preparations that create significant intelligence indicators. There are, however, other strategies and many proliferators may now be pursuing them.** One strategy is to bring weapons to full development, and to wait until a threat becomes imminent to actually produce the weapon. A second strategy is to follow the same course, but create large dual-use civil facilities that can be rapidly converted to the production of weapons of mass destruction. These can include pharmaceutical plants, food-processing plants, breweries, petrochemical plants, and pesticide plants. Key assembly lines,

however, can be concealed in a wide range of other commercial activities.⁹⁶ Weapons production facilities can be stockpiled for a later and sometimes sudden breakout. A third strategy is to focus on creating as few highly lethal biological or nuclear weapons to attack key political or civilian facilities in a foreign country, rather than its military forces. Highly lethal non-infectious or infectious biological agents are one means of such an attack, biological weapons directed at crops or livestock are another.

- ***Countries can pursue very different strategies in dealing with their past inventories of weapons.*** They can disclose and destroy them, knowing they do not face an urgent warfighting need, better weapons are coming, and this suits current political objectives. They can claim to destroy and hide the remaining weapons in covert areas known only to a few. They can claim to destroy, or lie, and disperse weapons where they can be used for warfighting purposes. In many cases, intelligence collection may not be able to distinguish between such strategies, and a given proliferator like Iraq can pursue a mix of such strategies—depending on the value of the weapon.
- ***In many cases, there is no clear way to know whether a program is R&D, production and weapons deployment, or production capable/breakout oriented.*** The problem is further complicated by the fact that Iraq and other countries have learned to play a “shell game” by developing multiple surface and underground military facilities and dual-use facilities and to create relatively mobile mixes of trailer/vehicle mounted and “palletized” equipment for rapid movement. Large special-purpose facilities with hard to move equipment often still exist, but they are by no means the rule. Intelligence collection takes time and may often lag behind country activities.
- ***There is no clear case other than the worst case.*** Unless a country keeps extremely accurate records of its programs, it is often far easier to estimate that maximum scale of what it might do than to provide an accurate picture of what it has actually done.
- ***In most cases, it is impossible to know how far a given project or effort has gotten and how well it has succeeded.*** The history of proliferation is not the history of proliferators overcoming major technical and manufacturing problems. It is the history of massive management and systems integration problems, political failures, lying technical advocates and entrepreneurs, project managers who do not tell their political masters the truth, and occasional sudden success. Short of an intelligence breakthrough, it is rarely possible to assess the success of a given effort and even on the scene inspection can produce varying or wrong results unless a given project can be subjected to detailed technical testing. For example, UNSCOM and the IAEA found that virtually all of their preliminary reporting on Iraq’s nuclear effort in 1992-1993 tended to exaggerate Iraqi capabilities once they had the time to fully assess the efficiency of key efforts like the Calutron and centrifuge programs.
- ***The only definitive way to counter most of these collection problems is to have a reliable mix of redundant human intelligence (HUMINT) sources within the system or as defectors.*** The United States, however, has never claimed or implied it had such capabilities in any proliferating country. The history of U.S., British, UNSCOM, and UNMOVIC efforts to deal with Iraq makes it painfully clear both that such transparency was totally lacking in Iraq and that most Iraqi defectors and intelligence sources outside Iraq made up information, circulated unsubstantiated information, or simply lied. Breakthroughs do occur, but HUMINT is normally inadequate, untrustworthy, or a failure, and these shortcomings cannot generally be corrected with data based on other intelligence means. Either inside information is available or it is not. When it is, imagery and signals intelligence generally do far more to indicate that HUMINT is wrong or suspect than to reveal the truth.⁹⁷
- ***In many cases, even the leaders of a proliferating country may not have an accurate picture of the success of their efforts, and most probably do not have a clear picture of the accuracy, lethality and effects, and reliability of their weapons.*** U.S. and British research efforts have long shown that even highly sophisticated technical models of the performance and lethality of chemical, biological, and nuclear weapons and delivery systems can be grossly wrong, or require massive levels of human testing that simply are not practical even for closed authoritarian

societies. No declassified intelligence report on any proliferation effort in any developing country has yet indicated that Iraq or any other proliferator has sophisticated technical and testing models in these areas. Intelligence cannot collect data that do not exist.

- ***Even if a nation's war plans and doctrine are known – which is unlikely – they may not be relevant.*** Many countries almost certainly acquire and deploy such weapons without developing detailed war plans or doctrines. Leaders may treat such weapons more as symbols or deterrents than in terms of actual use. Targeting and escalatory doctrine may be nominal or highly unrealistic. An actual crisis may then lead to efforts to develop a completely different approach to using such weapons that then interact with the enemy's behavior. The resulting "escalation ladder" may then bear no relation to the peacetime intentions on either side, or to any game theoretic model of efficient deterrence and use. Moreover, the inability on both sides to properly target and predict weapons effects – and simultaneously manage conventional and WMD combat – can give any resulting combat a highly random character.

Problems in Analyzing Iraqi and Other Country WMD Capabilities and Delivery Systems

Many of the resulting problems in the analysis of the WMD capabilities of Iraq and other countries are the result of the previous problems in collection. Moreover, in spite of the disclosures in the Senate, Butler, and Flood reports, many of the details of the methods the U.S., British, and Australia use in analyzing WMD remain classified. Nevertheless, these reports, and background discussions with intelligence analysts and users, do seem to reveal the following additional problems in analyzing the WMD threat:

- ***The uncertainties surrounding collection on virtually all proliferation and weapons of mass destruction programs are so great that it is impossible to produce meaningful point estimates.*** As the CIA has shown in some of its past public estimates of missile proliferation, the intelligence community must first develop a matrix of what is and is not known about a given aspect of proliferation in a given country, with careful footnoting or qualification of the problems in each key source. It must then deal with uncertainty by creating estimates that show a range of possible current and projected capabilities—carefully qualifying each case. In general, at least three scenarios or cases need to be analyzed for each major aspect of proliferation in each country—something approaching a "best," "most likely," and "worst case."⁹⁸
- ***Even under these conditions, the resulting analytic effort faces serious problems. Security compartmentation within each major aspect of collection and analysis severely limit the flow of data to working analysts.*** The expansion of analytic staffs has sharply increased the barriers to the flow of data, and has brought a large number of junior analysts into the process that can do little more than update past analyses and judgments. Far too little analysis is subjected to technical review by those who have actually worked on weapons development, and the analysis of delivery programs, warheads and weapons, and chemical, biological, and nuclear proliferation tends to be compartmented. Instead of the free flow of data and exchange of analytic conclusions, or "fusion" of intelligence, analysis is "stovepiped" into separate areas of activity. Moreover, the larger staffs get, the more stovepiping tends to occur.
- ***Analysis tends to focus on technical capability and not on the problems in management and systems integration that often are the real world limiting factors in proliferation.*** This tends to push analysis towards exaggerating the probable level of proliferation, particularly because technical capability is often assumed if collection cannot provide all the necessary information.
- ***Where data are available on past holdings of weapons and the capability to produce such weapons—such as data on chemical weapons feedstocks and biological growth material—the intelligence effort tends to produce estimates of the maximum size of the possible current holding of weapons and WMD materials.*** While ranges are often shown, and estimates are usually qualified with uncertainty, this tends to focus users on the worst case in terms of actual current capability. In the case of Iraq, this was compounded by some 12 years of constant lies and

a disbelief that a dictatorship obsessed with record keeping could not have records if it had destroyed weapons and materials. The end result, however, was to assume that little or no destruction had occurred whenever UNSCOM, UNMOVIC, and the IAEA reported that major issues still affected Iraqi claims.

- ***Intelligence analysis has long been oriented more towards arms control and counterproliferation rather than war fighting, although DIA and the military services have attempted to shift the focus of analysis.*** Dealing with broad national trends and assuming capability is not generally a major problem in seeking to push nations toward obeying arms control agreements, or in pressuring possible suppliers. It also is not a major problem in analyzing broad military counterproliferation risks and programs. The situation is very different in dealing with war fighting choices, particularly issues like preemption and targeting. Assumptions of capability can lead to preemption that is not necessary, overtargeting, inability to prioritize, and a failure to create the detailed collection and analysis necessary to support warfighters down to the battalion level. This, in turn, often forces field commanders to rely on field teams with limited capability and expertise, and to overreact to any potential threat or warning indicator.
- ***The intelligence community does bring outside experts into the process, but often simply to provide advice in general terms rather than cleared review of the intelligence product.*** The result is often less than helpful. The use of other cleared personnel in U.S. laboratories and other areas of expertise is inadequate and often presents major problems because those consulted are not brought fully into the intelligence analysis process and given all of the necessary data.
- ***The intelligence community does tend to try to avoid explicit statements of the short comings in collection and methods in much of its analysis, and to repeat past agreed judgments on a lowest common denominator level—particularly in the form of the intelligence products that get broad circulation to consumers.*** Attempts at independent outside analysis or “B-Teams,” however, are not subject to the review and controls enforced on intelligence analysis, and the teams, collection data, and methods used are generally selected to prove given points rather than provide an objective counterpoint to finished analysis.⁹⁹
- ***Time or bureaucratic momentum and poor supervision lead to a failure to proper review or “zero-base” analysis.*** Any review of unclassified reports shows a tendency to endlessly repeat prior assessments and conclusions without reviewing their content or with any effort to comprehensively review past judgments.

The User as the Problem

It is not clear whether many of the problems revealed by the Iraq War will not be repeated in future crises. All three reports effectively absolve the policy level user of responsibility. No one can work in both worlds, however, without learning that users of intelligence are at best intolerant of analysis that consists of a wide range of qualifications and uncertainties.

This is true even at the best of times, and the best of times do not exist when urgent policy and warfighting decisions need to be made. Users inevitably either force the intelligence process to reach something approaching a definitive set of conclusions, or else they make such estimates themselves.

Intelligence analysts and managers are all too aware of this fact. Experience has taught them that complex intelligence analysis—filled with alternative cases, probability estimates, and qualifications about uncertainty—generally go unused or make policy makers and commanders impatient with the entire intelligence process. In the real world, hard choices have to be made to provide an estimate that **can** actually be used and acted upon, and these choices must either be made by the intelligence community or the user.

The irony of the US, British, and Australian inquires into the problems in intelligence on Iraq WMD is that all have addressed the problem of the intelligence-user interface by omission, or in the form of platitudes. They are directed almost exclusively at reforming intelligence. In practice, reform may have to focus as much on reforming the user.

Lessons and Non-Lessons Regarding Proliferation

Finally, the war has also shown that intelligence needs to reassess how foreign powers and terrorist movements view proliferation and its impact on their ability to exert influence and conduct warfighting. Ever since the Gulf War, it has been clear that local powers and movements perceive weapons of mass destruction as a potential counter to US conventional capabilities and a way of striking decisively at the US. This “lesson,” however, needs to be kept in perspective.

The race to acquire weapons of mass destruction in the region dates back to the 1950s. It has been constantly kept to the fore by Israel’s undeclared deterrent, and was reinforced both by Iraq’s behavior during the Iran-Iraq War, and UNSCOM’s discoveries after the Gulf War. It doesn’t take US military success to stimulate proliferation. In practice, North Korea’s transfer of missile technology, and Pakistan’s willingness to sell P2 centrifuge technology and Chinese fissile weapons design may also be a more important recent stimulus.

The fact that Al Qaida was found to have conducted extensive studies of how to acquire weapons of mass destruction in Afghanistan is an important warning; so too are their efforts to attack Jordan in March 2004 with chemical weapons, the Ricin discoveries in the UK, and the knowledge that designs for reasonably sophisticated devices are available from commercial publishers and on the internet. The threat of terrorists using such weapons in attacks is clearly present and growing. Hostile movements are also aware that the US ability to track the source of covert attacks is limited. The failure to find the culprit responsible for the Anthrax attacks on the Capital makes this all too clear.

At the same time, the first novels describing the potential benefits to terrorists in using weapons of mass destruction appeared in the 1960s. The US took the possibility of covert state-sponsored Spetsnaz attacks using such weapons seriously from the 1990s on. The perceived vulnerability of US theater nuclear weapons in Europe from threats like Palestinian extremists, Badr-Meinhof, the Red Brigades, etc, was taken seriously enough to make major new efforts to protect such weapons in 1973 – an effort that began long before the October War. The idea of terrorist and proxy attacks is scarcely new, or a post-Cold War development.

Intelligence collection and analysis must consider several other points:

- **Simply acquiring weapons of mass destruction is not the same as knowing how to use them or what their effects will be.** There are many scenarios in which the nation or movement acquiring such weapons will have no real way to test their effectiveness, know little about targeting, and have to use uncertain delivery methods.
- **Lethality and effect differ radically by type of weapon of mass destruction.** Chemical and radiological weapons generally have limited lethality except in very large quantities. Biological weapons can have limited to “nuclear equivalent” lethality. Nuclear effects alter radically according to yield and factors like height of burst.

- **Having or using such weapons justifies response at almost any level:** While acquiring such weapons may have a deterrent value, it also fundamentally changes the military response likely to be used against the holder. At present, however, it seems likely that many Middle Eastern states and radical movements have not really thought much beyond the acquisition phase and to the war fighting/use phase and its aftermath.

In short, it is all very well to talk about proliferation as a “lesson” to regional states, Islamist extremists, and insurgent movements, but a lesson to do what? And, with what consequences?

¹ “Interview: General Richard Myers,” *Defense News*, April 14, 2003, p. 46.

² Interview with James Kitfield, “Attack Always”

³ Adapted from Mosley, “Operation Iraqi Freedom—By the Numbers.”

⁴ Ibid.

⁵ United States General Accounting Office, GAO, Report to Congressional Committees, “Military Operations, Recent Campaigns Benefited from Improved Communications and Technology, but Barriers to Continued Progress Remain,” WashiintonGAO-04-547, www.gao.gov/cgi-bin/getrpt?GAO-04-547, June 2004, p. 19.

⁶ Statement of General Tommy R. Franks, Former Commander of US Central Command, Before the Senate Armed Services Committee, July 9, 2003.

⁷ For background on the planning and conceptual thinking behind some of these developments, see Daniel Gouré and Christopher M. Szara, *Air and Space Power in the New Millennium* (Washington, D.C.: CSIS, 1997) and Stuart E. Johnson and Martin C. Libicki, *Dominant Battlespace Knowledge* (Washington, D.C.: National Defense University, 1995).

⁸ Department of Defense briefing on April 23, 2003, <http://www.defenselink.mil/transcripts/2003/tr20030423-0122.html>.

⁹ Statement of General Tommy R. Franks, Former Commander of US Central Command, Before the Senate Armed Services Committee, July 9, 2003.

¹⁰ British Ministry of Defense, *Operations in Iraq: First Reflections*, London, Her Majesty’s Stationary Office. July 2003, London, Her Majesty’s Stationary Office. July 2003, pp. 24-25.

¹¹ United States General Accounting Office, GAO, Report to Congressional Committees, “Military Operations, Recent Campaigns Benefited from Improved Communications and Technology, but Barriers to Continued Progress Remain,” WashiintonGAO-04-547, www.gao.gov/cgi-bin/getrpt?GAO-04-547, June 2004, pp 19-23.

¹² Stew Rayfield, “IMINT//Article on Marines and OIF National-Level Satellite Imagery,” e-mail, June 25, 2003. An article entitled “Marines In Iraq Lacked Access To National-Level Satellite Imagery” in *Inside the Navy*, June 16, 2003, p. 1, confuses a U.S. Marines lessons report on the limits imposed by the Marines’ assets with a failure to obtain and use imagery data.

¹³ Commanding General, “Operation Iraqi Freedom (OIF): Lessons Learned,” Ref: (a) MEF FRAGO 279-03, 1st Marine Division, U.S. Marines, May 29, 2003.

¹⁴ British Ministry of Defense, *Operations in Iraq: First Reflections*, London, Her Majesty’s Stationary Office. July 2003, London, Her Majesty’s Stationary Office. July 2003, p. 25.

¹⁵ Joe Burlas, “G-6 Says OIF Validates Transformation Path,” Army News Service, May 27, 2003.

¹⁶ Joshua Davis, “If We Run Out of Batteries, This War is Screwed,” *Wired Magazine*, http://www.wired.com/wired/archive/11.06/battlefield_pr.html.

¹⁷ British Ministry of Defense, *Operations in Iraq: First Reflections*, London, Her Majesty’s Stationary Office. July 2003, London, Her Majesty’s Stationary Office. July 2003, p. 5

¹⁸ Rowan Scarborough, “Myers Says Annihilation of Iraqi Army Wasn’t Goal,” *Washington Times*, June 30, 2003.

¹⁹ “No Bunker Found Under Bomb Site,” *New York Times*, May 29, 2003.

²⁰ United States General Accounting Office, GAO, Report to Congressional Committees, "Military Operations, Recent Campaigns Benefited from Improved Communications and Technology, but Barriers to Continued Progress Remain," WashiintonGAO-04-547, www.gao.gov/cgi-bin/gettrpt?GAO-04-547, June 2004, pp. 23-32.

²¹ Prepared testimony by US Secretary of Defense Donald R. Rumsfeld, Senate Armed Services Committee, July 9, 2003; Statement of General Tommy R. Franks, Former Commander of US Central Command, Before the Senate Armed Services Committee, July 9, 2003.

²² The quotes are taken from Commanding General, "Operation Iraqi Freedom (OIF): Lessons Learned." Discussions with officers from other services indicate that similar problems occurred in those services, although the army and air force seem to have had somewhat better dissemination systems.

²³ Colonel Al Baldwin, USMC, "I MEF ISR in OIF," Headquarters, U.S. Marine Intelligence Department, June 2003.

²⁴ Anne Plummer, "Army To Build System Architecture For Joint Blue-Force Tracking," *Inside The Army*, May 19, 2003, p. 1.

²⁵ Anne Plummer, "Army To Build System Architecture For Joint Blue-Force Tracking," *Inside The Army*, May 19, 2003, p. 1

²⁶ Frank Tiboni, "US, UK Troops Carry Force Trackers," *Defense News*, March 24, 2003, p. 6; Kim Burger, "US Army Shares Radios to Avoid Fratricide," *Jane's Defense Weekly*, March 12, 2003; Vernon Loeb, "Digitized Battlefield Puts Friend and Foe In Sight," *Washington Post*, March 3, 2003, p. 15; Frank Tiboni, "Force XXI Proves Mettle By Saving Lives in Iraq," *Defense News*, June 9, 2003, p. 42..

²⁷ Tiboni, "US, UK Troops Carry Force Trackers"; Burger, "US Army Shares Radios to Avoid Fratricide."

²⁸ Frank Tiboni, "US Army Seeks New Transports by 2008," *Defense News*, April 21, 2003, p. 22.

²⁹ Gail Kaufman, "USAF C2 Contest Gets Off Ground," *Defense News*, June 23, 2003, p. 18.

³⁰ Commanding General, 1 Marine Division, "Operation Iraqi Freedom: OIF Lessons Learned," Reference MEF Frago 279-03, May 29, 2003.

³¹ British Ministry of Defense, *Operations in Iraq: First Reflections*, London, Her Majesty's Stationary Office. July 2003, London, Her Majesty's Stationary Office. July 2003, pp. 25.

³² This analysis relies heavily on reporting by Anne Plummer in "Army To Build System Architecture For Joint Blue-Force Tracking," *Inside The Army*, May 19, 2003, p. 1.

³³ Gail Kaufman, "USAF C2 Contest Gets Off Ground," *Defense News*, June 23, 2003, p. 18.

³⁴ For a more detailed discussed of effects based bombing, see David A. Deptula, *Effects Based Operations : Change in the Nature of Warfare*, Arlington VA, Aerospace Education Foundation, 2001.

³⁵ Bradley Graham, "Military Turns to Software to Cut Civilian Casualties, Washington Post, February 21, 2003, p. 18.

³⁶ The details of these efforts are described in U.S. Central Command, "Target and Collateral Damage, 5 March 2003 (background briefing), and Senior Defense Official, "Background Briefing on Targeting," Department of Defense News Transcript, March 5, 2003.

³⁷ For an excellent book-length study of the subject, see Edward R. Smith, *Effects Based Operations: Applying Network Centric Warfare in Peace, Crisis, and War*, Department of Defense Command and Control Research Program (CCRP), Washington, DC, November 2002.

³⁸ Department of Defense, Transcript, Col. Gary L. Crowder, Chief, Strategy, Concepts and Doctrine, Air Combat Command, "Effects Based Operations Briefing, March 19, 2003, http://www.defenselink.mil/news/Mar2003/t03202003_t0319effects.html. The author has edited this briefing to remove all questions, references to slides, and greatly shorten the briefing. The words quoted, however, are Colonel Crowder's

³⁹ Michael Gordon, "US Attacked Iraqi Air Defenses Starting in 2002," *New York Times*, July 20, 2003; Bradley Graham, "US Moved Early for Air Supremacy," *Washington Post*, July 20, 2003.

⁴⁰ Niko Price, "Tallying Civilian Death Toll in Iraq War is Daunting," *Philadelphia Inquirer*, June 11, 2003.

⁴¹ Laura King, "Baghdad's Death Toll Assessed," *Los Angeles Times*, May 18, 2003, p. 1; Peter Ford, "Survey Pointing to High Civilian Death Toll in Iraq," *Christian Science Monitor*, May 22, 2003, p. 1; Associated Press, May 15, 2003; Iraqbodycount.net.

⁴² *Washington Post*, April 20, 2003, p. A20.

⁴³ Rowan Scarborough, "Myers Says "Annihilation of Iraqi Army Wasn't Goal, *Washington Times*, June 30, 2003.

⁴⁴ British Ministry of Defense, *Operations in Iraq: First Reflections*, London, Her Majesty's Stationary Office. July 2003, London, Her Majesty's Stationary Office. July 2003, pp. 5, 21.

⁴⁵ A fully accurate analysis would require a complex analysis of all of the sources of error, or an "error budget," for a given mix of targeting data, given launch conditions, and a give mark or model of a weapon. For obvious reasons, this would be a mathematical nightmare, even if suitable test and evaluation methods could be developed and funded.

⁴⁶ Adapted from Lt. General T. Michael Mosley, "Operation Iraqi Freedom—By the Numbers," "USCENTAF, Assessment and Analysis Division, April 30, 2003.

⁴⁷ Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War, Volume IV, The Gulf War*, Boulder, Westview, 1996, pp. 476-477.

⁴⁸ Arnaud de Borchgrave, "War by Remote Control," *Washington Times*, April 28, 2003, p. 17.

⁴⁹ See General Hal. M. Hornburg, "Air Support in Iraq," *New York Times*, June 3, 2003,

⁵⁰ The reader should be aware that 7,200 strikes could never be characterized by mission. See Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War, Volume IV, The Gulf War*, Boulder, Westview, 1996, pp. 442-443.

⁵¹ See Anthony H. Cordesman, *The Lessons and Non-Lessons of the Air and Missile Campaign in Kosovo*, Praeger, 2001, pp. 151-153.

⁵² Adapted from Lt. General T. Michael Mosley, "Operation Iraqi Freedom—By the Numbers," USCENTAF, Assessment and Analysis Division, April 30, 2003

⁵³ Tony Capaccio, "US Launched More Than 50 'Time Sensitive strikes in Iraq,'" Bloomberg News, April 14, 2003.

⁵⁴ David A. Fulghum, "Offensive Gathers Speed," *Aviation Week & Space Technology*, March 21, 2003; David A. Fulghum, "Opening Night in Baghdad," *Aviation Week & Space Technology*, March 21, 2003.

⁵⁵ David A. Fulghum, "Opening Night in Baghdad," *Aviation Week & Space Technology*, March 21, 2003.

⁵⁶ Adapted from Lt. General T. Michael Mosley, "Operation Iraqi Freedom—By the Numbers," USCENTAF, Assessment and Analysis Division, April 30, 2003

⁵⁷ Commanding General, 1 Marine Division, "Operation Iraqi freedom (OIF): Lessons Learned," MEF-FRAGO 279-03, may 29, 2003.

⁵⁸ The initial analysis conducted by C.N.A. (Apr 03) indicated the close fight could not be predicted 48-72 hours in advance and that shaping often did not focus on the primary objective laid out in the targeting process.

⁵⁹ The initial analysis conducted by C.N.A. (Apr 03) indicated the close fight could not be predicted 48-72 hours in advance and that shaping often did not focus on the primary objective laid out in the targeting process.

⁶⁰ A plan to implement a 48 hour Targeting cycle was approved by the DCG on 23 Apr 03. Also the real key to ensuring the PTL remains relevant and accurate is contingent on the efficacy of the intelligence collections effort, which is addressed in a separate topic.]

⁶¹ For a good discussion of many of the issues involved, see Lt. Colonel Peter L. Hays, *United States Military Space Into the 21st Century* (Maxwell AFB, Ala.: Air University Press, September 2002). There are many earlier works outlining the possible uses of space the United States made in the Iraq War and illustrating the evolutionary nature of the changes taking place. For example, see Stuart E. Johnson and Martin C. Libicki, *Dominant Battlespace Knowledge: The Winning Edge* (Washington, D.C.: National Defense University, 1995).

⁶² Vernon Loeb, "Intense, Coordinated Air War Backs Baghdad Campaign," *Washington Post*, April 6, 2003, p. 24.

⁶³ Adapted from Mosley, "Operation Iraqi Freedom—By the Numbers."

⁶⁴ William B. Scott, "Milspace will be Major Player in Gulf War 2," *Aviation Week & Space Technology*, January 12, 2003.

⁶⁵ Ibid.

⁶⁶ Jeremy Singer, "US Army Policy Spells Out Critical Space Capabilities," *Defense News*, June 16, 2003, p. 34.

⁶⁷ David A. Fulghum, "Offensive Gathers Speed," *Aviation Week & Space Technology*, March 21, 2003; Usha Lee McFarling, "The Eyes and Ears of War," *Los Angeles Times*, April 24, 2003, p. 1.

⁶⁸ This description is adapted from the USAF data base at <http://www.airforce-technology.com/projects/jstars/>.

⁶⁹ The 116th Air Control Wing operates the JSTARS aircraft at Robins Air Force Base in Georgia. The 116th is a new "blended wing" with both Air Force and Air National Guard personnel.

⁷⁰ On a standard mission the aircraft has a crew of 21 with three flight crew and 19 systems operators. On a long endurance mission the aircraft has a crew of 34, with 6 flight crew and 28 system operators. The Boeing 707-300 series aircraft is the JSTARS airframe. The aircraft are remanufactured at Northrop Grumman in Lake Charles, Louisiana, then transferred to the Battle Management Systems Division in Melbourne, Florida where the electronics are installed and tested. The propulsion system of the JSTARS aircraft consists of four Pratt and Whitney JT3D-3B turbojet engines, each providing 18,000 pounds of thrust.

⁷¹ Commanding General, 1 Marine Division, "Operation Iraqi freedom (OIF): Lessons Learned," MEF-FRAGO 279-03, may 29, 2003.

⁷² Eric Schmidt, "In the Skies Over Iraq, Silent Observers Become Futuristic Weapons," *New York Times*, April 18, 2003; Marc Selinger, "US Using More than 10 Types of UAVs," *Aerospace Daily*, April 22, 2003..

⁷³ Rowan Scarborough, "Myers Says 'Annihilation of Iraqi Army Wasn't Goal," *Washington Times*, June 30, 2003.

⁷⁴ British Ministry of Defense, *Operations in Iraq: First Reflections*, London, Her Majesty's Stationary Office. July 2003, London, Her Majesty's Stationary Office. July 2003, pp. 21.

⁷⁵ The RQ-1 Predator is a medium-altitude, long-endurance unmanned aerial vehicle system. It is a Joint Forces Air Component Commander-owned theater asset for reconnaissance, surveillance and target acquisition in support of the Joint Force commander. It is a system, not just aircraft. A fully operational system consists of four aircraft (with sensors), a ground control station (GCS), a Predator Primary Satellite Link (PPSL), and 55 personnel for continuous 24 hour operations. The basic crew for the Predator is one pilot and two sensor operators. They fly the aircraft from inside the GCS via a C-Band line-of-sight data link or a Ku-Band satellite data link for beyond line-of-sight flight.

The first aircraft were equipped with a color nose camera (generally used by the aerial vehicle operator for flight control), a day variable aperture TV camera, a variable aperture infrared camera (for low light/night), and a synthetic aperture radar (SAR) for looking through smoke, clouds, or haze. The cameras produced full motion video and the SAR still frame radar images. The three sensors were carried on the same airframe but could not be operated

simultaneously. The upgraded Predator carries the Multispectral Targeting System (MTS) with inherent AGM-114 Hellfire missile targeting capability, and integrates electro-optical, infrared, laser designator and laser illuminator into a single sensor package. These Predators cannot carry MTS and the SAR simultaneously. The aircraft carry and employ two laser-guided Hellfire anti-tank missiles with MTS.

Each Predator aircraft can be disassembled into six main components and loaded into a container nicknamed "the coffin." This enables all system components and support equipment to be rapidly deployed worldwide. The largest component is the GCS and it is designed to be rolled into a C-130. The air transportable PPSL consists of a 6.25 meter Ku-Band satellite system mounted on a trailer. It provides communications between the ground station and the aircraft when it is beyond line-of-sight and is a link into secondary intelligence dissemination networks.

The RQ-1B system needs 5,000 feet by 125 feet (1,524 meters by 38 meters) of hard surface runway with clear line-of-sight to each end from the GCS to the air vehicles. The RQ-1B includes an ARC-210 radio, an APX-100 IFF/SIF with Mode 4, an upgraded turbo-charged engine and an ice mitigation system.

Source: http://www.af.mil/news/factsheets/RQ_1_Predator_Unmanned_Aerial.html

⁷⁶ Michael Gordon, "US Attacked Iraqi Air Defenses Starting in 2002," *New York Times*, July 20, 2003; Bradley Graham, "US Moved Early for Air Supremacy," *Washington Post*, July 20, 2003.

⁷⁷ Source: <http://www.af.mil/news/factsheets/global.html>

⁷⁸ David A. Fulghum and Robert Wall, "Baghdad Confidential," *Aviation Week*, April 28, 2003, p. 32.

⁷⁹ Jonathan Finer, "With the Dragon Eye," *Washington Post*, March 7, 2003, p. A14.

⁸⁰ Adapted from <http://www.globalsecurity.org/intell/systems/dragon-eye.htm>.

⁸¹ Marine Corps Lt. Gen. Earl B. Hailston, Commander, U.S. Marine Corps Forces Central Command., "MARCENT Briefing from Bahrain," April 24, 2003, <http://www.defenselink.mil/transcripts/2003/tr20030424-0124.html>.

⁸² Bradley Graham and Vernon Loeb, "An Air War of Might, Coordination, and Risks," *Washington Post*, April 27, 2003, p. A1.

⁸³ Source: <http://www.aerovironment.com/area-aircraft/prod-serv/pointer.html>.

⁸⁴ Gail Kaufman and Frank Tiboni, "US Army Lays Out UAV Plans," *Defense News*, June 16, 2003.

⁸⁵ Gail Kaufman and Frank Tiboni, "US Army Lays Out UAV Plans," *Defense News*, June 16, 2003.

⁸⁶ Commanding General, 1 Marine Division, "Operation Iraqi freedom (OIF): Lessons Learned," MEF-FRAGO 279-03, May 29, 2003.

⁸⁷ Department of Defense, http://www.defenselink.mil/news/Mar2003/t03182003_t0318uav.html.

⁸⁸ http://www.defenselink.mil/news/Mar2003/n03182003_200303186.html

⁸⁹ Walter Pincus and Dan Morgan, "Defense Bills Expected to Pass Quickly," *Washington Post*, May 19, 2003.

⁹⁰ United States General Accounting Office, GAO, Report to Congressional Committees, "Military Operations, Recent Campaigns Benefited from Improved Communications and Technology, but Barriers to Continued Progress Remain," WashiintonGAO-04-547, www.gao.gov/cgi-bin/getrpt?GAO-04-547, June 2004, p. 5.

¹ See Col. Ernie Howard, "The Strategic Logic of Suicide Terror," Air University Warfare Studies Institute, April 2004.

⁹² British Ministry of Defense, "Operations in Iraq, Lessons for the Future," London, Ministry of Defense, December 2003. The lessons are quoted in full paragraph form, retaining the original paragraph identification. References to "First Reflections" are to an earlier Ministry of Defense report on the war published on July 7, 2003.

⁹³ Australian Ministry of Defense, *The War in Iraq: ADF Operations in the Middle East in 2003*, Canberra, Ministry of Defense, 2003. This report is drawn from a classified review of Australia's contribution to US-led coalition operations in Iraq. It follows the progress of the war – focusing on the part played by the ADF – and identifies some of the key lessons learned during three operations:

- **Operation Bastille** (pre-deployment of forces to the Middle East, acclimatization and in-theatre training);
- **Operation Falconer** (combat operations to disarm Iraq); and
- **Operation Catalyst** (stabilization and recovery operations).

The quotes are taken from the entire document and reorganized by intelligence-related subject.

⁹⁴ Many of the comments made in this section are based on interviews with U.S., British, and Australian officials, officers, and experts after the war, and the author's prior experience in analyzing proliferation. There are many useful press reports that have emerged since the war. In addition to those referenced later in this chapter, these include Warren P. Strobel and John Walcott, "CIA Lack Info To Counter Claims About Iraqi Weapons," *Miami Herald*, June 3, 2003; James Risen, "Word that US Doubted Iraq Would Use Gas," *New York Times*, June 18, 2003; Bruce Auster, Mark Mazetti, and Edward Pound, "Truth and Consequences," *U.S. News and World Report*, June 9, 2003; Evan Thomas, Richard Wolffe, and Michael Isikoff, "Where are Iraq's WMDs?" *Newsweek*, June 9, 2003; Michael Duffy, "Weapons of Mass Disappearance," *Time*, June 9, 2003; James Risen, "Iraq Arms Report Now the Subject of A CIA review," *New York Times*, June 4, 2003; Maggie Farley, "Blix's Final Words to Security Council are Words of

Caution,” *Los Angeles Times*, June 6, 2003; Tony Capaccio, “Pentagon 2002 Study Reported No Reliable Data on Iraq Weapons, Bloomberg.com, June 6, 2003;

⁹⁵ All of the following points are quoted, with minor editing and reformatting, from the British (“Iraq’s Weapons of Mass Destruction—The assessment of the British Government,” September 24, 2002 - <http://www.pmo.gov.uk/output/page271.asp>) and U.S. (CIA, “Iraq’s Weapons of Mass Destruction Programs, “October 4, 2002-http://www.governmentguide.com/govsite.adp?bread=*Main&url=http%3A//www.governmentguide.com/ams/clickThruRedirect.adp%3F55076483%2C16920155%2Chttp%3A//www.cia.gov) White Papers. Additional British charges against Iraq for concealing evidence of its weapons of mass destruction can be found in a second white paper: “Iraq: Its Infrastructure of Concealment, Deception and Intimidation,” October 7, 2002, <http://www.number-10.gov.uk/output/Page1470.asp>.

⁹⁶ For an interesting discussion of the problems in assessing dual-use facilities in Iraq, see Walter Pincus, “Weapons Linked to Dual Use Facilities in Iraq,” *Washington Post*, June 2, 2003.

⁹⁷ For some additional data on this aspect of these assessments made of Iraq, see Bill Gertz, “Iraqi Group Aid CIA Intelligence,” *Washington Times*, June 12, 2003; John Diamond, “Broad Purges Wiped Out Most Iraqis Helping CIA,” *USA Today*, June 17, 2003; John Diamond, “Weak Spy Network Hurt Hunt for Arms,” *USA Today*, June 17, 2003.

⁹⁸ Earlier unclassified CIA reports on problems like the ballistic missile threat often projected alternative levels of current and future capability. The qualifications and possible futures are far less well defined in more recent reports. For example, see CIA, Unclassified Summary of a National Intelligence Estimate, Foreign Missile Developments and the Ballistic Missile Threat Through 2015,” National Intelligence Council, December 2001, http://www.cia.gov/nic/pubs/other_products/Unclassifiedballisticmissilefinal.htm.

⁹⁹ There is no way to determine just how much the Special Plans Office team set up within the office of the Secretary of Defense to analyze the threat in Iraq was designed to produce a given conclusion or politicized intelligence. The Department has denied this, and stated that the team created within its policy office was not working Iraqi per se, but on global terrorist interconnections. It also stated that the Special Plans Office was never tied to the Intelligence Collection Program—a program to debrief Iraqi defectors—and relied on CIA inputs for its analysis. It states that simply conducted a review, presented its findings in August 2002, and its members returned to other duties. See Jim Garamone, “Policy Chief Seeks to Clear Intelligence Record,” American Forces Information Service, June 3, 2003; and Briefing on policy and intelligence matters, Douglas J. Feith, under secretary of defense for policy, and William J. Luti, deputy under secretary of defense for special plans and Near East and South Asian affairs, June 4, 2003, <http://www.defenselink.mil/transcripts/2003/tr20030604-0248.html>.

Some intelligence experts dispute this view, however, and claim the team’s effort was used to put pressure on the intelligence community. Such “B-teams” also have a mixed history. They did help identify an intelligence community tendency to underestimate Soviet strategic nuclear efforts during the Cold War. The threat analysis of missile threats posed to the United States by the “Rumsfeld Commission,” however, was a heavily one-sided assessment designed to justify national missile defense. Also see Greg Miller, “Pentagon Defends Role of Intelligence Unit on Iraq,” *Los Angeles Times*, June 5, 2003; and David S. Cloud, “The Case for War Relied on Selective Intelligence,” *Wall Street Journal*, June 5, 2003..