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Beyond Luddites and Magicians: Examining the MTR

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"Think of what it would mean to have real-time surveillance of a 200-mile wide battlefield, and to be able to send a ballistic missile anywhere on that battlefield in four minutes—a missile that goes reliably, and goes where you want it to go. . . . That's a marvel."[1]

— Admiral W. A. Owens
Vice Chairman, Joint Chiefs of Staff

"Any sufficiently advanced technology is indistinguishable from magic."[2]

— Arthur C. Clarke

In his 1952 short story "Superiority," Arthur C. Clarke wrote of an intergalactic war between two space-faring empires. One side began the war in a position of strength, with superior numbers and technology. They only had to conduct a straightforward campaign with their crushing superiority to prevail. They became enthralled, however, with the idea that new technologies would make it possible to win without casualties. Lured by the promise of cheap victory, they invested in increasingly advanced technologies that promised much yet brought previously unforeseen vulnerabilities. As they discarded old methods at the urging of their scientists, who argued that "a revolution in warfare may soon be upon us," their high-tech fleet became increasingly smaller and more powerful, yet at the same time fragile, specialized, and complex. In the meantime, their foes produced increasing numbers of cheap, less-capable weapons. Eventually, the high-tech side was overwhelmed, despite having many "miracle weapons" with magical properties.

"Superiority" was meant to warn Cold War weaponeers and planners that the best weapons don't always win wars, and that superior technology

must gain practical, balanced expression in order to be effective. That conservative moral has relevance today, for a revolution in warfare is upon us. Regardless of subtle semantic differences among interpreters and critics, the world of weapons, sensors, communications, computers, and, most important, the integration of information that drives them, is changing dramatically. The Military Technical Revolution (MTR) is the military application of the much broader civilian information revolution. The information revolution becomes relevant to soldiers in its ability to cohere—to shape information into useful, congruent, actionable, purposeful intelligence on the battlefield.

The United States is entering an era that will bring profound changes, and it is unclear what the consequences of the MTR may be. Enthusiastic arguments tend to center around "things, and numbers of things"—hardware and kill probability—while ignoring the larger issues of how the capabilities of these things may change the way we organize, train, and equip forces. In concentrating on things rather than synthesis, we invite the effects of what has been called "the law of unintended consequences." What will be the effects of highly complex, interrelated systems performing under extreme stress? And can technology allow us to dispense with the Clausewitzian concept of battle, an environment dominated by chaos and friction?

This article will address these questions by looking at the MTR in a new light, avoiding a systems and hardware analysis, and instead focusing on the "first principle" of the MTR: that technology now gives us the ability to gather and distribute information in such a way that it is possible to gain a qualitative advantage over an opponent who cannot—a gain of an order of magnitude or greater. New sensors, such as high-altitude signals intelligence architecture, improved unmanned aerial vehicles, and precision radar, are coupled with means to integrate and synthesize the vast amounts of data generated. They then rapidly disseminate the targeting information to highly accurate strike platforms. A key distinction is that new sensor-fuzed weapons, while impressive, remain evolutionary and incremental improvements of weapons that date from World War II.[3] Qualitative change lies in new abilities to gather information, process it, and distribute it in real time.

Two interrelated concepts undergird this architecture, and examining the first principle of the MTR means looking at the nature of these concepts. The first concept is the dialectic relationship of coherence and disruption on the battlefield. Closely related is the paradox of how commanders and their

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staffs, who may come to depend on the certainty provided by information coherence, can function effectively in its absence.

Coherence and Disruption

Disruption is poised against coherence in a dialectic. Throughout history, it is generally accepted that disruption has had the upper hand; the environment of combat has tended to be chaotic and confusing. Organizations have succeeded in this environment by adapting to it, through individual leadership, flexible organization, and doctrine. By and large, their degree of adaptation has been their degree of success. Now, the MTR appears capable of shifting the advantage in this dialectic: coherence may prevail.

Two considerations will determine whether coherence will prevail over chaos and disruption. The first is essentially technical, the second philosophical. Just how much coherence can we gain, and at what cost? There is a point of diminishing returns, and a point beyond which technology will not take us in seeking coherence. In Desert Storm, despite overwhelming Allied information dominance, coupled with air superiority and a favorable correlation of effective ground combat power, most of the Iraqi Republican Guard—the Iraqi operational center of gravity—was able to execute a workmanlike withdrawal from Kuwait. The "Great Wheel" of the Allied force landed its powerful blow at least partially on air. Much of the Republican Guard lived to fight another day. This was caused in large measure by Central Command's inability to deduce Iraqi intentions. Even with an ability to plot with certainty virtually any Iraqi location, Central Command remained unable to distill Saddam's intent from the overhead imagery, intercepts, and other observations.[4] Location and movement tracks may be 90 percent of the solution, but the remaining ten percent—the intent of the enemy commander—may well remain unknowable. The ability to recognize this limitation inherent in even the most sophisticated intelligence architecture will become increasingly important as we come to depend on it more and more.

The second consideration lies in the nature of information and the philosophy of its use. The MTR is merging with a warfighting culture that historically seeks, and requires, information coherence. A by-product of this process can thus become a creeping centralization of command and control functions, with a concomitant decrease in the importance of the commander actually on the ground, in contact. Ironically, this will act against some of the new capabilities that the MTR features—the ability to "flatten" hierarchies, allowing direct access to critical intelligence by echelon-skipping subordinates. The potential for centralization raises the specter of our experience in Vietnam, where President Johnson abused excellent communications to routinely interfere at the lowest echelons, even to involve himself in tactical targeting. While political leaders in the Gulf War refrained from doing this, it is unclear that this represents a good test of restraint. After all, there is little

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incentive to interfere when all is going well. It is in moments of stress and disaster that the ability to reach down becomes so inviting. To those whom the gods would drive mad, they first give perfect communications.

At the same time, despite our best efforts, chaos and disruption will always be present in any system. The MTR may well tend to reduce it only at the top of the pyramid. Some theorists even argue that operational command posts can be centralized in the United States and connected to theater operating forces by appropriate data links.[5] Since disruption and chaos can be reduced but never erased in any system, it follows that a top-down approach may increase disruption somewhere else, possibly at the bottom of the pyramid—where forces are in contact, and increasingly distant from decisionmakers.[6] At the same time, information read at higher echelons, however accurate, produces a need for more information. This can lead to "information pathology," an addictive state in which organizations never have enough actionable information.[7]

A future opponent, conversant with the lessons of the Gulf War and Vietnam, might choose to challenge MTR technology by presenting an asymmetrical low-tech strategy, perhaps one not energy-based and therefore not vulnerable to most of our sensors. Such a strategy would minimize communications and electronic indicators so severely that there would be very little to "read." Such a response would effectively deny the ability to employ many offensive MTR capabilities. This would force a passive posture on any foe, but especially on a force that is MTR-dependent. Our own love affair with decisive maneuver, precision strike, and the ability to synchronize actions in time and space thus may not be relevant, possible, or even desirable for all our future opponents. Operations in Mogadishu in September and October 1993 offer a good recent example of this asymmetry. Opponents like this are not vulnerable to information warfare. At the same time, our own information systems will remain vulnerable.[8] It is axiomatic that the more we expect from our computers, the more we have to tell them about ourselves, and the more that can be learned about us.[9]

Although the MTR provides remarkable opportunities to manipulate information to our advantage while denying it to an opponent, we must remember that there will be limits to our ability to cohere—and disruption will always be present. If perfect knowledge of the enemy situation is *n*, then we

will never get closer to it than *n-1*. Perfection is not attainable, and we should not invest the staggering sums it will cost to chase this chimera. Relative, uneasy, and shifting dominance is attainable most of the time, and that should be our goal.

The End of Uncertainty, or What if Rommel Doesn't Show?

The MTR is the first revolution in warfare that has the potential to reveal what has until now been unknowable: the ability to see the other side of the hill, to know where an opponent is, to be able to understand what he is going to do, or to make his actions irrelevant. The MTR attempts to move beyond Clausewitz, making him obsolete by applying a technological fix for what until now has been the central human dynamic in war: *the need to know, and the need to act without knowing all.*[10]

The Army's long-term goal, as outlined in TRADOC Pamphlet 525-5, *Force XXI Operations*, is nothing less than complete digitization of the battlefield, enabling commanders at all levels to share a comprehensive view of it. When coupled with sensor-based input on the enemy, commanders will gain—in theory—near total target awareness. As one writer put it recently, "It is conceivable that the future soldier or weapon system will have four integral components: the global positioning system, a laser range finder, a computer that will integrate the other systems, and a radio capable of a reliable and fast datalink."[11]

The purely technical obstacles to this concept are solvable if we accept *n-1* instead of *n*—perfect knowledge—as our objective. It is less certain what effect these changes will have on commanders themselves. The habits born of such relative certainty in tactical operations may erode the ability of these same commanders to act within an environment of uncertainty. *Force XXI Operations* recognizes this tension, and its discussion of battle command argues that future commanders, while usually armed with certain information, will still have to "accept uncertainty and not hesitate to act instead of waiting for more analysis or information." This is a concept that is easy to describe, yet hard to translate into action.

An excellent example, by analogy, of the insidious effects of dependence on certainty is that of Panzer Gruppe Afrika in 1941 under Rommel. During Auchinlek's Crusader offensive, subordinate commanders came to depend on Rommel's uncanny ability to show up at the decisive time and place, equipped with profound tactical insight, often taking over their sub-units and maneuvering them directly. This worked well, but when Rommel failed to show at the decisive time and place, commanders became tentative and sluggish. They had come to depend on his insight, and they were cautious and unimaginative in his absence. "This dichotomy surely led to that impression of confusion and lack of direction within Panzer Gruppe Afrika which distinguishes some of the Crusader battle."[12]

Attractions, Consequences, and Conclusions

The most powerful subliminal attraction of the MTR is the idea that it promises the ability to conduct military operations "on the cheap," bringing success with a minimum of casualties. Our response to an alleged Iraqi plot against former President Bush, the TLAM attack on Iraqi intelligence activities in Baghdad in 1993, is an example of this kind of warfare. The problem with this attack is typical of the double-sided MTR coin: while precise, the weapons were not perfect, and civilians were killed. The attack looked suspiciously like saccharine warfare, a response that ultimately leaves little impression on the enemy, a bad taste in one's own mouth, and a lingering suspicion that a steady diet of it might not be healthy.

Saccharine warfare is the continuation of a uniquely American approach to technology's role in warfighting. It began with the development of technologies to counter perceived Soviet numerical superiority during the Cold War. With the end of the Soviet threat, it has permutated into a search for technologies that will minimize American and allied casualties, while prevailing on an immaculate battlefield in wars that are viewed in America's living rooms.

The Gulf War represents a latter-day Cambrai for MTR proponents. Like the British in 1917, the United States and its Allies were surprised by the success of their new technology, and were not fully prepared to exploit the opportunity it created. The use of space-based systems, precision munitions, stealth technology, global positioning systems, and theater missile defense all represented the first wave of the MTR.[13] The key element of the equation, however, is whether or not we build on this victory. In 1917, the British army's unreadiness to exploit its surprise success left it open to an embarrassing reverse in a German counterattack.

The United States can avoid a similar experience and exploit its Gulf War victory only by expanding and refining the promise of these emerging technologies—by finding the pivot point to apply this new battlefield leverage. To accomplish this, the MTR must be manifested not only in technological change, but also in operational innovation and adaptation, expressed doctrinally.[14] The extent of the MTR is not known yet, so the capabilities its weapons and cohering vectors bring are still clouded. The character of technological development is unruly, spasmodic, and, to some degree, uncontrollable. This places it at the opposite end of the spectrum from the development of doctrine for military forces, which tends to be predictable, cautious, and self-regulating. The resolution of these structural antagonisms—almost always partial, and on a case-by-case basis—will remain fundamental to the effective employment of new ideas on the battlefield. There can be no overarching model, but there must be an overarching philosophical base.

This means that the MTR must not become linked to the blind acceptance of a post-Clausewitzian battlefield, upon which there is no "fog of war,"

a place where commanders see all, know all, and with frictionless certainty, kill all. Our technology is not advanced enough to overcome the dialectic of coherence and disruption, and we will not fight on an immaculate battlefield. The endless cycle of measure-countermeasure-countercountermeasure will continue to grind away, and the forces of disruption and chaos will hold their own against cybernetic coherence. Warfare transcends high-speed information management. It remains the clash of naked human will, the province of moral force. To attempt to reduce these factors to a flat plasma display is to make two-dimensional what is a three-dimensional activity. This does not mean we should be Luddites[15] and reject technology. The MTR will give US forces enormous leverage if we recognize the limits, as well as the advantages, of technology, and if we keep one wary eye cocked away from our computer screens. Despite these remarkable advances, the human will, not the computer chip, remains the starting point on all matters pertaining to war.

NOTES

1. W. A. Owens, quoted in John Berry, "The Battle over Warfare," *Newsweek*, 5 December 1994, p. 27.

2. "Clarke's Third Law," from Arthur C. Clarke, *Profiles of the Future: An Inquiry into the Limits of the Possible* (New York: Harper & Row, 1973).

3. There are isolated examples of new weapons that embody revolutionary principles—stealth technology, for example—but they are relatively few. Weapon development remains fundamentally incremental and evolutionary.

4. Michael R. Gordon and Bernard E. Trainor, "How Iraq Escaped to Threaten Kuwait Again," *The New York Times*, 23 October 1994, p. 1; and also Bernard E. Trainor, "Schwarzkopf and His Generals," *Proceedings*, June 1994, pp. 45-47.

5. Michael Mazarr, et al., "The Military Technical Revolution: A Structural Framework," Center for Strategic and International Studies, Washington, March 1993, page 27. This medium-length paper is an excellent introduction to the basics of the MTR. While not critical enough in its approach, and almost breathless in its excitement, it remains an excellent foundation document.

6. See Frank M. Snyder, *Command and Control: The Literature and Commentaries* (Washington: National Defense Univ. Press, 1993), pp. 112-14; and Martin van Creveld, *Command in War* (Cambridge, Mass.: Harvard Univ. Press,1985), pp. 247-49.

7. Van Creveld, pp. 247-49.

8. See Donald E. Ryan, Jr., "Implications of Information-Based Warfare," *Joint Force Quarterly* (Autumn/Winter 1994-95), pp. 114-16; and Jeffrey R. Cooper, "Another View of the Revolution in Military Affairs," Strategic Studies Institute, USAWC, Carlisle, Pa., 1994, p. 32.

9. The recent story of the 16-year-old British hacker who allegedly accessed a variety of sensitive US computer networks via the Internet is illustrative. See Tim Kelsey, "Teen Hacks Top-Secret U.S. Computer; British Boy Posted Military Information on Internet," *The Ottawa Citizen*, Ottawa, Canada, 3 January 1995, p. A1; and John Markoff, "Data Network is Found Open to New Threat," *The New York Times*, 22 January 1995, p. A1. See also *The Report of the Defense Science Board Summer Study Task Force on Information Architecture for the Battlefield*, Office of the Under Secretary of Defense for Acquisition and Technology, Washington, October 1994, p. 24.

10. For the definitive discussion of this issue, see Van Creveld's *Command in War*.

11. Robert R. Leonhard, "The Death of Mission Tactics," *Army*, July 1994, p. 18.

12. David Fraser, *Knight's Cross: A Life of Field Marshal Erwin Rommel* (New York: Harper Collins, 1994), p. 296. See also pp. 294-97 for a broad discussion of Rommel's style of command.

13. Andrew F. Krepinevich, Jr., "Keeping Pace With the Military-Technological Revolution," *Issues in Science and Technology* (Summer 1994), pp. 23-24.

14. Ibid.

15. The Luddites were organized bands of men who destroyed textile machinery throughout the Midlands of England during the period 1811-1813, and again in 1816. Their actions were partly a reaction to the industrial revolution, a longing for the old, simple pre-technology ways, and partly a response to the pressures Napoleon's Continental System placed on the English economy.