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The High Ground

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MILITARY THOUGHT AND THE ESSENCE OF WAR
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*“It will free man from the remaining chains,
the chains of gravity which still tie him to this planet.”*

Robert Grove Jr.

35,880 km above the Earth’s surface, it is dark, lonely and cold – the universe looks black and empty. Far away, the Earth is just a small bright disc; the Middle East, Indian Sub-Continent, and South-East Asia frame the deep blue Indian Ocean below. Always in view of these highly troubled regions, Milstar 5 is relentlessly busy. The \$1.268B spacecraft’s movement is imperceptible as large reaction wheels balance torque to keep the spacecraft from tumbling while precision antennas slew to track incoming data streams from Air Force Global Hawk aircraft and Army Special Operations units deployed all around, and now inside, the Iraqi nation. Orbiting 15,000 km below, all 27 satellites of the Global Positioning System (GPS) are in view as they circle the Earth. From Milstar 5’s geosynchronous¹ vantage point, the GPS satellites occasionally appear to pass through the highly classified spy satellites of many nations – America, Russia, China, Israel, France, Japan, and others – as they survey targets, assess damage, and search for hostile activity. The view along the communication satellite’s daunting 15m length looks deep out into cold, black space; occasionally in view is an aging Cold-War-era infrared missile warning spacecraft – built with 35 year old technology – intently scanning its side of the Earth for any sign of a dreaded chemical-weapon-tipped Scud missile launch – one outdated military system trying to find another. On command from a ground station, a short

¹ In a geosynchronous orbit, a spacecraft circles the Earth in exactly one Earth day. A satellite in this orbit, therefore, appears to perpetually “hang” over a stationary point along the Equator.

burst of high-energy radio energy from Milstar 5 retargets a salvo of Tomahawk cruise missiles just launched from the USS Donald Cook in the Red Sea – the missiles are skimming along the Earth’s surface far, far below. The Tomahawks’ guidance systems look out into space for L-Band transmissions broadcast from the four GPS satellites not blocked from their view by the Earth, autonomously charting a course to a recently discovered Iraqi leadership bunker. The Tomahawks scream toward their target, carefully avoiding a whirling sandstorm – too small to be discerned from Milstar 5’s position – being tracked by the array of military and civilian weather satellites deployed by the Americans and their British allies.

Milstar 5 is the latest technical marvel in a massive armada of spacecraft, launched from Vandenberg in California or Cape Canaveral in Florida, that are part of the United States’ effort to employ the heavens in its ever-increasing drive to map, survey, observe, and understand the battlefield. What America is buying, though, with its hundreds of billions of dollars in high technology space equipment, is really something that the great general Napoleon, and his contemporaries, already had – a piece of *the high ground* from which to survey and direct the battle. In this one critical way, the character and conduct of war, so changed in the last two hundred years, is beginning to look again like it did in ancient times.

Losing Control

The Napoleonic Wars were both the beginning and the end of an era in warfare. They were the beginning of what many scholars would today call modern war – military conflict between entire nations, using all resources of those nations, and during all seasons of the year. But they were also the end of an era of war that had stretched far back into antiquity, far beyond written

records. Napoleon and his rivals were the last supreme commanders who really had full control of all of their units – commanders who could watch and direct all major elements of a battle as it unfolded. From his command position atop a hill or ridge, the gifted Corsican timed, directed and watched his cavalry charge, his artillery fire, his infantry ranks advance – his eyes observed the effect, his mind adjusted the tactics, his signal corps conveyed his wishes. He watched his enemy move and strike – using his military genius to counter and rout. Napoleon was master of his element and, more importantly, the entire battle.

General Robert E. Lee was a student of Napoleon's tactics², and worked hard to apply them in his war – but he was to be disappointed by a battlespace swiftly expanding beyond his control. Rapid advances in technology, transportation, and the size of armies were rapidly expanding the elements of the fight beyond the reach of one man. At the Battle of Gettysburg, Lee commanded a line that wound through trees, across streams, around towns, and over hills. His attempts to command near-simultaneous attacks at both flanks of his line faltered among the confusion of missing cavalry and misconstrued commands. Due mostly to misunderstanding of Lee's intentions by his subordinate, Lieutenant General James Longstreet, the Confederate effort to engage while the Union left flank was still weak, just a few miles away, took most of a day and ended in failure.³ In the end, Lee's understanding of the battlespace was limited by his ability to view just a small piece of it at one time, his subordinates misread his intentions when he was not present, and his efforts to time combined attacks were lost as runners were waylaid in the woods.

² Russell F. Weigley, The American Way of War (Bloomington and Indianapolis : Indiana University Press) Ch. 6.

³ Harry W. Pfanz, The Battle of Gettysburg (Eastern National Civil War Series, 1994), 24.

As the physical size of the battle grew, the fog of war, so meticulously described by Carl von Clausewitz half a century before,⁴ was getting worse with every engagement.

A work-around for this dilemma first came from Clausewitz's countrymen, Helmuth von Moltke the Elder and Alfred von Schlieffen, in the late nineteenth century. These Prusso-German thinkers developed the theory of "mission-oriented" orders including the concept of "Commander's Intent," whereby the supreme commander charted a course for his subordinates who were then given broad autonomy within their local spheres of influence to execute as they saw fit. Delegation of authority and empowerment of subordinates became the only way to fight effectively as battles grew larger.⁵ This method of command quickly became standard in all of the world's armed forces, reaching a peak in the Second World War where command of whole regions was delegated to theater commanders who then delegated authority to lower subordinates to implement elements of the battle.

The *character*⁶ and *conduct*⁷ of war, therefore, had altered significantly since Napoleon's day. A battle's leadership had been fundamentally altered – control of an engagement's tactics having been shifted from the supreme commander down to significantly lower levels. Different units or elements of a force were given broad direction and a sense of the "Commander's Intent," rather

⁴ Carl von Clausewitz, On War, trans. Michael Howard and Peter Paret (Princeton, New Jersey : Princeton University Press, 1976).

⁵ Gunther E. Rothenberg, "Moltke, Schlieffen, and the Doctrine of Strategic Envelopment," in Makers of Modern Strategy: From Machiavelli to the Nuclear Age, ed. Peter Paret (Princeton, New Jersey : Princeton University Press).

⁶ Defined as *who* fights in war and to *what ends*.

⁷ Defined as the ways in which warfare is carried out or *how* the war is fought.

than specific real-time instructions. Individual climatic battles – the tests of two supreme commander’s tactics and wills – were replaced by long strategic drives conducted independently toward a set of common goals. Military strategy and battlefield tactics, while always somewhat different in scope, became significantly more distinct.

Retaking the High Ground

The United States was to be the first nation to reverse this trend. In America, the public tends to associate outer space with the National Aeronautics and Space Administration (NASA) – but in doing so is missing the (much) bigger picture. The Department of Defense (DOD) began America’s space age and today outspends NASA over two-to-one on space system development and procurement, fielding a wide array of capabilities that are available to it around the globe. By 2008, this ratio is expected to climb to almost four-to-one.⁸ As each new system has been conceived and developed, the effect has been to increase the central commander’s understanding of the battlespace and his/her control over it. The unit commander’s autonomy is being eroded as he/she becomes ever more connected to headquarters and as headquarters gains ever-greater understanding of the situation on the ground, sometimes even surpassing that of the local commander. In this way, the vacuum of space is being used in a direct attack on the fog of war.

The Eyes of Heaven

The end of the Korean Conflict – the last war fought by the United States without any space assets – saw the beginnings of the modern commander’s ability to view the entire battlefield at

⁸ Keith Stein, “Cost Problems Across the Board for Military Space Programs,” Space & Missile, 09 June 2003 and Kurt Kleiner, “Congressmen clash over NASA’s future,” New Scientist, 08 March 2003.

once. After the war, the Eisenhower administration initiated America's first large-scale space program, later to become known as the Corona Program.⁹ Corona launches carried sophisticated cameras into space to photograph large swathes of the globe, returning pictures on standard camera film in canisters that were retrieved as they plunged into the Pacific Ocean. In one day, the first successful Corona satellite photographed more of the Soviet Union than the whole U-2 program was able to during the entire Cold War. These "film-return" spy satellites were first used by military commanders in the Vietnam War, where they provided (if delayed by days to weeks) vital information on troop movements, the extent of Chinese involvement in supporting the North Vietnamese, and battle terrain. Corona, the only space-based spy system ever declassified by the United States, led the way to today's wide array of space assets focused on intelligence. Though current-day systems will not be discussed further, it is fair to say that they play a major role in reducing the fog of war for all elements of the military leadership.

Tracking the Eye of the Storm

The Vietnam War also saw the first use of military weather satellites in major combat. General William Momyer, commander of the air war in Vietnam, thought "that meteorological satellite use in Southeast Asia operations was among the most significant innovations of the air war."¹⁰ Over perpetually-cloudy Vietnam, satellite weather predictions changed the bombing concept of operations from one where aircraft were instructed to bomb targets of opportunity if they could find a break in the weather to one where reasonably accurate predictions allowed planners to

⁹ Jeffrey T. Richelson, "U.S. Satellite Imagery, 1960-1999," National Security Archive Electronic Briefing Book No. 13, 14 April 1999.

¹⁰ Hank Brandli, "Weather Satellite Photos and the Vietnam War," United States Naval Institute, Spring 1991.

program bombing runs a day in advance in locations where there would be clear skies. The effect of these systems, then, was to reduce the autonomy of individual pilots and centralize control of bombing operations at headquarters. Three decades later in Operation Iraqi Freedom, weather over the battlespace was constantly monitored by DOD DMSP¹¹ systems, as well as NASA and NOAA¹² commercial systems, and fed constantly – through spacecraft like Milstar 5 – to leadership nodes for tactical engagement planning purposes. Commanders today have near-perfect knowledge of weather conditions across the battlefield, something that Napoleon was able to do simply by looking up at the sky.

Getting Wired Without Wires

Early military satellite communications (SATCOM) – then a closely guarded secret – also made its appearance during the Vietnam War, providing reasonably assured access to certain units in the field. In addition to improving morale by allowing soldiers to occasionally “talk to home,”¹³ SATCOM proved to be a revolution in military control, allowing for near instantaneous tasking to, and information from, the field. While severely limited by available bandwidth and the number of units with receivers, the groundwork was laid for what was to become, arguably, the most important of all the military space systems.

SATCOM today is the glue that holds together the military force, allowing headquarters to control and assess all elements of the battle. In the Gulf War – referred to by many as “The First

¹¹ Defense Meteorological Satellite Program.

¹² The National Oceanic and Atmospheric Administration.

Space War”¹⁴ – and, to a greater extent, in Operation Iraqi Freedom, fleets of geosynchronous and LEO¹⁵ spacecraft provided instant access to engaged units and performed operations as complex as retargeting strike aircraft and cruise missiles in flight. The DOD is putting significant resources into “network centric warfare,” ensuring that all sensors and shooters are linked into one network allowing for unprecedented control of forces across the theatre. In fact, today four of the Air Force’s nine largest programs are SATCOM systems.¹⁶ To a large degree, SATCOM is erasing a unit commander’s autonomy in the field allowing headquarters to control most elements of the battle in real-time. SATCOM capability has even brought to an end the U.S. Navy’s much vaunted independence of the ship’s Captain “over the horizon.” Finally, one can argue that the rise of commercial SATCOM, first experienced in the Gulf War as the so-called “CNN Effect,” has reduced the “fog” for the population back home, allowing them to participate to a greater degree, through public pressure, on the course of today’s conflicts.

A Watchful Cold Warrior Fights in a Hot War

In 35,000 km geosynchronous orbits, alongside communications satellites like the Milstar series, Defense Support Program (DSP) satellites watched for Soviet nuclear-tipped missile launches through much of the latter part of the Cold War. During the Gulf War, they were reprogrammed to detect Scud missile launches threatening Israel and coalition forces, providing near-

¹³ Sean Ross and Craig Rosen, “Roll Call: Radio’s Involvement During the Vietnam War,” Billboard Publications, Billboard, 26 January 1991.

¹⁴ Jeffrey L. Caton, “Joint Warfare and Military Dependence on Space,” JFQ Journal, Winter 1995-96 48.

¹⁵ Satellites in “Low Earth Orbit,” usually defined as anything up to 2,400km altitude, are said to be in LEO.

¹⁶ Troy Meink, “Transformational Military Communications,” International Conference on Composite Materials Proceedings, San Diego, 2003.

instantaneous warning of incoming ballistic missile threats. During Operation Iraqi Freedom, this system was significantly improved, providing commanders with precise predictions (relative to the Gulf War) of the missile's likely impact point and allowing coalition forces in the area to prepare for possible chemical and/or biological weapons attack. As with other space capabilities, these space systems acted to increase the overall commander's understanding of events in the battle in near real-time unlike in previous conflicts – the dreaded “V” launches on London are a case in point – when ballistic missiles were undetectable until just before impact.

The Mother of All Space Wars

Despite the astonishing expansion of informational awareness provided by all the space-based systems discussed above, perhaps no system in the U.S. military arsenal has done more to consolidate direct control back in the hands of the supreme commander than the Global Positioning System (GPS). Following in the footsteps of the Navy Navigation Satellite System which provided basic two-dimensional position data, the GPS constellation, first activated with a reduced capability in 1978, achieved its current capability in 1993 and now provides highly accurate three-dimensional position and trajectory data anywhere on the globe, 24 hours a day, in all weather conditions. In the Gulf War, the GPS system gave accurate position information to most field units and is “now credited as making possibly the single most important contribution to the success of the conflict.”¹⁷ GPS enabled the surprise of the now-famous “Left-Hook” maneuver, which Iraqi forces reportedly did not believe was possible due to the difficulty of navigating across the open desert. Married to the various SATCOM systems, the GPS system

¹⁷ Sir Peter Anson BT and Dennis Cummings, “The First Space War: The Contribution of Satellites to the Gulf War,” RUSI Journal, Winter 1991.

provided, instantaneously, the position knowledge of units in the field to the supreme commander. A notable milestone in modern warfare was reached in Operation Iraqi Freedom, often referred to as the “Mother of All Space Wars,”¹⁸ when the GPS constellation’s capabilities were married up with precision-guided munitions in a major conflict. The majority of cruise missile- and aircraft-delivered bombs in Operation Iraqi Freedom used signals from the GPS system to find and hit their targets, either preprogrammed into the weapon before launch or programmed in flight, sometimes by communications satellites like Milstar 5. For the first time in two centuries, the supreme commander understood the location of his/her engaged forces, directed them as a single fighting entity, and precisely dictated the objects of their firepower.

Forward to 2015, Backward 200 Years

Technology, then, is in the process of allowing us to recapture what we lost in the mid 1800s – the ability to have centralized control of the battlefield. Today’s battlefields are no longer simple plains or fields but stretch across nations, sometimes continents – the high ground of space is the key to understanding and directing them. The potent combination of precision global position knowledge of friendly and enemy units, consultation and direction of friendly forces through ubiquitous wireless communication, precision target selection, and surveillance by overhead assets has fundamentally changed the character and conduct of war, putting the supreme commander back in charge of the components and tactics of the fight. Napoleon would be in his element.

¹⁸ U.S. Air Force Col Gregg Billman, commander of the 45th Operations Group at Cape Canaveral, as quoted in Jim Banke, “Array of Space Technologies Aids War Effort,” [DefenseNews](#), 14 April 2003.