

The Next Generation of Warfare

This essay seeks to summarize the dynamics that will shape the next century of warfare. The overall argument is as follows:

- *The focus within policy and media circles on fourth-generation warfare runs the risk of neglecting the larger picture*
- *While there can be no question that insurgencies/non-state actors currently have the advantage (fourth-generation warfare), key trends are already underway that will shift advantage back to nation-states (fifth-generation warfare)*
- *These trends are the weaponization of space and cyberspace, along with total surveillance; although each of these has been explored in isolation, the implications of their integrated impact are only hazily understood*
- *The primary challenge for the U.S. military is to balance short-term investments in 4G warfare with the need to prepare for the coming 5G world*

U.S. National Security in the 21st Century

We have divided the essay into the following sections:

- *Introduction*
- *Part One: 4th Generation Warfare (Today)*
- *Part Two: 5th Generation Warfare (Tomorrow)*
- *Part Three: Assessment of Current Threats to U.S. National Security*
- *Coda: Notes Toward A Theory of Space Weaponization*

***PART ONE: 4G WARFARE
(TODAY)***

Fourth Generation Warfare

- We start by accepting *William Lind et al.*'s thesis that we are currently in an epoch of fourth-generation (4G) warfare, defined by *growing numbers of non-state actors/terror groups* challenging nation-states in an increasingly fractured world
- The current *Long War/Global War on Terror* embodies this new reality; the fact that no U.S. president has yet defined the victory conditions for this conflict is a clear indicator that we are likely to be stuck here for some time
- The extent to which 4G represents a break with previous generations of warfare cannot be overemphasized; for the first time since their rise to prominence in post-medieval Europe, *nation-states are in danger of losing control of their monopoly on force*

Talkin' About My Generation

Fourth generation warfare shifts advantage to non-state actors

	1 st Generation	2 nd Generation	3 rd Generation	4 th Generation
Time Period (roughly)	1648-1860	Civil War/WWII	WWII/Cold War	Current
Technologies	Muskets; bayonets	Breech-loading rifles; machine guns	Mechanized armor	Improvised, individual weaponry
Tactics	Line and column	Attrition	Blitzkrieg	Rear-area operation; terror strikes
Advantage	Nation-states	Nation-states	Nation-states	Non-state actors

The New Global Insurgency

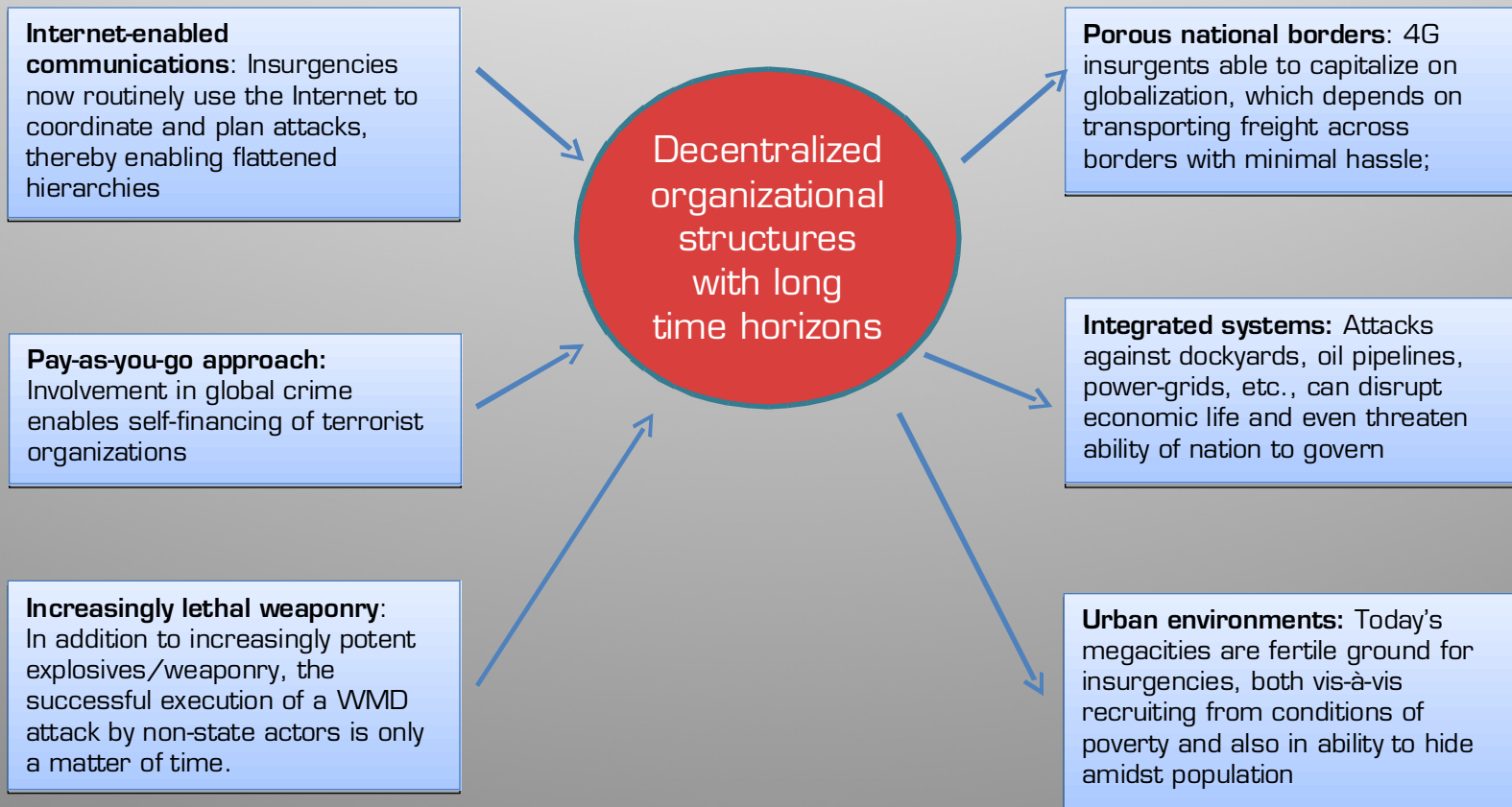
- The resilience of 4G insurgencies lies in their ability to marry *bottom-up leadership structures* to increasingly lethal technologies while taking advantage of the very globalization they hate
- This combination leads to a *harrowing cost-benefit dynamic*: 9-11 is estimated to have cost Al-Qaeda half a million dollars, with economic damage to the U.S. in excess of 80 billion; this represents a sixteen thousand-fold return on investment
- Disconcertingly, most of the trends driving 4G warfare are *only just beginning to gather momentum*; as they accelerate, they are likely to redefine not just warfare, but the societal fabric that underlies it

4G Insurgency Advantages

Capitalizing on the new “terrain”...

...bottom-up insurgencies...

...attack globalization’s weak points



The Global Battlespace

- We reiterate Thomas Barnett's thesis that the main tension in the current global geopolitical structure is the "arc of instability" that runs (roughly) across much of the equatorial nations within the Third World; it is this cauldron of failed/failing states that affords the most fertile ground to contemporary insurgencies
- This battlespace will become increasingly volatile as swelling populations compete for ever fewer resources while global warming renders ecosystems increasingly dynamic
- Also of note is the extent to which the most successful proponents of 4G warfare are those that create "proto-states" within the carcass of the old; Hezbollah in Lebanon is the classic example here, as are some of the Latin American drug cartels

The Arc of Instability

Bulk of world's "trouble spots" concentrated along an arc cutting across equatorial zones



Accelerating Factors:

- Resource scarcity
- Economic volatility
- Population growth

The U.S. Response

- Narrowing the scope of focus, we consider as a case study *the U.S./Al-Qaeda conflict*, which has raged for the better part of a decade; while much has been written about how the U.S. "lost the plot" by moving into Iraq, several factors have received less attention
- *First*, neutralizing Iraq never made sense in and of itself; it was clearly intended as *a precursor to a similar strike on Iran* by decision-makers who underestimated the forces required to secure Iraq (and who continue to *overestimate the extent to which they have Iraq under control*)
- Second, the move into Iraq meant a diversion of U.S. resources away from the centers of gravity of the *real* long war (compared to which even Afghanistan is a mere sideshow): *if Al-Qaeda can "flip" any one of the three key states (Pakistan, Egypt, Saudi Arabia), they will win their most significant victory to date* (see the illustration on the next page)
- *Third*, Al-Qaeda's terrorist network is far less dangerous than its power to spawn and inspire other groups; simply put, *there will be many more Al-Qaedas*, and our efforts to fight the first one have seriously curtailed our options for dealing with the next ones
- *Fourth*, this is a war that *may still be in its opening phases*

Three Glaring Vulnerabilities

Seven years into the “long war,” one of the three strategic centers of gravity has at last moved into focus



EGYPT

Overpopulation
increasing instability
along Nile delta

SAUDI ARABIA

World's leading
petroleum exporter;
Bin Laden's #1 target

PAKISTAN

#1 current problem;
maintains 30-50
nuclear weapons

Contextualizing the Options

- As the U.S. experience shows, the global reach of 4G insurgencies leaves nation-states with a *dwindling set of responses*
- Of particular import is whether the nation-state in question faces a "home-grown" insurgencies, and—if so—to what extent those insurgencies have "hollowed-out" the state in question (i.e., *Pakistan and Mexico are both examples of states with dwindling central control*)
- For those nations that (a) still possess stable governments and that (b) face transborder attacks from 4G insurgencies, *two fundamental sets of (suboptimal) responses present themselves*

Two sets of suboptimal options

#1: “Take it to the enemy”

- **Destroy state-sponsors of 4G warfare:** Worst move possible; non-state actors will capitalize on power vacuum, turn it into hell on earth
- **Fight fire with fire:** e.g., the “surge”, which is largely dependent on the U.S. military's success in building relationships with local militia groups to maintain order—which makes it a short-term solution by definition
- **Counterinsurgency 2.0:** Rely exclusively on precision strikes and covert-ops

#2: “Secure the home front”

- **Seal/control borders:** Virtually impossible to do in an open society
- **Increased emergency response:** Undoubtedly the central missed opportunity so far, with Katrina underscoring the degree of failure
- **Control public opinion:** 4G insurgencies tend to divide public opinion, leading to increased domestic polarization that weakens the overall society and tempts leadership to crack down on dissidents in order to continue war.
- **Surveillance:** Unlikely to approach “failsafe” levels within context of current society (but see the next section of this essay)

Seeing Beyond the Present Crisis

- The dynamics that underpin 4G warfare will be *dominant for decades*
- However, despite the claims of some 4G theorists, *the contours of the next generation of warfare are relatively clear*; we are now in a position to consider the key determinants of 5G warfare

4G AS GÖTTERDÄMMERUNG?

“Attempting to visualize a Fifth Generation [of Warfare] from where we are now is like trying to see the outlines of the Middle Ages from the vantage point of the late Roman Empire. There is no telescope that can reach so far. We can see the barbarians on the march... But what follows the chaos they bring in their wake, only the gods on Mount Olympus can see. It may be worth remembering that the last time this happened, the gods themselves died.”

—William Lind

***PART TWO: 5G
WARFARE
(TOMORROW)***

Clamping Down

- Societies will not remain static in response to 4G incursions; those that wish to survive will eventually move to ***order-of-magnitude tighter levels of security***
- In particular, we are likely to see the culmination of the "total surveillance capabilities" that exist in nascent form today
- Such an "airtight" surveillance will be a ***necessity for protecting the developed world's cities against 4G insurgencies***; indeed, it is difficult to envision populations resisting the deployment of ubiquitous surveillance in the wake of additional attacks at or above the level of 9-11

Big Brother Is Watching

Range of technologies on the cusp of maturity will drive total surveillance society in face of 4G threats

Ubiquitous Sensors

Sensors will scale toward nano, "flood" society

Terahertz radar

Very short wavelength radar utilized to penetrate walls

RFID Proliferation

Embedding of RFID chips in devices can be extended to people

Cellular

Ability to track cell phones via microwave emission

The Redefining of the Internet

- Ensuring the integrity of surveillance systems will ultimately depend upon ***dramatic enhancement of the government's powers online***
- Such a step will also be necessary ***to forestall 4G incursions against internet chokepoints (e.g., power-grids)***
- We thus anticipate that across the twenty-first century, governments will ***militarize/nationalize cyberspace***, at least insofar as hardening of all key assets; this nationalization will be the next stage beyond the current "wild west" phase of the internet (i.e., China's "Great Firewall" is thus likely to be more the rule than the exception)
- At its most extreme, such nationalization would include the ***outright "cauterization" of the preponderance of national/regional cyberspace***; though this would almost certainly occur in tandem with a near breakdown of globalization, ***current trends in 4G warfare would appear to be fully capable of bringing this about***

Not Your Grandfather's Internet

As the Internet becomes increasingly vulnerable to hostile incursions by both nations and non-state actors...

...governments that wish to survive will militarize increasing portions of the civilian net

- *Titan Rain (2003-?)*: Series of coordinated attacks on U.S. defense industry computers since 2003; believed to be Chinese in origin
- Estonia (May 2007): Key Estonian networks subjected to massive denial-of-service attacks by Russian hackers

- ✓ Electrical grids
- ✓ Financial databases
- ✓ Hospitals/Emergency Response
- ✓ Air traffic control systems
- ✓ Transport grids
- ✓ Landlines; wireless towers; satellites

The Big Picture

- The future is thus likely to be divided between *societies that have collapsed into 4G anarchy and those nation-states that have gone into "lockdown" mode*, moving to control/protect their populations via a total control of information
- Increasingly secure within their own borders, such nation-states will also take advantage of the *oncoming maturity of space-based weaponry*: indeed, the linkage of space-based reconnaissance to hyper-precise firepower originally *seemed to usher in the start of a "revolution in military affairs" (RMA)*, particularly with the rapid toppling of the Afghan and Iraqi governments; however, *the current reality of 4G insurgencies underscores just how premature that vision was*
- Nonetheless, as many have recognized, the *value of orbital control will only increase* across the 21st century, particularly as the speed of munitions deployment increases; **ultimately, guerillas will be largely confined to operations that are (a) underground or (b) in cities in which all order has collapsed**; though this still will leave insurgencies with plenty of room for maneuver, they will no longer pose a threat to the basic integrity of the world's most powerful nation-states
- That said, the world's most powerful nation-states *will continue to pose a threat to each other*, particularly as they jockey for control of the high ground that space represents

The View from Orbit

"Eyes in the sky" enable U.S. conventional supremacy already...

U.S. Space-based Assets



- Satellite recon gives U.S. global view
- GPS guided munitions destroyed Iraqi army in 1991, 2003
- Any conventional power that wishes to challenge U.S. will have to challenge U.S. space-based assets

...and will drive increasingly rapid/precise targeting

X-51 Precision Strike Vehicle



- Currently in development
- Capable of attaining speeds approaching Mach 7 and striking anywhere in world within sixty minutes
- Future generations of hypersonic missiles will be capable of "dwelling" off targets indefinitely before striking

Fighting for the High Ground

Foreign military theorists are acutely aware that they must deny the United States access to its satellites in any forthcoming state vs. state conflict; this urgency will only increase if U.S. satellites are used for missile defense

“If an anti-satellite weapon destroys a space system in a future war, the destruction will have dealt a blow to the side that owns and uses the space system, stripped it of space supremacy, and weakened its supremacy in conducting information warfare, and even its supremacy in the war at large.”

–Liberation Army Daily

“The mastery of outer space will be a requisite for military victory, with space becoming the new commanding heights for combat...”

*–Captain Shen Zhongchang,
Chinese Navy Research Institute*

From Militarization to Weaponization

Any space-based arms race/conflict is likely to unfold in a manner analogous to the initial weaponization of the air

Theater	Era	Phase One: Militarization	Phase Two: Weaponization
Air	World War One	Aircraft used for recon purposes	Aircraft mount guns to target each other and ground
Space	21 st Century	GPS, spy-sats provide recon, precision targeting	Spaceships mount weapons to target each other, as well as ground/air targets

Definitions

- *Space is already militarized (i.e., used for military purposes)*
- *Actual weaponization occurs when either (a) space-based platforms mount weaponry, or (b) an attack is launched on a space-based platform*

The Queen of Space

- The key ingredient that will both drive and shape space weaponization is the coming *maturity of directed energy weapons*
- Though such weapons are in their infancy, a wide variety are likely to be in use before the end of the century, and probably much earlier

ON THE HORIZON

“While the technologies that are required to bring these capabilities to fruition are several decades away, these ideas offer the greatest promise in reaching the goal of an instantaneous capability for conducting global attacks.”

—Colonel Thomas Bell, Air War College

Directed Energy Variants

Current experiments in directed energy...

Boeing Airborne Laser



- Chemical laser mounted on 747; December 2008 test prelude to "all-up" operational testing
- 12 years in development
- Latest test solved what skeptics said were insurmountable issues involving atmosphere diffraction

...likely to reach fruition in a number of areas

Lasers: Numerous examples in development (e.g., MIRACL; THEL); could be deployed in space in next few decades

Microwave: Anti-personnel prototypes have been created; strategic versions will allow disruption of systems

Particle beams: Projection of charged or neutral particles; research here lags lasers considerably.

Xasers: Detonation of nuclear warhead channels x-rays onto target; envisioned as crown jewel of SDI and well within technical reach

The long-term implications

- While it remains impossible to predict the precise rate of directed energy development, several factors should be kept in mind (a chart of projected evolution is shown on the next page)
- *Factor #1*: The expense of these weapons largely limits their deployment *en masse* to nation-states
- *Factor #2*: Ultimately, these weapons could be capable of striking any point on the planet as needed; they are thus likely to be a decisive factor in restoring supremacy to nation-states
- *Factor #3*: DE will be the centerpiece of space-based missile shields capable of striking missiles during their boost phase

The Evolution of A Weapon

Directed energy development likely to unfold across four stages

	Phase One (Today)	Phase Two	Phase Three	Phase Four
Strategic Impact	Minimal*	Marked	Major	Decisive
Offensive capabilities	Nil	<ul style="list-style-type: none"> •Surgical strikes against satellites, aircraft •Anti-personnel applications 	<ul style="list-style-type: none"> •Attacks on ICBM fields •Neutralization of opponent's space-based hardware 	Real-time targeting of any point on planet/orbit at speed of light
Defensive Capabilities	Nil	<ul style="list-style-type: none"> •Theater defense •Rogue missile strikes 	Major factor in any nuclear exchange	"Industrial Strength" missile shield

*Current strategic impact limited to impact on global armaments spending, diplomacy.

The Next Generation of Warfare

- We are now in a position to take stock of the overall picture
- Our basic contention is that at some point in this century *the fourth generation of warfare (favoring non-state actors) will be overtaken by a fifth generation of warfare* that restores supremacy to retooled/re-militarized nation-states
- It seems virtually certain that such nation-states will be increasingly authoritarian

4G vs. 5G Warfare

Next generation of warfare will shift advantage back to nation-states

	4G Warfare	5G Warfare
Time Period	c. 2000-2050	c. 2050-onwards
Advantage belongs to...	Non-state actors	Retooled nation-states
Space weaponization capabilities	Nascent	Maturing
Cyberspace configuration	Bottom-up ("Guerilla terrain")	Top-down ("Tool of state")
"The home front"	Under assault	Police-state

PART THREE:
Assessment of Current
Threats to U.S. National
Security

The Next Attacks

- Returning to the present day, we offer up an analysis of the *principle threats to the national security of the United States* in the present/near-future
- Most (though not all) of these threats could be carried out by either nations or non-state actors; the list runs the gamut of 4G possibilities even as it hints at the coming age of 5G warfare
- Significantly, the *attacks of 9-11 appear relatively minor* when weighed alongside far more dangerous possibilities

From Every Direction

Type of Threat	Likelihood in Next Ten Years *	Comments
<i>WMD event</i>	8 (10 is maximum)	Dirty bomb most likely scenario
<i>Full-scale nuclear strike</i>	1	A resumption of cold war with Russia would raise this risk
<i>Assassination attempt on key leadership</i>	7+	Maximum moments of vulnerability are gatherings of collective leadership (e.g., State of the Union addresses)
<i>Attacks on soft targets</i>	8	Virtually any undefended crowded event/location is vulnerable
<i>Disastrous policies</i>	6+	See next page
<i>Internet assault</i>	7	Rise of the "smart web" will increase national vulnerability
<i>Satellite disruption</i>	4	Options include hacking, EMP or kinetic disruption
<i>EMP assault</i>	3	Detonation of nuclear device above U.S. could paralyze large parts of nation
<i>(Nuclear) missile strike by rogue state</i>	2	Reprisal-destruction of aggressor nation probably limits this to accidental launch or insane leadership

We Have Met The Enemy: A Final Note

- Thucydides was highly skeptical of the ability of democracies to conduct rational foreign policy; the ease with which insurgent leaders have used their attacks to draw/lure the U.S. into 4G quagmires would do nothing to convince him otherwise
- This is all the more problematic because one of the realities of 4G warfare is that the U.S. incursions are actually accelerating the collapse of the very regions which they seek to secure

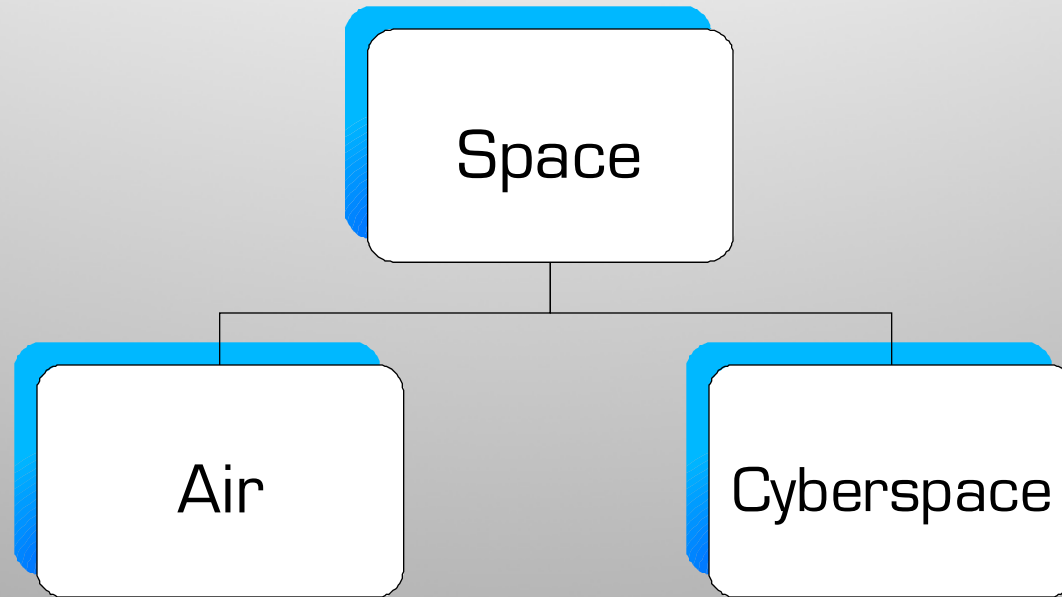
Coda:
Notes Toward A Theory of
Space Weaponization

TAKING STOCK

- 5G warfare will likely be a reality long before space weaponization has achieved its full potential
- Tempting as it is to assert that the culmination of such weaponization would constitute 6G warfare, we will content ourselves here with offering up some basic principles without attempting to construct an overall framework
- We begin, of course, with doctrine

Organizing for the High Ground

Space doctrine will drive doctrine for both air forces and cyberspace



- From a command perspective, air and space will need to be integrated for maximum advantage

- Hypersonic missile and directed energy weaponry will spell end of “cult of flying ace”, radical shifting of leadership mindset

- Space war likely to be as much an information war as anything else

- Strictly speaking, space and cyberspace can be regarded as equal to one another, but we surmise that hardware/budgets will ensure that space commanders maintain primacy

Space Is the Place

Laying the groundwork for a theory of space warfare starts with the environment

Four Key Environmental Factors

#1: Emptiness:

Volume of space out to geostationary is about 50 billion times greater than air combat arena—which in turn is dwarfed by rest of Earth-Moon system.

#2: Vacuum:

Lack of atmosphere precludes propagation of explosions, while allowing electromagnetic energy/beams to radiate almost unattenuated

#3: Orbits: Spacecraft have “quasi-positional” characteristics: they are neither totally static nor totally mobile, but instead generally in predictable patterns

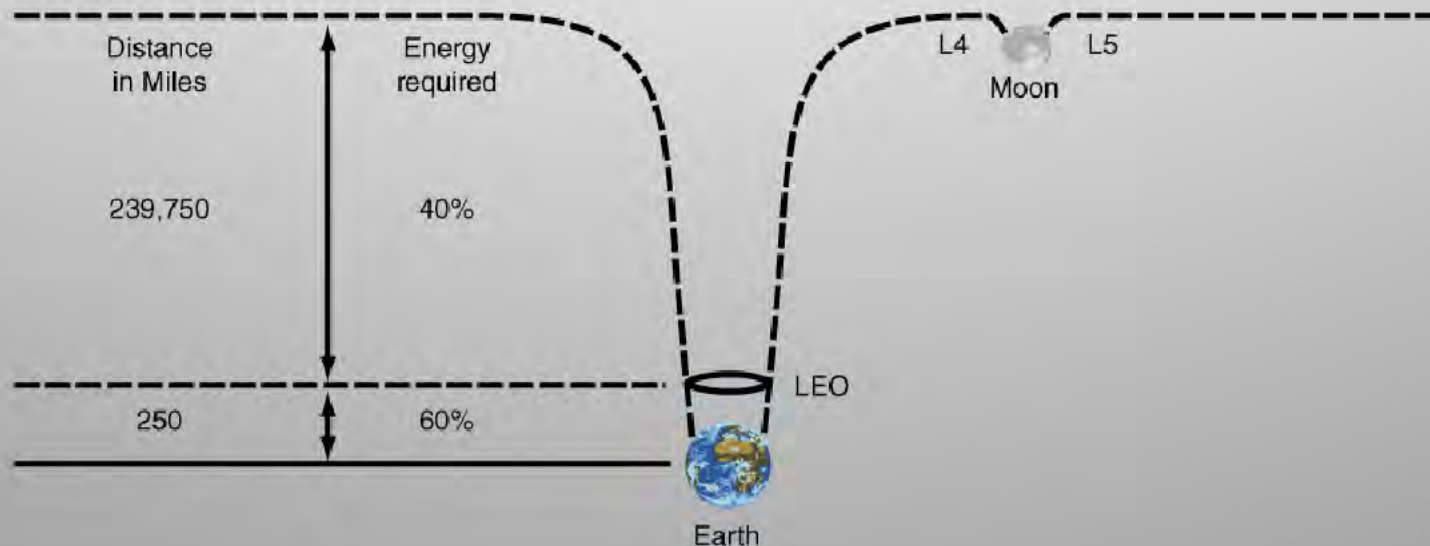
#4: Topography:

The topography of space is invisible, and largely a function of the gravity wells that will shape all future tactics; see next page for additional details

The Future Battleground

Gravity wells define topography of Earth-Moon system, will shape battle for “high ground”

Energy Requirements in Earth-Moon System



KEY CONSIDERATIONS

Overall victory will hinge on control of Moon/L4/L5
•Combat within lower orbits likely depend on control of geostationary/geosynchronous orbits

Source: Collins, John, *Military Space Forces: The Next Fifty Years*, p. 24

Four (Initial) Doctrinal Principles

Mature directed energy capability deployed in orbit will shape a whole new doctrine

Principle	Comments
Hair-trigger deployment	<ul style="list-style-type: none">•Speed-of-light weaponry allows for virtually no early warning•Humans likely to be removed from firing loop
Counterforce primacy	<ul style="list-style-type: none">•Mature missile shield will necessitate (at least initially) detargeting of cities•Primary focus will be on destroying opposing forces
Rapid degradation of firepower	<ul style="list-style-type: none">•Damage will be concentrated disproportionately in initial phases of war•Situation will fluctuate with unprecedented swiftness
"Solid vs. space" tension	<ul style="list-style-type: none">•<i>E.g.</i> the Moon might be more advantaged than the exposed (albeit slightly "higher" L4/L5 libration points

About the Author

- David J. Williams is a professional author/futurist, with over ten years in management consulting to F2000 companies
- His science fiction novel, *The Mirrored Heavens*, will be released in mass-market paperback by Random House's Bantam Spectra at the end of January 2009
- Learn more about his work and the weaponization of space at <http://www.autumnrain2110.com>