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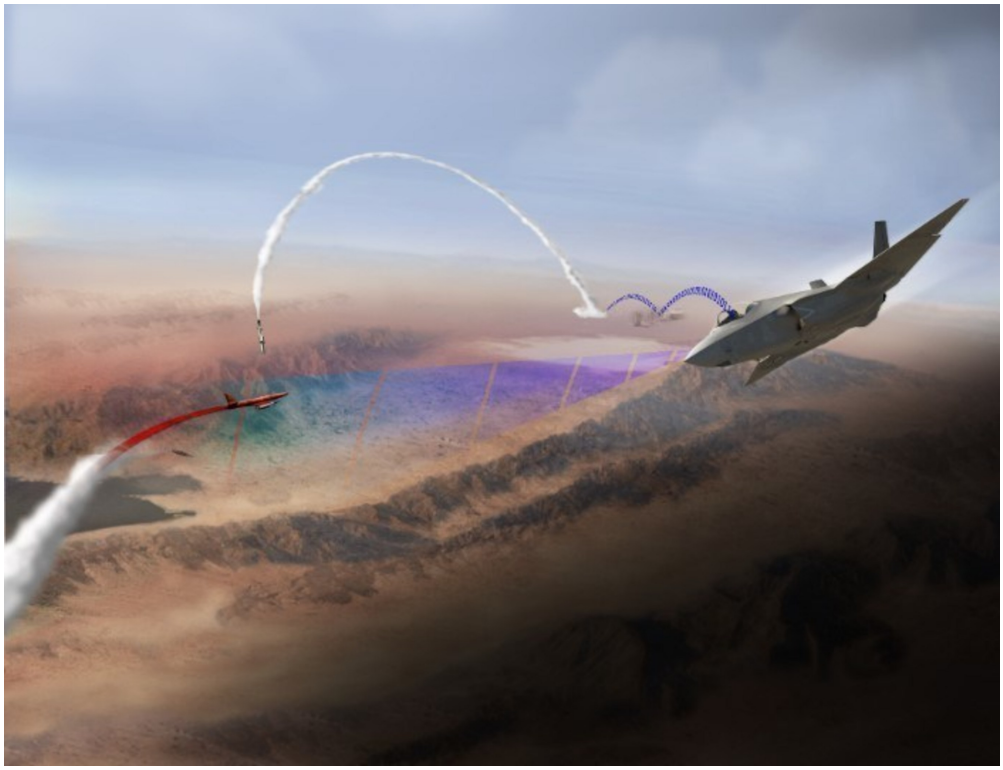


June 7, 2019

Fighting at The Speed of Light: Making it All Work

05/20/2019
By Ed Timperlake

Honoring, and empowering humans engaged in the deadly serious occupation of defending their fellow citizens as combat warriors in putting their life on the line is everything in a military analysis before any future technology discussions can begin.

It is no good to talk about future technologies without starting from the nature of warfare and of human engagement in that warfare.

Often looking at ground battles from the earliest recorded days, the forces engaged had a simple guiding rule — kill the enemy in greater numbers.

There is no hard and fast rule from history of what tips a battle one way or another except one core principle: with the will and means to continue to degrade ones opponent winning is enhanced.

The great quip often credited to Grantland Rice who gives full credit to a fellow sports writer comes to mind;

As Hugh Keough used to say: "The race is not always to the swift, nor the battle to the strong; but that is the way to bet.

Such insights actually are biblical from The King James Bible (such poetic writing):

"I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favour to men of skill; but time and chance happened to them all."

At the most basic Payload Utility function, the key to combat success since the dawn of warfare is captured in a ery simple example — the great command of learning the very basic art of accurate marksmanship.

"Ready on the Left Ready on The Right-Already on the firing line" and with that every Marine is trained in the use of their rifle.

Once trained and retrained and retrained until actual combat because their skills are never allowed to atrophy the individual Marine has a direct engagement using a very simple payload utility function in shooting the weapon.

The combat utility of the basic rifle is acquiring the target and then accurately engage to kill the enemy.

That type of engagement at the basic infantry level is no different than the senior Generals and Admirals having their fighting forces acquire and engage targets using many different mixed and matched payloads.

This universal way of war is often correctly referred to as combined arms, as layer after layer of direct and indirect fires, kinetic and non-kinetic, weapons are engaged to defeat the enemy.

I created a short hand phrase "Tron" war for that spectrum of non-kinetic offensive and defense weapons integrated together.

In fighting against a reactive enemy in a larger battle, the aggregation and disaggregation of sensor and shooter platforms with no platform fighting alone is the commanders goal.

Making it all come together effectively is the challenge.

The infantry squad leader directs his combat force by pre-briefing, briefing and then direct voice commands to maneuver his fire team elements during the very confusing heat of combat, often accurately called the fog of war.

Using voice commands since biblical days is fighting at the speed of sound it is up close and personal.

However, with early electronic devices, for example the Civil War telegraph, the platoon leader concurrently reached electronically up and down the chain-of-command to be part of a greater focused unity of purpose combat force.

Commanders at the highest level have to keep both cohesion of the combat engagement mission by effective communications, while concurrently relying on all to engage intelligently relying on their individual initiative to fight to the best of their ability.

Communicated information is essential.

But central as well is empowerment of the force.

The key is to ensure a maximum of capability for combat operations to be able to operate independently with accurate real time dynamic intelligence at the right level at the right time to make their combat function superior to the enemy.

Very little is different from the deck of Navy Strike force or Air Battle or Ground Commander from a Marine Platoon commander except the complexity of all the "moving parts" to be managed and employed to fight that are also spread out over very great distance.

Fighting at the Speed of Light

But after two decades of the land wars, we need to learn to fight again in higher intensity operations.

We need to Fight at the Speed of Light.

This requires that a fighting force at all levels must take advantages of ever increasing technological advances to make decisions using the speed of light.

In other words, symbolically as the laws of theoretical physics are evolving, the test is the application phase or the success of the applied physics phase, so to speak. Nothing illustrates this more than E-MC squared to the atomic bombs that ended WWII.

With advances in all forms of "tron" war from Directed Energy, to Cloud Computing to Artificial Intelligence to robust encryption, many building block mathematical algorithms are now assisting the process of generating accurate and timely information in making the step from being theoretical to applied.

At the moment battle begins, command and control is essential and has to have several attributes.

First and foremost, accurate information has to flow through robust redundant systems at the speed of light in making everything come together to fight and win.

The infantry platoon commander trusts the training and combat effectiveness of each Marine to do the right thing using initiative in following orders in the heat of battle while also trusting higher commands to provide supporting arms, including air, to get it right and at the right time.

The communication and intelligence capability in this 21st Century evolution/revolution of global coms is the connective tissue for human decisions with how to conduct successful operations and to use payloads effectively at the speed of light.

This where the capabilities begin to come together.

The future is now because from today "zero day" to five years out, there is sufficient insight to merge the human combat brain functioning with existing and near term technology to fight and win in any combat theater.

We have highlighted the importance of the 0-5 military and the central significance of how technology is integrated into evolving concepts of operations rather than focusing on an abstract long term future.

Recently, a senior British commander when discussing our approach referred to this as the rolling FYDP which in his view is crucial to engaging in combat operations successfully going forward, rather than abstracting waiting for the best hi tech solution some think tank could come up with.

America is blessed that many in the defense industrial base in responding to combat requirements have answered the challenge to build systems of systems inside the emerging Kill Web way of fighting, vice obsolete Hub Spoke and linear Kill Chain thinking.

First existing command and control is always against a reactive enemy a time dependent factor that is critical to force level combat.

If a commander can count having the initiative combat ops tempo over the enemy then his forces can be dynamically optimized as a coherent combat directed fighting force.

This is the challenge of effective command and control, of course ultimately the commander has to always have the wisdom and judgment to fight to win effectively.

If victory in battle could have been simple engineered it would have already been done so.

The Challenge

Given competent and skilled commanders there are two qualities of a fighting force that are needed for the force to derive the full capabilities of its weapons systems.

The first is motivation or dedication, or call it; will, heart, ambition or competitiveness. It is the quality that makes fighting personnel appear enthusiastic rather than lackadaisical or dispirited.

The second is a forces technological capability which is the ability at the appropriate level to have the capacity to understand and operate the rather sophisticated equipment associated with modern war.

Marrying force motivation with technological capability allows a superior force to achieve combat performance over the enemy. It is a combination of appropriate combat equipment at all levels of any engagement operated by trained individuals .\ Inventory of weapons systems and platforms, including sufficient munitions at the start of a war can make all the difference.

The time factor of both battle damage repair with any possible industrial surge and sufficient logistical supply/resupply while ensuring a pipeline of well-trained individuals from E-1, basic initial enlisted rank to 0-10, Admiral or General is simple to identify but a huge challenge to get it so right at the time of initial conflict. Trained humans matched up to technology is an obvious statement and makes all the difference as a combat campaign progresses.

The biggest challenge in the rapidly exploding human/information dynamic in this 21st Century challenge of modern war is the ability to have all make accurate decisions using light speed technology.

The Big Three

The emerging "Big Three" of 21st Century Tron war are: Cloud Computing, Artificial Intelligence and ever advancing encryption technology.

There are many appropriate technological stovepiped research applications which can be drawn upon to shape a dynamic integrated capability.

Cloud computing, Artificial Intelligence and secure encryption are very appropriate research areas unto themselves. There is also the need to be ever technology and con-op vigilant for a counterpunch combat challenge of a reactive enemy always working to deny their enemy's (US) successful employment of our Big Three while protecting the development and employment of their own.

Remember it is not just about the money but it always about the money.

CLOUD COMPUTING

Cloud Computing R&E with the recent sole source DOD contract of Ten Billion awarded to Amazon comes at just the right time. Such a massive influx of R&D money if managed smartly will make a significant difference to advance US military cloud computing capabilities.

American military test and exercise planners can easily horizontally intellectually work inside emerging Cloud, Kill Webs, with the template of the payload utility function of multi-domain, multi platforms sensors and shooters with no platform fighting alone.

Combat Cloud research and engineering can be tied together as a global enabler to fight at the speed of light.

Success in building testing and using cloud computing emerging capabilities can become a significant component of a combat force engaged in stopping a strategic nuclear attack delivered by hypersonic weapons at all levels of threat-from space and atmospheric maneuvering glide to sub launched HSCM.

The potential of ready secure data being interactive at all levels of command is an intriguing concept. The theory and execution of "Kill Webs" by the U.S. Sea Services shows great promise.

The US Navy has pioneered the Kill Web concept versus the kill chain, with the latter reflecting linear thinking.

A global Combat Cloud built as a secure, robust, and redundant go to source of data based decision making at light speed can provide useful warfighing networking and intelligence sharing concurrently in and out of each combat theater.

This potential real time combat dynamic learning at all levels of command and when needed capability is central to the way ahead.

This will allow directed combat action sensor/shooters delegated down to all and will be very significant at all levels of force engagements.

In other words, successful cloud research is tailor made to have scalable forces operating around the globe using the same data base.

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is rapidly approaching fleet wide empowerment to make truly actual speed of light decisions. It is not necessary to try and integrate AI into diverse military utility functions because it will most definitely find it's own way in.

The Defense Advanced Research Agency (DARPA) is championing AI research.

For more than five decades, DARPA has been a leader in generating groundbreaking research and development (R&D) that facilitated the advancement and application of rule-based and statistical-learning based AI technologies.

Today, DARPA continues to lead innovation in AI research as it funds a broad portfolio of R&D programs, ranging from basic research to advanced technology development.

DARPA announced in September 2018 a multi-year investment of more than $2 billion in new and existing programs called the "AI Next" campaign.

What should not be overlooked by DOD and, specifically DARPA, is the fact that Medicine has been pioneering many dimensions of AI, with significant research investments. Although HIPAA privacy rules and DOD Classification protocols are different, they both have a very similar issue to deal with: to guard the sanctity of data and there are significant penalties in each system. Violate HIPAA and there can be significant private sector law suits. Violate the sacred trust of one's security clearance and it can be a career ending mistake at a minimum.

So far the differential in research money between Military AI research and medical AI research greatly favors medicine

"Healthcare Artificial Intelligence Market to Top $34B by 2025"

This would suggest that learning from what currently exists in medical AI should most definitely be part of any important DARPA research way ahead.

The global market will rise to the challenge of synthesizing massive volumes of big data though machine learning techniques, including deep learning, semantic computing, and neural networks, according to the report.

Key clinical and operational areas will include medical imaging analytics, drug discovery and clinical trials, clinical decision support, natural language processing, biomarker discovery, and patient management.

Software developers seeking to address these use cases are likely to see $8.6 billion in annual revenue by 2025, contributing to the $34 billion total in software sales, hardware installations, and consulting opportunities within the AI market.

(Note Medicine is already integrating AI and Cloud Computing)

Cloud-based solutions accounted for the largest segment of the software and service market in 2017, and are likely to continue to grow in popularity as organizations seek speedy, low-cost options for deploying and maintaining health IT systems.

Two examples of AI in a health care applications touch on just two of countless lessons from a community spending billions of dollars already.

First, a paper on deep learning and a computer vision in which deep learning can outperform humans highlights research in the health field of relevance to defense.

Examining the use of AI for Imaging in Clinical Care

Aalpen A. Patel, MD, Chair, Department of Radiology, Geisinger Health

In recent years, deep learning has revolutionized the field of computer vision. In ImageNet competition, deep learning models are now outperforming humans in object detection and classification. In medical imaging, deep learning has been used in variety of image processing tasks such as segmentation and in recent years, for diagnostic purposes such as diabetic retinopathy and skin cancer detection using large medical datasets.

More recently, we have published a paper describing DL based identification of intracranial hemorrhage on CT scans of the head and using it to prioritize the list for interpretation.

We believe that using large clinical grade, heterogenous data set is extremely valuable in generalizing and translating to clinical tools. This is just the beginning – combining all the -ologies, -omics with imaging will lead to insights we have not had before.

AND this is a universal dynamic as DOD research moves forward:

Avoiding Hype and False Conclusions About AI in Medicine: Key Concepts and Examples

Mike Zalis, MD, Associate Professor of Radiology, Harvard Medical School

With advances of machine intelligence in healthcare, key stakeholders risk suffering from an inflation of expectations and misunderstanding of capabilities. This talk will summarize key conceptual underpinnings of machine learning methods and discuss academic and industry implementation examples of AI in healthcare. The goal of this talk is support participants in adroit critical thinking as they face potential applications, initiatives, and products involving AI in healthcare.

ENCRYPTION

Ever improving encryption technology can take many different research paths and often can create as much confusion as enlightenment.

Just one example of interesting research paths this is building a "Security Token"-

One example of dynamic possibilities in this field can be ways t leverage encryption technologies from the Bitcoin world.

This is but one example of many was to encrypt data based information. I am not engaging in the Bitcoin money fight-just the proof of concept of using block chain math potential for national security information secure transmittal research.

One should always be mindful of a word of warning from a man owning 10% of all bitcoins in the world of the damage of a very early bad start; never make a Security Token-as brutally said by the

owner of 10% of all bitcoins isn the world a "Shit token" inside a corrupted ecosystem. The key is always "trust of information" in any ecosystem.

A "value" of bitcoins is obvious, when thought about, is that in the actual creation process it is not just "value" but it is also a standalone unique "nugget" of information.

The mathematical protected uniqueness of each bitcoin now may highlight a way of transferring classified information flow in 21st Century war fighting enterprise.

Instead of focusing on "bitcoin" as a unit of value which is a very real attribute, think of creating mathematically unique "nuggets" that when 'spent" are used to "buy" or actually access classified information.

Thanks to a Cornell Professor's research using a unit of Block-chain math in perhaps securely fighting at the speed of light has had a brilliant proof of concept.

Intel's core idea allows users to run their code unmolested in a secure enclave. That means both ends of a transaction have the same constraints.

"Normally you don't know what the computer on the other end of the relationship is going to do," Sirer says.

"You have no idea what code they're running or what kind of adversarial behavior they could engage in, so you have to write your protocols in the most conservative manner possible.

"But with this technology, you know exactly what code the other side has, and you're assured the person cannot change or violate the integrity of that code.

"This allows us to build mechanisms on top that are much more efficient."

In a test, Sirer and his colleagues set up a Teechan channel between Imperial College in London and Cornell University and sent transactions across the Atlantic at the blistering fast speed of one-one-hundred-thousandth of a second

Shaping a Way Ahead

The senior leadership challenge in defense is to foster and accept innovations generated within "stovepipe" fielding processes from vertical IR&D to R&D to requirements and to engage in cross-learning, It is not enough to introduce innovation in the individual sectors,

The challenge and the opportunity to empower decision making at the speed of light by shaping integrated C2 drawing upon these technologies in the big three areas of innovation,

Rather than chase individual emerging technologies such as the Cloud, AI or encryption it is much more productive to immediately begin the "applied physics" phase of crafting experiments for dynamic iterative solutions that allow all to constantly learn how to fight at the speed of light.

Each of the “Big Three” has it’s own R&D dynamic so having an open dynamic testing process can accommodate each technology’s current practical demonstrated capability — all constantly integrated together in an open loop learning but operational cycle.

Accurate, timely, target acquisition and target engagement leading to payload utility success from the heavens to under water is the goal.

Shaping success is ongoing con-ops learning process success is found in the Nike saying of just do it.

It is not about simply discussing technology in isolation.

As the cloud comes on line, we can embrace it as a dynamic way to share information.

As AI improves in many situations, the human factor can be successfully taken out of the loop. One huge caution in that there is both promise and danger in getting AI correct to consider never having a totally closed loop AI engagement process.

Encryption is a wondrous field of research and mathematical advance are being made every day.

For the most advanced military forces in the world, the most practical way to learn to fight at the speed of light begins just like the first command a private hears “Ready on the Right Ready on the Left, with the boundaries of being ready on right and left incorporate global engagements with all weapons.

The command “Ready” can begin on instrumented training ranges. Not only is training for training sake essential, but just like the individual Marine sees exactly where his rounds have hit the target.

The real time data collected on instrumented ranges is everything for enragement improvements at all levels.

Feeding back the captured range data results in trying to make accurate payload decisions at light speed can accelerate all aspects of future combat success.

Hard data from instrumented ranges is the most essential building block of marrying human capacity with their ever improving force technological adeptness.

For all who want to successfully fight at the speed of light, they are only limited by their imagination on how to mix and match offensive and defense engagement exercises on instrumented ranges.

One simple example, one could deploy staggered F-35s on station hundreds miles apart integrated with advanced Hawkeyes, UAVs and active AEGIS ships and then run very fast low level bogies with a minimum RCR signature at them from hundreds of miles away.

Then clock the ability to safely pass target acquisition and then weapon engagement data against such a threat.

Finally, begin to include Space Assets after testing integrated “air-breathing” systems. I suspect Space is nice but might not be the panacea all believe it can be in the year 2030.

After such a series of engagements break the problem down to simple questions with the focus being only technology available specifically in a 0-to 5 years out year time horizon with a rolling FYDP being created.

Conclusion

The future of combat is very high right now and it is essential to deal interactively with these various dynamics:

Will Combat Cloud research help?

Will AI make a difference?

Is encryption of data essential?

How can various platforms mix and match weapon payloads?

What is the current and five year out use of space based systems.

Do all types of UAVs help?

What difference does ever improving Directed Energy make?

If the threat comes from below the surface, on the sea or land or screaming from space, where does existing technology come together and where are deadly seams for an adversary to exploit?

If a very fast set of bogies, one R&D team suggests several F-104s as adversary, what is similar with low flying Mach 1+ targets to being different from hypersonic incoming warheads going a mile a second .

With that initial lower Mach data collected than asked the above questions again and again and again, so successful ways ahead will be discovered by integrating in considerations of HSCM and advanced BMD (including hypersonic maneuvering glide warheads) .

Eventually the research and testing is for both Live Virtual Ranges and computer simulations.

But nothing should take the place of first learning by doing in building from limited in geography operations to the very large global combat.

With respect to U.S. test ranges, the East Coast military Warning Areas are perfect, eventually Allies can be part of learning by doing.

Four distinct possible combat global areas could be considered to eventually test proof of concepts between US and Allies while building stronger integrated combat Kill Webs;

The round two of suggested research, after limited test range experiments is to acknowledge the global geography of threats being both similar and different all with the common threat of escalation into a potential nuclear weapon exchange.

Looking at potential flash points of global threat areas that the American Military has can be seen in four "wicked" combat theaters anyone of which can escalate to major tactical and strategic use of of Nuclear Weapons.

1. South China Sea
2. North Pacific
3. Nordics
4. Battle of the Atlantic.

My personal opinion is research will demand better quicker longer reach payloads as the most pressing challenge.

America might have to go back to the future in looking a very low yield Nuc warheads.

But that is a national debate, including all Allies, fraught with much political danger but it still may be considered as the most productive way ahead to save a Navy Carrier strike force.

A Nuc is one heck of a Payload Utility function.

Strategy, Concepts of Operations and Technology: The Challenge and Opportunity of Shaping a Distributed C2 Enabled Force

05/20/2019

By Robbin Laird

I would argue that the US and its allies are not so much facing a great power competition. I would refer to it as a global contest between 21st century authoritarian powers and the liberal democracies.

And on each side of the competition there is significant cross learning going on. With regard to the authoritarian powers, Russia, China, Iran, Turkey, just to mention the most prominent they are clearly playing off of each other's policies challenging the democracies and, in some cases, actively collaborating,

With regard to challenging the democracies, these authoritarian states are using what some in the West refer to a "whole of government policies" or in other words, using a very wide range of tool sets to try to disrupt an dominate

It is clear that the democratic powers need to find ways to expand their own tool sets to respond, including capabilities such as offensive cyber operations.

One clear line of difference is the reliance of the authoritarian militaries on hierarchical decision making versus the potential for Western militaries to shape a much more flexible, distributed force.

But for the Western forces to do so will requires a significant change beyond the legacies of the land wars.

In the land wars, which have been intensive from time to time but are largely slow mo war from a strategic point of view. The West has shaped rules of engagement which create a very hierarchical C2 system.

The new video technologies and new communications systems have been shackled by a centralized command structure.

And if this template continues, the West will lose a significant advantage which new technologies will allow.

This is why analysis of military technologies can never stop with an analysis of technologies, but must look to concepts of operations, training and the system of authority which militaries are built around.

An interview which I did some time ago with Robert Evans, formerly of Northrop Grumman and now with Cubic Corporation highlighted what the technology built into the F-35 could unleash in terms of C2.

Formations of F-35s can work and share together so that they can "audible" the play.

They can work togethe, sensing all that they can sense, fusing information, and overwhelming whatever defense is presented to them in a way that the legacy command and control simply cannot keep up with, nor should keep up with.

That's what F-35 brings.

If warfighters were to apply the same C2 approach used for traditional airpower to the F-35 they would really be missing the point of what the F-35 fleet can bring to the future fight.

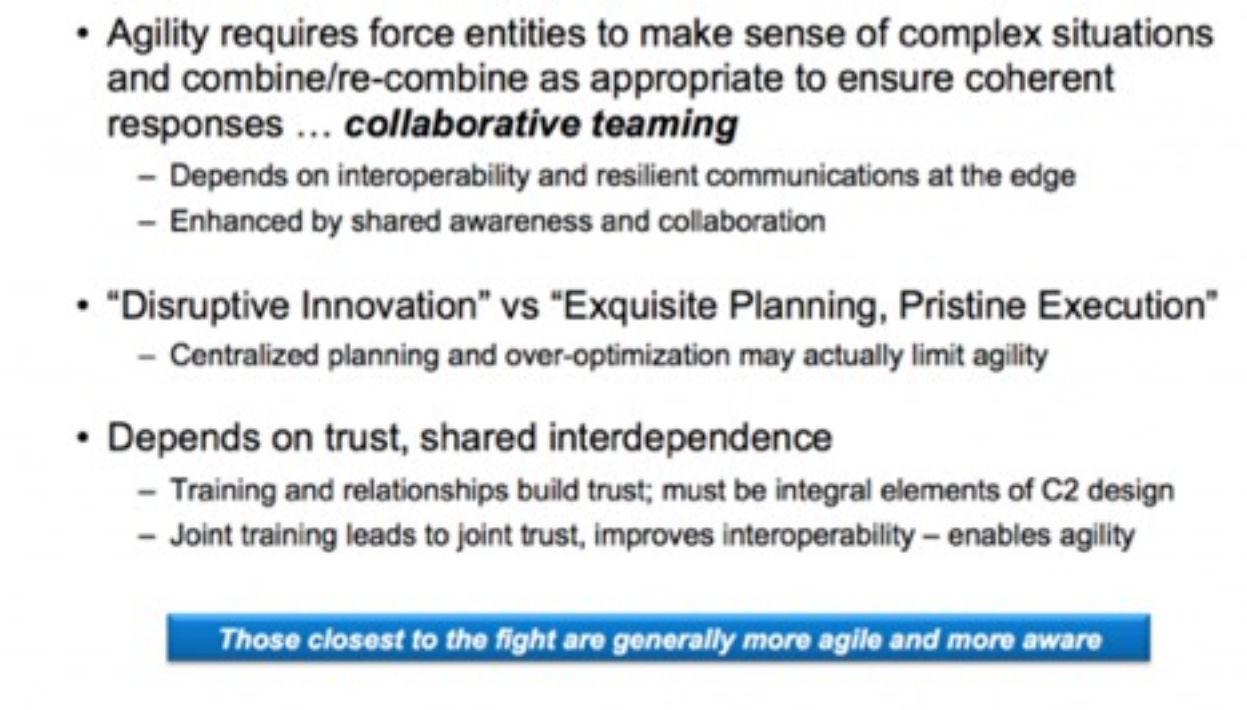
In the future, they might task the F-35 fleet to operate in the battlespace and affect targets that they believe are important to support the commander's strategy, but while those advanced fighters are out there, they can collaborate with other forces in the battlespace to support broader objectives.

The F-35 pilot could be given much broader authorities and wields much greater capabilities, so the tasks could be less specific and more broadly defined by mission type orders, based on the commander's intent.

He will have the ability to influence the battlespace not just within his specific package, but working with others in the battlespace against broader objectives.

Collaboration is greatly enhanced, and mutual support is driven to entirely new heights.

The F-35 pilot in the future becomes in some ways, an air battle manager who is really participating in a much more advanced offense, if you will, than did the aircrews of the legacy generation.



What Evans identified was a potential inherent within the F-35 which can be delivered by the integrated combat systems on the aircraft which can not only create data fusion but a very different decision-making system, one able to operate very effectively and comprehensively at the tactical edge.

But this advantage built into the aircraft will simply not be realized if the older templates of decision making are pursued; and this will be doubly a challenge if this happens as the authoritarian states are building strike in mass directed by hierarchical decision making as a key way ahead.

This will not happen by itself and requires a very different approach to C2 and building out from this approach to capturing the technologies which will accelerate this potential strategic advantage as well.

The F-35 with its DAS systems and its integrated approach for a man-machine system to managing data and to establish a very different approach to reversing the relationship between C2 and SA, whereby decision making at the speed of light gets enhanced by man-machine capabilities on board the aircraft informed by data coming into the network is laying the foundation for a broader revolution.

But this revolution can be enabled by the technology but will not happen unless the services and the allies embrace it and shape new distributed decision-making templates.

The global fleet of F-35s lays a solid foundation for engaging a broad coalition of liberal democratic military powers to contribute to shaping s new template of decision making and distributed concepts of operations.

Re-shaping C-2: Decision Making at the Tactical Edge

05/22/2019

By Robbin Laird

With the introduction of new communications and video technologies, military decision making has changed over the past twenty years.
A significant point of change was the introduction of Rover which created what Secretary Wynne, under whose mandate Rover was introduced, referred to as the democratization of the battlefield.

In a 2012 interview with one of the key shapers of the Rover technology, the impact of Rover on C2 was highlighted.

Rover has been a key element of democratizing the battlefield.

The General has the generally same picture as the guy in the field does.

And this rover essentially creates a horizontal command structure where any Special Forces Team or Captain or a Lieutenant on the ground or a Battalion Commander or a theater committee can call in the air strike commensurate with the Rules of Engagement (ROE).

It's really the story about the JTACS and how they into very effective fighting tools that we have used in

This democratization of the battlefield has unfolded in the context of the land wars in the Middle East and has been an essential part of a significant reshaping of what air support means to the ground forces.

With the strategic shift from the land wars to higher intensity operations, how then to replicate the Rover experience but to do so for the distributed force operating in much higher tempo operations?

As noted in the last piece in this series on distributed C2, the coming of the F-35 and its sensor fusion provides a significant foundation for rethinking how C2 at the tactical edge could occur.

In some ways this is just the beginning of a significant shift in the capability which can be unleashed by new technologies and new approaches to command and control.

A key technology which could drive such change is the delivery of ubiquitous full motion video, embedded with overlays which can provide dynamical contextual awareness to the warfighter at the tactical edge.

With a proliferation of decision-making technology, risk can be reduced and decisions made more rapidly and with better outcomes.

But for a full motion video enabled force with embedded overlays to lead to the kind of change, which inherently it could, two related capabilities need to occur.

First, senior commanders have to avoid detail management through C2 intrusiveness and to focus on appropriate mission command.

The practices of the past twenty years where video technologies have often been used for intrusive controls at the tactical edge by senior commanders simply will not work in a high tempo operational environment and will take away the advantages which could accrue to a distributed force.

And, secondly, operators at the tactical edge need to learn how to make decisions using the context provided via overlays to the full motion video.

They need to understand how to implement mission command in a high tempo environment with enhanced decision-making tools made available to them.

In effect, the challenge facing today's F-35 pilots to shift from performing as an AWACs-like commander, to becoming a decision maker at the point of interest with the full motion video and overlays available to them, is a harbinger of a broader transformation of the C2 environment.

But this will not happen unless both aspects of change interactively occurs – namely, Generals lead but do not provide detailed intrusion; and distributed force commanders, operate on the SA which can be constructed with the tools available at the tactical edge.

And another challenge involves how the US has operated its intelligence processes.

In high tempo operations, it is not about collecting data, and culling it at some command post in the rear. It is about the intelligence function being embedded into a tactical edge rapid decision-making process.

Much of this information is fleeting, and it is a question of making better rather than worse decisions more rapidly; it is not about slowing down decision-making to the speed which hierarchical review requires.

Recently, I had a chance to talk with Bradford Powell, Vice President and General Manager of Cubic Corporation's C2ISR Solutions business, about the nature of change in the C2 sector.

We discussed both the general dynamics of change as well as some solutions being worked by Cubic as well.

In this piece, I am focusing our discussion of the dynamics of change and in the next one I will address some specific Cubic solutions.

According to Powell, the clear trend line is to expand significantly access to imagery and to full motion video (FMV), while improving integration between the two.

While today, access to FMV within the military is targeted and to some extent limited, a decade out, full motion video will be ubiquitous.

He noted that his group at Cubic has primarily focused on handling the movement of video from Airborne ISR platforms.

For example, they have provided means for getting MQ-9 video from point A to point B.

With the growing flood of video, the challenge will be not simply to manage it, but to turn the video stream into an effective decision-making tool at the tactical edge.

"We are working to provide context within the full motion video feeds, which will enable the operational user to make tactical decisions more effectively."

He described C2 as moving from a focus on maps, to command and control operating from within full motion video.

And to do so will require tools that provide context easily used by the tactical decision maker.

As a relatively simple example he referred to the television networks placing yellow first down markers over the video of a football game. If one then imagines the various data clusters which could be laid down over the full motion video available to the tactical decision maker, in his area of interest or the area where he is operating, then the coming future of video driven context for C2 at the tactical edge can be envisaged.

The task is to insert relevant tactical data into the full motion video.

"The full motion video focused C2 environment would then evolve to make a broader set of intelligence products discoverable in the video."

The overall focus is to provide the local decision maker with much greater context for what he is looking at in the full motion video.

Obviously, as this capability is introduced, refined and developed, artificial intelligence can be shaped to provide effective tools to help shape the data coming into the contextual shaping function for the full motion video.

In short, "what is the impact of full motion video in terms of making faster decisions and communicating those decisions in a more effective way and enabling decision making at the lower level?"

In other words, the template for decision making is changing.

A shift to a distributed force will be effective only if a new template for decision making is put in place, one that allows for 21st century mission command and decision making at the tactical edge operating in high tempo operations.

Shaping C2 for a Degraded Operational Environment: The Role of GATR

05/30/2019

By Robbin Laird

With the central role which crisis management will play for the US and its allies, a key area of change is in the area of C2. Distributed operations which will be an essential part of the strategic shift will require distributed C2.

And C2 will have to operate in degraded operations environments.

A tested technology which can provided capabilities to support flexible insertion forces in the higher end and support for HADR operations on the lower end is the GATR system.

The GATR system provides a very flexible, mobile, deployable solution to ensure for reliable communications on the fly which can be used to support military insertion forces or to provide for connectivity when natural disasters have brought down normal operating systems.

I recently had a chance to talk with Cubic's Victor Vega, Director of Emerging Solutions, about the GATR system.

I first became aware of both Mr. Vega and GATR from the role of the system in dealing with the HADR situation in Puerto Rico in 2017.

In an article by Debra Werner of Space News published on December 5, 2017, the role of GATR was highlighted.

Cubic Corporation's GATR satellite antennas continue to provide communications links for residents and community leaders in Puerto Rico more than two months after Hurricane Maria devastated the U.S. territory and nearby Caribbean islands.

Employees of GATR Technologies, part of Cubic Corporation's Mission Solutions Division, were in the U.S. Virgin Islands working to reestablish communications in the wake of Hurricane Irma, when Help.NGO's

Disaster Immediate Response Team and Cisco Systems' Tactical Operations Team called for assistance in Puerto Rico.

Victor Vega, GATR Technologies director of emerging solutions, and his colleagues packed inflatable satellite antennas in suitcases and brought them to areas of Puerto Rico where hurricane-force winds and fallen trees had dismantled the terrestrial communications infrastructure. They installed inflatable GATR 2.4 meter antennas on rooftops, including two U.S. Army National Guard buildings that served as a distribution point for food and water.

Vega noted that he has been with the GATR program from the early days when it was produced by a small startup company (GATR Technologies) which was acquired by Cubic Corporation in 2015.

He argued that the acquisition has been good for the GATR effort as "We have been able to move from being an antenna provider to being part of a broader effort to become a satcom provider and to provide systems to DoD as a program of record."

But he underscored that the core GATR capability is really about rapid response. He pointed out that when they began, the already contributed capability to the Hurricane Katrina disaster. The factory is located in Huntsville, Alabama and they put GATR into a truck and drove to the disaster area and provided sat com capabilities for the first responders.

"The prototype already allowed FEMA to get Internet access so people could come in and fill out the FEMA request forms and to communicate with their familes to let them know they were alright."

He underscored that since that time, the GATR system has been a frequent contributor to HADR C2. The graphic below shows the HADR events at which GATR has provided C2 in a degraded operational environment.

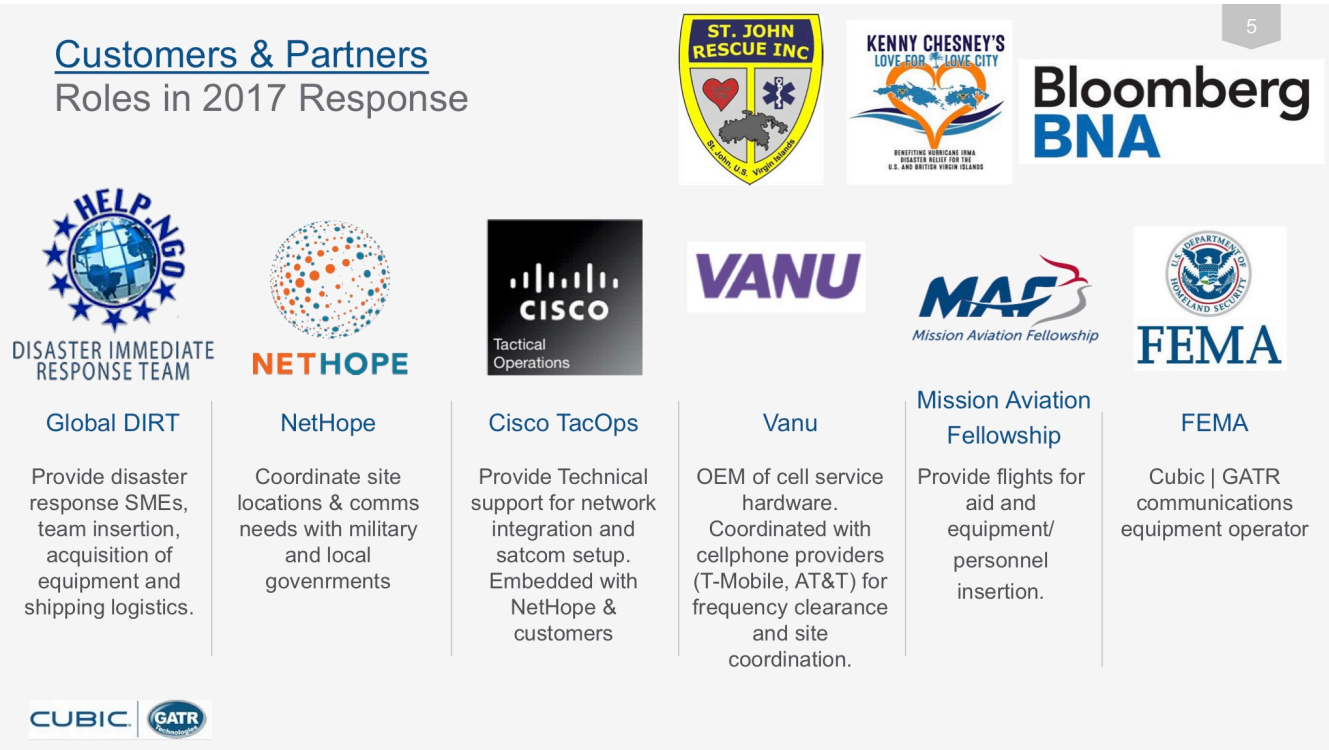
Vega argued that given the centrality of communications to modern society, re-establishing C2 has become a central focus for relief agencies which providing HADR rebuild efforts. "The faster C2 can be restored, the more rapidly can order be re-established and chaos mitigated."

GATR has virtually no logistics footprint so to speak. It can be packed along with suitcases for transport with other cargo; it does not need specialized vans or specialized lift helos or aircraft to bring to the area of interest. The small logistical footprint means it can be brought to the area of interest by a wide range of ground or air or sea transport systems.

This also means for insertion forces in higher end contingencies, a distributed C2 capability can be laid down rapidly and with minimal lift required. The system can be and has been carried with airborne troops and precision air dropped to the area of interest as well.

Because the focus is shifting from the big established bases of the Middle East land wars, to an ability to operate across the combat spectrum in a crisis situation with distributed forces, such a flexible coms capability is an essential part of the mobility and flexibility which the evolving force structure needs to prioritize.

With regard to HADR operations, FEMA has become a customer of GATR as well as several NGOs which operate in the HADR environment. For example, in HADR operations in 2017, the following partners worked with GATR in support of operations:



In other words, GATR can support a wide range of missions operating in a disrupted or degraded environment.

I noted that the US military is clearly reworking island hopping as part of the US-allied strategy in the Pacific.

Vega commented that GATR clearly has a role in such a strategy and provided this example.

A US Army Unit based in Hawaii has been using GATR for some time to support exercises across the Hawaiian Island chain.

One of the officers of this particular unit told Vega that “we cannot do our mission operating out of ice cream truck satcom. We cannot move all that equipment and get our job done.”

To do their mission, this US Army unit transitioned from the legacy system of trucks and antennas to GATR, a clear harbinger for a more flexible approach, one needed for HADR or other mission sets.