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Digits Collide. Commanders Decide. Command and Control in a Digitally Transformed Age

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Introduction

No warfighting function carries the same import as Command and Control (C2). From the very first organized military formation, the ability of a leader to perceive, command, control, and ultimately win depended on this penultimate function. The various joint functions are essential to create unified action and synchronization of capabilities: Intelligence shapes understanding, fires project lethality, maneuver creates geometry, logistics builds strength, and protection increases resilience; however, C2 engineers every victory.

The core tenets of C2 serve as an 'organizational framework' for the orchestration of applied lethality and successful operations. C2 has the ability to align actions to outcomes and create synergies. It aligns activities, coordinates tasks, enables integrated understanding, and tracks actions on the battlefield. It records, reveals, plans, and executes, turning tactical actions into game-changing effects. Command and Control wields the other warfighting functions to integrated effect, turning potential energy into successful battles, campaigns and military victories.

In a digitally transformed age, C2 is the most impacted warfighting function, presenting exciting opportunities and inherent risks. Integrated and resilient digital enterprises will give commanders increased and more nuanced visibility into enemy positions and capabilities. Planning and operational execution based on real-time reporting will generate a tempo that a lesser informed enemy cannot pace. In newly digitized functions, data will help reveal artifacts of the battlefield in a continuous flow. Access to integrated situational awareness through digital understanding allows high fidelity coordination of actions on a fluid battlefield, and the ability to quickly recover when inevitable friction and surprise raise their heads. That is all to come.

The integration, synergy, efficiency and tempo of operations flows from a high-quality digital representation of the real battlefield. There are large challenges to achieving this vision, challenges that are as much human as they are technical. Digital C2 is not a panacea. A data environment may hold irrelevant or inaccurate data. The nuances of data quality and data relevance might make it hard to discern what is factual versus what is assessed. Human judgment and machine-generated insights are only as valuable as how effectively they are used, so reliability and trust become paramount. C2 outputs can be biased by inaccurate or unfamiliar virtual models of real activity. Misunderstanding of the provenance or misapplication of data flows might create debilitating effects. A tsunami of data entering a C2 node might overwhelm a commander or staff, creating more friction than clarity. Virtual portrayals of data will require tailoring to be sharply relevant where the risks are greatest.

Data and visualization are not the only challenges. In a human-machine watch center, the ease of embracing machine-generated solutions might tempt fatigued watch-standers to accept machine recommendations without applying sound human judgment. Accountability of decisions may diffuse as layers of human and machine transactions are combined in opaque ways. With the

introduction of probabilistic artificial intelligence models, machine outputs may not correlate with human expectations. Still, the value of accurate virtual representations of reality are of incredible value. Data driven virtualization will allow tomorrow's commander to 'see', 'understand', and interrogate his/her battlespace. Accelerated staff action will create game changing understanding and tempo a successful force cannot win without. All of the components of both 'command' and 'control' will inevitably be shaped by digital **transformation**. C2 will mature and grow to deliver new capabilities and new opportunities.

Every warfighting function will be impacted by digital transformation, but none more than C2. It is the business of commanders, warfighters, planners, practitioners, and enablers to understand the nuances of Command and Control in a digital age. The integration of machine insights and human intelligence creates the opportunity to harvest the best of both.

The Function of Command

C2 starts with 'command.' Command is the authority a military commander lawfully exercises over military subordinates to assign missions to them. It is a simple but important foundation of military operations. 'Command' is a singularly designated authority that comes with the inherent obligation for subordinate elements to obey lawful commands. Commands may have multiple 'control' relationships, but never more than a singular 'command' relationship. That simple clarity is valuable and unique. Commanders are typically nested in hierarchies that create multiple layers of command guidance. This becomes a 'chain' of command that aligns a unit within a hierarchy of organizational authorities. 'Unity of command' ensures that units have a singular chain of responsibility to that specific commander. Given that authority, Commanders have considerable latitude to tailor their efforts to achieve their mission outcomes. In contrast, the function of control follows from this clear legal framework. Command sets the stage for orders, policies, processes, and risks that are accepted by the commander. Command imbues the commander with great authority and great responsibility, and it is through the authority of command that commanders can begin to control the battle. The personal leadership presence of the commander is one of the most important influences on the command's success. Importantly, Command authority cannot be devolved to machines.

The Function of Control

'Control' differs from command, in that Control is the set of artifacts that commanders create to execute their command responsibilities. Whereas Command is an authority, Control is the set of actions a commander uses to execute that authority. Control is pervasive in a chain of command, and it is where leaders make their intent, their policies, and their guidance known. A first consideration for commanders and organizations is the recognition that most aspects of the battlefield are not under the control of the commander. The weather, the terrain, threat compositions, the ferocity of enemy action or political guidance that restrains the activities of the command are all examples of things that are not controllable by the commander. Commanders,

aided by their staff, must start with a sound judgment of what is inherently controllable, and what is not. That initial assessment sets the stage for the commander's understanding of the inherent risk in those things he/she cannot control.

Commanders execute control through orders, directives, procedures, plans, personal direction and other guidance. 'Control' is the set of mechanisms a commander uses to guide units in their execution of operational responsibilities. In a ground context, control measures may include missions, phase lines, order of movement, restricted fire areas, or targeting guidance. In an air context, 'control' is executed through missions, flight schedules, priority targets, airspace deconfliction requirements, maintenance standards, and prioritization of efforts. In Joint doctrine, to 'control' is to manage and direct forces and functions consistent with a commander's authority. Controls articulate and actuate the will of the commander regarding the planning, tempo, type, and transmission of battlefield information that flows through the headquarters. Controls can influence activities, postures, tempo, location, targets, and priorities. A Commander's position gives him/her authority to define the controls to be leveraged. Control is an articulation of the tools the commander leverages to shape the battlefield, the force and the outcomes. Importantly, the authority to control is inherent in command, but the authority to command does not come from articulating controls. That is, a staff creating controls under a commander's guidance does not confer command authority. The artifacts of control are often the work of a commander's staff, but they must necessarily carry the imprimatur of the commander's intent.

Establishment of the command and control relationships for a military organization are essential, but incomplete. Control is a continuous action, and very much premised on enemy activity, friendly status, and the evolving threats to mission and force. The Commander dynamically balances a range of 'controls' to meter the tempo, geography, human terrain and ethical boundaries. To illustrate this, a steering wheel is a control. When a steering wheel is turned, it gives a range of feedback to the driver. Similarly, the force itself plays a key role in shaping the returns back to the commander. This feedback creates a set of measurement characteristics for commanders to refine and iterate their controls. Controls are designed to be flexible and nuanced. Controls influence the system to be 'under control'. Feedback to the commander can take many forms. At times, it is a direct report to the commander – e.g. Situation reports, Logistic reports, and Intelligence reports are all feedback elements. Sometimes, feedback can be reflected in the tone of voice a subordinate uses or be as nuanced as the exhaustion reflected in a face. Feedback on the effectiveness of those controls (and recommendations for additional sets of controls) is the give and take that allows a commander's intent to flow into battlefield realities. We should not think of control as a one-way vector. Control 'measures' are important things. But the ability of a commander to read, interpret and respond to controls continuously is a central component of the art of command.

Terminology Note: The Misappropriation of ‘Command and Control’

We cannot understand the future of C2 without some understanding of its origins. A broadly applicable and accepted definition is surprisingly challenging. We might imagine operational and institutional leaders from Napoleon to Eisenhower and not find a universally accepted definition of C2. Even though many great leaders have excelled in C2, C2 is not ‘leadership.’ Similarly, we can look at communications and networked digital systems and come up short. C2 is not ‘networked data systems.’ Confusingly, there are any number of military systems that advertise battle management, communications, warning indicators, network management or digital integration. While many of these have appropriated “C2” into their program descriptions, they are clearly not to be mistaken for definitional C2 capabilities. Even the Joint effort to define and construct a system for Joint All Domain Command and Control struggles with definitional drift and more attention to the policies of network architecture rather than the renewed focus on controlling the battlespace. True C2 demands command and control of the battlefield and the forces in it as the core elements. C2 requires a focus on the threats, the capabilities, the risk and opportunities in the situation. The careless usage of ‘control’ that conflates digital traffic with real battlefield control is a dangerous shorthand. A disciplined pursuit of virtualized capabilities that turn data into battlefield insights and intuitive recommendations is the future, but remains elusive. Digital age opportunities that create true understanding must rapidly displace digital feeds that contain only overwhelming datascares with no virtualized articulation of the battlespace and the forces in it.

The ‘Human Art’ of Command and Control

The ideals of human Command and Control have long been associated with individual human mastery and the management of large scale units. Clausewitz captures the idea in his formulation of the *coup d’oeil* or, ‘inner eye’, of a gifted commander. Yet the combination of societal change, digitization, and a technology-enabled force gives rise to new opportunities in command and control. In a modern digitally-enabled environment, that ‘inner eye’ is distributed across functional communities and lower echelon leaders through data availability and familiarity. The democratization of knowledge has changed the awareness and the power of individuals in modern society. Legacy Napoleonic organizational constructs may no longer be the best way to take best advantage of the individual skills of the modern members who make up the force. Technology has changed the capabilities of the modern force, but our organizations have not. As an artifact of that lag, the ‘science’ or ‘method’ of Command and Control articulated in Joint doctrine struggles for relevance. The doctrinal reference terms are largely organizational in their approach. They address hierarchies and chains of command that Napoleon would have understood. These miss the nuances of a much more educated and digitally productive modern force.

While Command is clearly aligned with a Commander, it is in the execution of controls and force cooperation on the battlefield that yield desired outcomes. It is here that opportunity lies. It is unfortunate that the focus of doctrine is on the deconfliction of organizational relationships rather than the synergy that is created when human partnerships within and among units are free to share battlespace understanding and combine effects to achieve mutually beneficial outcomes. C2 as an organizational construct is necessary, but with digital underpinnings of every warfighting function available, modern C2 offers much more than its predecessor (non digital) capabilities. The way human commanders integrate and achieve their battlefield outcomes is far more important than an organizational template. This is increasingly true in a modern force that is much more distributed, integrated, and equipped with access to expansive digital connective tissue. When successfully practiced, C2 blends organizational science with the tactical arts, creating relationships across unit boundaries to create synergy and tempo in its actions. The nuanced understanding that experienced humans bring to effective C2 is irreplaceable.

Legacy C2

Today, units are largely defined around functional communities with expertise in executing individual or collective battlefield functions. Each warfighting function has a lexicon that uniquely describes the processes, equipment, procedures, and outputs of a given operational community. Both the 'science' and the 'art' of each functional community is passed down through the rank and file and forms the basis for both functional expertise and human identities. Each warfighting community has its own doctrinal baseline for the methods, tools, and context for the application of C2 within that function. Thus, experienced members lead new members in learning best practices and the necessary outputs of their craft. From these roots come the core identity and expertise of military members. This identity and expertise are reflected in loyalty to mission, mentorship of individuals, commitment to shared goals and perseverance in the face of risk or dangers. The core aspects of human loyalty, empathy, management of fear, and resilient response to dangers on the battlefield are the product of Services and functional community development. These human aspects of warfighting and C2 remain essential. Talented commanders leverage this loyalty and professionalism to reinforce commitment, build confidence and create trust. They are found in creative human communities with shared relationships and a mutual commitment to shared outcomes. When artfully commanded, these expert human communities create tempo and integrated actions. They become 'control' surfaces for achieving the goals articulated by commanders. Professional communities working cooperatively to achieve the objectives articulated by the commander's intent are the critical component of 'control'. This human interaction, spontaneity, and empathy among comrades is a powerful force in the smooth execution of every mission. The term 'Mission Command' encapsulates this principle. 'Mission Command' is a command and control approach that delegates operational tasks to smaller units with specific objectives, but minimal guidance on how to perform the task. Mission Command takes advantage of the high quality individuals that populate modern formations. Based on a clear commander's intent, Mission Command allows

decentralized execution and rapid exploitation of opportunities created by initial successes. In short, legacy organizational constructs for military formations and corporations are ripe for change that takes better advantage of digital connectivity, cultural familiarity of a transformed digitized environment, and the high quality human capital available.

Digital transformation is an artifact of the human environment, and has already made a great impact on military operations and command and control. Digital evolution is not something that is coming, it is something already integrated in our social, economic, physical and military environments. Digital transformation is not ‘new’, but its character, and the artifacts associated with the term, are continuously changing. ‘Trans-form’ literally means, ‘the form changes.’ The changed form of C2 is reflected in the increasing foothold of digital capabilities into operational settings. Our current state is an extension of the earliest days of digitization. That vector has created a one-way transformation that shows no sign of slowing. Understanding and managing digital transformation in war is the acme of professionalism in modern Defense. Humans, machines, and the teams they constitute will have to meet this challenge of the decade, and perhaps beyond.

Digital Transformation – Technical Opportunities

Digital Transformation is not ‘new’. Among many potential starting points, the mass transition of hand-written transaction ledgers to digitized form served to revolutionize accounting and transaction recording. While initially doubted, this transformation eventually showed its value in speed, accuracy, reliability and portability. Digitization created opportunities for speed and scale that paper records could not match.

Adhering to an exponential digital transformation curve, current artifacts of technological change, especially in the digital space, have markedly accelerated as synergy among digital enterprises expand. At its core, digital technologies have gained such scale largely because they leverage ‘exponential’ technologies. In a physical environment, building one tool fills the hand of one workman. In a digital environment, the construction of one software tool can be proliferated across entire communities at the speed of cultural adoption. For example, with a common service data environment, multiple entities can take advantage of the data or insights gained by any single node on the network. A ride-share company leverages exponential technology as its platform brings in new customers at minimal additional cost. Exponential technologies in military transformation must leverage these same synergies. The availability of high-quality and relevant data environments could feed hundreds of small tactical information tools.

Much has been written about the inability of the traditional ‘weapons platform’ culture optimized to deliver hardware (tanks, ships, planes) to deliver Defense capabilities that can leverage this same exponential scaling effect. Contemporary defense capabilities are not inherently integrated into networks of collectors, taskers and effectors. They could be. Instead, organizational constructs are derived from Napoleonic units. New digital based artifacts are

growing increasingly familiar, and the warfighting imagination that can envision military outcomes from networked data systems are growing rapidly.

Together, the collected data, software algorithms and artificial intelligence developments are available to provide a nascent version of the exponential effect. Data management has also taken root in the DoD, with nascent efforts on-premises and growing commercial cloud foundations for storage, security, and compute. Still, achieving exponential scale is inhibited by Service and Program tribalism. Accountabilities and metrics for transformational change have not been established. It is typically not a lack of technology that holds back defense innovation. It is a lack of 'imagination' and 'implementation at scale'. With the technology of digital transformation readily available, the opportunity for 'exponential' C2 is tantalizingly near. For C2, this creates enormous opportunities.

Digits Collide. Challenges in Digital C2

War is a human endeavor. Within war, nothing is more subject to fog and friction than Command and Control. And nothing within Command and Control is more fraught than the relationships among battlefield reporting, digital presentation, and intuitive virtualizations that facilitate understanding without burdening with overload. In its simplest terms, the proliferation of effectors in the battlespace will create challenges for operational priorities and synchronization of effects.

Subordinate command initiative, normally a very positive response, might now create opportunities for conflicted understanding. When everyone can see what is happening in the battlespace, it might be a challenge to decide who gets to do what. When many hundreds of digital agents (operating on supply requests, casualty evacuation, defensive fires, or similar activities) require human intervention, the ability of a single commander is severely constrained. As previously described, Controls encompass the mechanisms the Commander has available to influence the battle and the forces in it. However, there is no way a human commander can observe and understand all the elements of a modern battle around him/her because the scale of modern operations extends far beyond the ability of individual human cognizance. Given the breadth and depth of military operations across multiple domains, the breadth of this vulnerability becomes severe.

Data overload and data scarcity will be simultaneous challenges in C2 that can be equally debilitating and often jockey for influence in the commander's decision environment. As multiple echelons of the staff now have access to a much broader swath of battlefield data, the commander's intent, and execution status, there are more opportunities for uncoordinated actions, unintended effects, mission fratricide, or worse. Unclear guidance and misinterpretations of commanders intent, battlefield roles, and the state of execution will, at times, disrupt the timing, flow or the sequence of the commander's planning. When everyone can make reasonable assessments of opportunities in the battlespace, who will coordinate, reconcile,

and decide? When data has nuanced application, and potential users have access but are blissfully ignorant of the peculiar data environment, the seeds of chaos have been sown.

The criticality of data application is central to success. No longer content with 'more' data that competes for decision-maker assessment, the new threads in C2 will demand tailored understanding, relevant application, and intuitive integration with other data layers. The application of data (virtualized presentations of battlespace understanding) will determine success or failure. Those C2 professionals who think only of bandwidth and data 'pipes' will do great disservice to commanders and decision-makers.

Proliferation of Agents that need to be Commanded and Controlled

An additional complication of the modern battlefield is the increased number of distributed effectors and intelligent nodes on the battlefield. The flow of data to a singular commander ignores the (potentially) thousands of decision support applications across the tools in the battlespace. Both human functional experts and autonomous agents that are already busy servicing various functional processes will be running continuously. Control of automated processes for nearly every function will create synergy, tempo, sustained operations, and visible data that must be assessed and integrated. But, the expertise to blend data, operations, automation, and virtual presentation in ways that are intuitive will be in high demand. Broad visibility across the theater will require practiced and well-understood processes for reacting to the unexpected, monitoring plan execution, and integration of individual functions at the right time and place. Artificial Intelligence tools will play a natural role in policing data flows, deriving relevant artifacts from large scale data intakes, and drawing attention to risks that are reflected in the data.

An Ode to Virtualization

Military organizations have, from the beginning, leveraged 'virtual' understandings of real situations. When the first commander took a stick and drew a coordination line and stick figures in the dirt, human warfare began to leverage virtual representations of the battlefield to achieve real effects. The quality of these virtual representations has steadily improved. Modern map capabilities have evolved to include three dimensional characteristics of physical battlefields, network topographies, functional charts for military processes, and a host of other virtual representations. Virtual understanding of real artifacts is a condition of almost every human endeavor.

Digitization extends the virtualization process to another level. It is hard to get a physical map from one point to another. It is very difficult to deliver a sand-table to a distant headquarters. In a digitized environment, not only are the artifacts of the battlefield represented in a virtual environment, but they can be sent near-instantaneously to many places at once. The tradeoff is

that the virtual environment is unintelligible without the application of the right tools. Digits alone are useless. Digitization represents a tradeoff of speed and scale at the cost of translating data into virtual environments that humans can perceive. When nearly every element of the force has the same situational awareness through access to shared data platforms, new rules for deconfliction will be required. Elements of the staff will have to pre-negotiate data policies, freedom of action and boundaries for validated virtual understanding. Virtualization can help validate, articulate, and enforce live capabilities, but will struggle with human complexity. It is important to understand the limits of virtualization as well. There is no substitute for looking into the eyes of a tired junior leader to truly read the levels of confidence, fear, exhaustion, and resilience.

Human Challenges with Data

The quality of a modern digital virtualization environment will not be measured by the volume of data that flows to a commander or staff. Instead, the metrics will be centered on the intuition a virtualized ecosystem creates. In fact, not pushing as much data as the decision maker will be enabled through intuitive displays and integrated presentation.

Individual data sources, each tailored to one effector; unshared data that has been jealously protected by an adjacent warfighting community; data that is labeled, but has nuanced application; potential users who have access to sensitive data but are blissfully ignorant of the peculiar data environment; all of these are human challenges played out in the degradation of the force data environment. The challenge will not be finding enough data in this environment. It will be in finding the right data that is accessible to the user community that needs it. If past behavior is any guide, individual organizations (or Services) might respond to friction and uncertainty by inhibiting data flow from sensitive operations or sensors to other elements of the force. Data tribalism will become a major inhibition to integrated operations. Intuitive understanding (through virtualization) and data trust are the pillars of future C2.

Commanders Decide. Opportunities in Human-Machine Teaming

The complexity of 'control' on the modern (scaled) battlefield will require new thinking about battlefield data relationships. The force that understands its environment through smart application of data to the environment will win. The force that eschews data and becomes aware of challenges as they present themselves will be disadvantaged. The challenge begins with command relationships articulated in controls. In classical C2, the perception of a human commander and staff that is close enough to the fight to be acquainted with most of the activities in the battlespace prevails. The long range risks in the modern battlespace can be intercontinental in scale. Against that scaled challenge, Commanders and staff have the ability to build broad networks of sensors and effectors, linked through artificial intelligence. The presence of information machines and smart systems alters (broadens) both force awareness of what is happening in the battlespace, and potential options to contribute to control. In this battle

at modern scale, C2 becomes continuous and devolves to a much wider range of participants. Data will feed virtualized representations that inform decisions by the commander as well as decisions across the layered force. The force will benefit from shared data understanding, with automation agents that continually leverage battlespace data to inform decisions. Much of this awareness (and compute) can be generated from long distances. It will not be necessary to be in the battlespace to affect it.

How commanders overcome ‘incoherence’ in their actions will be an important skill. As actors across the force execute upon the elements of the battlespace that they can perceive through data, alignment, focus, priorities, and integration will all benefit from data machines. Digital reconnaissance and digital situational awareness are the tools commanders will need to create a faster tempo than the enemy’s. This might require new forms of operational control. An ‘old’ problem was how to find the enemy so that he could be engaged and defeated. A ‘new’ problem will be how to manage the battle when subordinates, virtual agents, and the enemy are all acting on the same data and same situational awareness at the same time the commander is formulating his/her plans. The real transformational opportunity in C2 is a shift from data to understanding. The value of tomorrow’s C2 is not found in the delivery of data as data itself is only the raw material for operational insights. Real value is found in the translation of digital content into the virtualized realities that humans can inherently sense.

The physical artifacts of today’s command centers (big screens, rotating slide shows, rows of desks, and data feeds that come on bespoke circuits) can be significantly enhanced. Communications professionals can do ‘magic’ things with network topographies, network security, and data processing, but the value that flows through those networks will be found in its applicability to functional communities and command layers. Operational communities need to be stacked with ‘imagineers’, not digital network technicians. Interpretation of data into a virtual representation that appeals to a consumer community demands translation by members of that consumer community. Making sense from a minimal amount of data is an economy that advantages tempo and understanding. With data flows, ‘more’ is not generally ‘more useful.’ Functional maps, overlays, graphs, bar charts, infographics, videos and the like extend the opportunity to articulate meaning from data. Virtualizing challenges in the real battlespace is a skill unto itself, and is a necessity to C2 in an increasingly digital age.

The Ethics of Human- Machine Teaming

A new relationship with battlefield information machines will require new thinking by technologists, warfighters, ethicists and commanders. The ‘theory’ of operational integration of machine recommendations, artificial intelligence, autonomous data integrators, and machine-driven execution is not only a command and control challenge, but also an ethical challenge. The integrated presence of human judgment and machine data awareness will not only impact decision-making, but will also affect trust, law of armed conflict determinations, decision-accountability, and perceptions about the core ‘humanity’ of warfare and conflict.

Today, commanders make decisions based on trust in the efforts of the staff, long-standing human relationships, a core ethic of professional reliability and trust in functional warfighting communities that know their craft. In a newly data-informed command post, veracity of information will be a continuous challenge. Making practical and ethical decisions in a much expanded decision environment will be challenging. Human context and human understanding of even the most seemingly benign data flows will be critical as battlefield systems integrate increasing layers of data automation underpinning complex processes. What data to trust, what systems to trust, what perceptions to trust will create new underpinnings of responsible decision-making. Much of that trust will have to build up through training and practice. No algorithm should make its first appearance on the battlefield before it has been deliberately vetted through experience gained through training and diversified data. Accountability for veracity of data and machine recommendations demands a science and ethic by itself.

Over time, machine information and human judgment in a virtualized environment will become second nature. There is already a deep ecosystem of decision machines, precision munitions, automated processes, intelligence flows, and more that are based on professionalism and trust and will inform more complex warfighting developments. Humans and ethical warriors have the mandate to extend the core of trust into every complex task presented.

Command. Control. Trust. Technology. Ethical Warfighting

Artificial Intelligence, semi-autonomous systems, and C2 are changing rapidly. Additionally, the character is changing rapidly in the face of an expansive digital transformation. The broad digital transformation has been instrumental to our society, our national productivity, our broad prosperity, and our national security competitiveness. C2 similarly takes on a new character.

In a digital transformation, it is important to understand how the core elements of the C2 warfighting function are executed. Orders are top-down, as the commander has the best comprehensive picture. While the force has the greatest fidelity picture, it is limited to smaller contexts. Looking over the next hill requires coordination, scheduling and execution are gradually disappearing, while new technology for commanding and controlling evolves daily. It leverages SW driven exponential technology. While the roots of C2 are consistent with predecessors, the methods and digitization are new. Still, we find ourselves with one foot in the digital world and another in analog. Digital C2 is an exponential catalyst, yet our pre-digital roots encumber our transition and our success.

Understanding and professionalizing C2 is a critical requirement to leverage the advantages we have. Even in a digital age, the roots of C2 practiced for generations remain relevant and necessary. It is not enough to rip out analog systems and replace them with integrated data environments (although that would be a great start). As the concept of C2 continues to be refined, it is important to differentiate the concept of C2 from the tools that enable it. While the tools of C2 continually change, the ethics, skills, and the humanity of C2 remain the indispensable core of

modern warfighting. Conflation of C2 and ‘communications’ or ‘networks’ is a dangerous misconception. Technological capabilities are only effective solutions to battlefield problems when they are screened through the lens of warfighting function. In a digitally transformed age, the tools for C2 execution have evolved continuously and rapidly. But there are great risks in technology applications that are not anchored in warfighting effectiveness. In an environment where technology is frequently offered as a substitute for thoughtful warfighting, enthusiasm and hype have historically accompanied technology development. But technology becomes transformational only when it is applied within a functional warfighting construct. “How do we win?” is the challenge for warfighters and technologists alike. C2 is the architect of victory.

As new tools for C2 become available, new methods and practices for victory will become available. New relationships among machines, humans and battlefield understanding will accelerate operations. This will not happen without transformational leadership. The core of C2 professionalism will be to take ownership of a transformational digital environment. That will not come for free. Leaders and practitioners have the obligation to shape the practice, outcomes, and ethics of a transformed C2 function.
