



## □ Networked Command Systems in Tomorrow's Warfare

General Military Review

Le chef d'escadron Stéphane JAY

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**Western militaries agree that tomorrow's success will be based on deconcentration of manoeuvre, on a capability approach guided by expected effects, on Command and Control (C2) agility and not on available technologies. Squadron Leader Jay considers that the prospects for the evolution of the C2 matrix organisation challenge the traditional functioning of the chain of command and that the expected gains, in a purely technological approach, should not make us forget that warfare remains an eminently human activity and that this type of approach carries significant risks of force disruption.**

To respond to changes in the operating environment<sup>62</sup> As a result, Western armies are seeking to adapt their organizations and modes of action. Their main aim is to fight against transparency and the widening of the battlefield. Maintaining their freedom of action will be based on the redevelopment of uncertainty, which generates permanent dilemmas through the dispersion of units, the improvement of agility and the convergence of effects to meet the challenge of numbers. It will also require reducing the ground footprint (physical and electromagnetic) in a context where the difference in safety between front and rear will have been experienced, and significantly improving the understanding of a more complex and changing environment.

Faced with this new operational environment, the agility of command systems is particularly sought after.<sup>63</sup> It must ensure the resilience of the command capability. It will be based on five structuring skills<sup>64</sup> which are: modularity, mobility, footprint control, interoperability and information superiority.

Networked warfare, the American "network centric warfare", consists in linking all means of information (sensors), decision (chains of command) and action (weapons systems),

regardless of their owner and user.<sup>65</sup>

Beyond the obvious tactical gains of this approach, this study proposes to establish an overview of the main opportunities, but also the risks of developing this system applied to C2.

## **Expected gains and status of the concepts developed**

### **The main prospects**

Facing the end of "operative comfort"<sup>66</sup>, tomorrow's C2 will have to meet the challenges of resilience and acceleration of the decision-making cycle.

Resilience could be based first of all on the deployment of a single command network, but relying on a redundant SIC mesh (a "digital web"). The storage of information would be dematerialised within cloud computing.<sup>67</sup> to reduce the physical footprint in theatre, while relying on a national processing and storage infrastructure.

The acceleration of the decision-making cycle will be based in particular on the processing capacities of the "big data".<sup>68</sup> by artificial intelligence (AI). As a real decision-making aid, AI should make it possible both to speed up the operational decision-making process and to integrate the proposed solutions into a cross-domain logic. Consequently, the American and British allies are considering a substantial reduction in the number of staffs within their headquarters (MS) thanks to the automated processing capabilities. information processing capabilities, by deporting analysis capabilities and coordination cells at tactical level to national territory (example of 3D deconfliction by a JTAC team)<sup>69</sup>. Although these technical solutions may appear attractive, they do not take into account the planning needs of a French PC and do not integrate the new areas of warfare (cyber, space, perceptions). As such, the AI processing capabilities are simply aimed, from the French point of view, at reducing the cognitive overload towards which our MS tend and at relieving them of repetitive tasks.

The dispersion of C2 should also ensure the continuity of the manoeuvre and generate uncertainty in the conduct of operations.

The info-value in Scorpion makes this distributed command of operations possible. The ability to reconfigure both units and C2 in the long term makes it possible to envisage a highly agile dispersed maneuver, facilitating shifts and multidirectional approaches to efforts, including when interlocking with the enemy.

### **Possible organisational transformations**

In terms of the organisation of command structures, several options are emerging:

- Tactical matrix C2: while maintaining a pyramidal command structure at the design and conduct levels, it is possible to develop a matrix system at the tactical level (SGTIA) improving the convergence of effects. The horizontal sharing of information, the resulting acceleration of decision making and the automation of links between observers and effectors are at the heart of information systems.

- Deconcentration of MS structures: the principle of a networked command system allows

the separation of MS operational functions into modules on vehicles, in order to increase mobility and reduce their footprint on the ground. This dispersal improves survivability, but also brings specialised cells closer to the ground and thus improves the relevance of the required effects. This dispersion could also create uncertainty, both through the inability of the enemy to identify a command post (CP) and through the flexibility of such an organisation in seizing tactical opportunities. Finally, it improves subsidiarity, in that the dispersed cells have greater autonomy in the field.

- Matrix-based management and planning: the dispersal of command posts can go even further by generating autonomous C2 modules, each with all the reduced capabilities of a MS.<sup>72</sup> Their dissemination in the field ensures an ad hoc command capacity in each compartment. This geographical and temporary approach to command directly calls into question the organic continuity of command.

## Experiments in progress

Following the example of France, the Americans have massively invested in the field of info-valuation. In the context of the multi-domain battle, the expected gains aim in particular at improving the coordination of effects. Nevertheless, there does not seem to be, at present, a willingness to "horizontalise" C2. In the framework of Agile Warrior (British experiment), the TRADOC officers appeared evasive and backward when these perspectives were raised. The Americans first sought to develop the command mission (subsidiarity and initiative), citing the French approach in the field.

The British, as part of their prospective seminar Agile Warrior, soon to be set out in their 2035 force concept (CF(L)35), aim to revolutionise their entire command structure. Beyond the planned abandonment of the GTIA level in favour of a Future Combat Team (FCT) similar to an autonomous SGTIA with robust inter-service capabilities, the drastic reduction of C2 within this new structure is also envisaged: ten officers to command a 450-soldier CTF with the full spectrum of capabilities of the current FTIA and seven days of logistical autonomy. Their model is based on the dispersion of multipurpose C2 modules, capable of commanding one or more CTFs depending on the evolution of the manoeuvre. The expected gains fall into several areas: permanence of command ensured by a form of redundancy of capabilities scattered in the field, decentralised command as close as possible to the action, reactive planning, and the ability to respond to changing circumstances and structures that can be adapted to the situation and the action (grouping of CTFs under the same C2 module, decentralised actions planned by other modules).

The Dutch have launched into the experimentation (until 2019) of an even more radical solution with the "Net Force" concept. Their motto is to use new technologies in the best possible way and not just improve what we already do at the margin. The idea is that all command relationships should be as horizontal (flat) and temporary as possible, so that the force becomes a real network.

## The matrix organisation model in crisis management?

Reflections on the horizontal sharing of information find a favourable echo in crisis management. This is the case, for example, of the French application "Hermès - Coastguard function", a reference in the organisation of the response to maritime crises. By developing a collaborative interface for all players, the application has made it possible to work horizontally. This organisation mode seems to be bearing fruit in terms of

responsiveness and faster decision-making. However, its transposition to the land-based operational environment would nevertheless pose many problems in terms of planning (a maritime crisis remains a standardised event in terms of planning and management). A maritime crisis remains a standardised event, less prone to the uncertainty generated by an enemy), the permanence of communications (no mobility of the crisis centre) and the system's capacity to evolve, in particular.

### **Likely risks during an operational engagement**

The networked C2 system seems to offer real prospects. However, when confronted with the realities of war, limits and risks quickly emerge.

The first limitation is technological. This system relies on the reliability of its communication network. Whether in terms of the technical quality of the links for accessing information, the reliability of data or the information system, this organisation of the chain of command makes the following dependent on technology<sup>74</sup>. In parallel with its development, it is necessary to think from the outset about command in a deteriorated situation, but also to be able to maintain a critical and independent view of the data that could be proposed by the AI.<sup>75</sup> It is interesting to note that the Americans have just abandoned their information system (close to the Scorpion information system) because of flaws detected in the design, allowing third powers to access the system.

The second limitation lies in the elaboration of the manoeuvre. One of the strengths of hierarchical command is to ensure consistency between the different levels in the action. In a "horizontal" command, the autonomous action of units contributes to the overall effort, while ensuring a form of uncertainty in the enemy. However, overall coherence may be affected. How to ensure coordination and synchronization of efforts when the British brigade will command between four and five autonomous CTFs? Even if units will be more reactive, the coordination of the different C2 modules and especially the lack of a clearly identified planning cell may make the "sense" of the manoeuvre lose its "sense". The command mission will have to revolve around the definition of a major effect, the translation of the leader's spirit. This notion is complex to grasp in the British model, which calls it "enlightened disobedience". Finally, the mass of potentially accessible information and the risk of wanting to know too much can lead to the blindness of leaders through cognitive saturation. In the context of crisis management, it is easy to discriminate against information within its scope. Is it that simple in a high-intensity battle?

The main risk stems from the human nature of warfare. As mentioned by General Desportes<sup>76</sup> "...the key to effective command will remain, at its core, the ability to deal with uncertainty.

While the networked C2 system and the high degree of unit autonomy seem to provide the necessary flexibility, organizational simplicity must also be sought. "Simplicity gives the organization good readability. ...] Each soldier has a clear vision of his chain of command and can more easily perceive the new connections that need to be made if the hazards of the battlefield lead to the dislocation of the current organization. ...] The military rule of "Know thy leaders" is not only a tool for preserving authority and discipline, but also a means of reactivity in combat. »<sup>77</sup>

On the other hand, the appetite for risk-taking, which is necessary to adapt to circumstances in a context that can only be imperfectly controlled, can only develop through a "community of culture". Confidence, developed from peacetime onwards



through training, adherence to a common doctrine and mutual knowledge between the leader and his subordinate, are the only qualities that enable initiative to be taken. Confidence also guarantees the maintenance of morale in the long term in the face of adversity. In a "horizontal" system, where command can vary according to the phases of the manoeuvre, it seems complex to maintain this "knowledge of leaders" and, as a corollary, the maintenance of trust and consistency of command. This organisation would require ongoing and complex training.

As such, it is interesting to measure the magnitude of the task against the difficulties encountered in training...In this respect, it is interesting to measure the scale of the task in terms of the difficulties encountered in training in a realistic context, given the space required for the dispersion of units, but also to control deployment over time.<sup>78</sup>

Based on this analysis, it is possible to propose a cross-classification, in terms of hazardousness and probability, of horizontal C2 approaches (Model C2).UK model) and more conventional (FR model) approaches, according to a few criteria (IA coordination, data perversion, CDT coherence, quality of SIC links, moral decay).

At present and in the near future (2035), the networked C2 system pushed to its extreme (Agile Warrior), leading to the dilution of the organic hierarchical link, generates more risks than opportunities. This British, or Dutch, vision of tomorrow's command seems to reduce the war to technical actions, and underestimates its fundamentally human character.

The median solution<sup>79</sup>The aim is to "horizontalise" the tactical level links within a single network, while maintaining a structured hierarchy as soon as theThis approach, which consists of "horizontalising" the tactical level links within a single network, while maintaining a structured hierarchy when dealing with conduct and planning, makes it possible to take advantage of technology while at the same time ensuring the continuity of the chain of command. The American approach to multi-domain battle, or the French approach in Scorpion, are part of this balance.

Future developments must ensure that this unity of command is guaranteed, while dispersing and making the CP's constituent cells more mobile. A form of dispersal by functions linked by a collaborative network would make it possible to improve the protection and resilience of the CPs. This organisation is also based on greater subsidiarity, a guarantee of agility. This does not settle the question of slowing down the manoeuvre in the event of the loss of the leader, but guarantees the overall coherence of the force.

Eventually<sup>80</sup>it is possible to envisage a radical revolution in tactics...<sup>81</sup>...questioning the physical, organic bond of command. This prospect of a "virtual" tactical link will require a radical change in mentality both towards subordinates (training, understanding of the tactical environment, manoeuvres down to the lowest levels of execution, increased autonomy) and towards leaders. Knowledge and power would be dissociated. Distributed knowledge would require the leader to no longer intervene in execution and to ensure only the conduct of units temporarily in his area of action. The leadership echelon is understood, in this perspective, as a level of geographical coherence (management of scarce resources, articulation of the "pawns" at his disposal, distributed logistical support).

62 Read: Future operational environment 2035, CICDE; Future land action; symposium "Tomorrow is won today", EMAT.

63 Among the factors that make up this agility, the interim report on the network mandate of the operational function "command support" underlines the need for to split up command capabilities, to have permanent access to information in a combat cloud

architecture and to optimise the management of information exchanges.

64 Interim report on the network mandate for the command support operational function, JSAT/SCPP, April 2017.

65 At the tactical level, this "infovalorised" mode of operation will enable more efficient information transmission, the establishment of a "common operational picture" and the development of a "common operational picture", significantly improving decision-making, greater effectiveness of weapon systems that will make direct use of the information available on the network (example : shooting out of direct sight). Extended networking will thus ensure the cooperative operation of entities (sensors, decision-makers, effectors) in a short loop. As is the case with the Internet, information is no longer used to apprehend the situation and to decide, but directly to act. It is very clearly a power multiplier, which is the real passage to the information age. Extended networking will tomorrow be the sole support for interoperability, unique and therefore indispensable, since the pre-eminence of coalition operations will remain.

66 Future land action, EMAT.

67 Cloud computing involves harnessing the computing and storage power of remote computer servers over a network (usually the Internet).

68 Massive data: a set of data that has become so large that it is beyond human intuition and analytical capabilities, and even beyond those of conventional computerized database or information management tools.

69 No parallel with a French PC can be drawn given the current staffing levels of an American PC. This same prospect of a British reduction is constrained and forced by their budgetary and recruitment difficulties. It does not respond to an operational improvement.

70 General Hubin, Perspectives tactiques, Economica, Paris, 2000.

71 CDEC/DEP C2.

72 This development could generate a need for more and more modules for planning and conduct and become counter-productive in terms of C2 volumes (British approach).

73 General Hubin, Perspectives tactiques, Economica, Paris, 2000.

74 In the event of a loss of link, it may be noted that a hierarchical system will be more prone to disruption than a networked system. Nevertheless, the coherence of action seems more uncertain in a networked system deployed by operational functions. This multi-purpose module system seems to be able to respond to this type of disruption. Beyond the question of information transmission, the question of the coherence of the system, guaranteed by the spirit of the mission, of real subsidiarity within the forces, a quality independent of the chosen organisation, and of resilience, developed through mutual knowledge and training, must be asked.

75 Within the framework of the CICDE's AI and big data study groups, it appears that the ability to pervert digital data will be one of the major challenges of tomorrow's war.

76 General Desportes, Décider dans l'incertitude, Economica, Paris, 2004.

77 This vision of command is rejected by General Hubin, who considers that the tactical link will be achieved through the reduction of the feeling of isolation allowed by the "common picture", by the ability to The tactical link will be achieved by reducing the feeling of isolation that comes from the "common picture", by the ability of the command level to ensure more effective coordination of support in its area of responsibility, but also by simulation and upstream wargaming to ensure a "community of thought" replacing the physical link.

78 Study of the Studies and Prospective Unit: prospective reflection on the probable evolution of training conditions in the Scorpion era.

79 Corresponding to the Scorpion approach phase 1 and 2.

80 Envisaged in Scorpion phase 3 beyond 2035. Tactical perspective developed by General Hubin.

81 A distributed command of operations based on a zonal approach of the echelon of command and delegating the execution of the maneuver to the lowest level.

At the end of the Special Military School of Saint Cyr, promotion "Lieutenant Brunbrouck" (2004-2007), squadron leader Stéphane JAY chose the Train weapon. He notably served in the 511th Train Regiment before commanding the transport squadron. During this first part of his career, he was deployed in Chad, Afghanistan and Mali. Since then, he has been serving in the Studies and Prospective

Division of the Command Doctrine and Training Centre (CDEC).

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<b>Author (s) :</b>	Le chef d'escadron Stéphane JAY
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