

# Command and Control in the Information Age: Evolution or Revolution?

by *Professor Christopher Elliott CB MBE*

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Thirty years ago, regimental daily orders were typed up by a clerk on a wax skin. If errors were made, the wax characters were filled in with Correctine (a solvent with wax dissolved in it), then left to dry and the correct words typed over. The sheet with its typed imprint was placed on a metal drum, inked and the image then transferred to many blank sheets of paper. The regiment would then, and only then, know the structure of the coming day. Later, a photocopier was used to reproduce the typed sheet, but the original was still produced using a typewriter and ribbon. This year, daily orders are posted via keyboard on a unit's intranet, read instantaneously and amended at will.

At the end of the Cold War, operational plans were still put together using chinagraph (wax pencil) overlays on maps. The overlays were used to display graphically the commander's intention with arrows and icons; they contained important control lines to de-conflict activity. Once the plan had been finalised, it was then traced over many times using large sheets of clear paper. These copies were rolled up and distributed to subordinate formations by the fastest means – usually a dispatch rider. At important moments in an operation, the commander would call in his subordinates for 'Orders' and he would describe his plan. In all probability he would explain

how the most difficult phase of the coming battle might go and where he thought the decisive action might be. He could detect, or not, comprehension in the eyes of his subordinates. As the subordinate commanders departed, they were given a rolled-up traced copy of the battle plan and travelled back to their own headquarters where the process was repeated. Many will remember stumbling around on dark nights trying to find those headquarters, with all the inherent delay and confusion. The whole process could take many hours. This year, it is technically possible for a senior commander to draw lines and arrows on a map-based 'whiteboard', which can be seen *as they are being drawn* by all the subordinate commanders many miles away in their own headquarters. This year, de-confliction can be achieved by looking at everybody's real locations, GPS-reported and GPS-accurate, displayed on a blue forces situation awareness screen ... and simply staying out of each other's way.

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There were also enormous hurdles of synchronisation to overcome. Massing combat power at a critical point was the key skill, and this required complicated handwritten road-movement calculations in order to get the necessary weapon platforms, enablers and troops concentrated, usually travelling down narrow routes with scarce capacity. This year, units receive a computer-generated time of move, but can also physically see, via GPS reporting, the number of allied forces using a route, by individual vehicle, and take opportunities to fill spaces

accordingly. Fire plans used to be drawn up using pen and ink on a special form and synchronised to 'H' hour. Details could be changed later and some flexibility was built in, but this was usually at the expense of concentration of firepower. This year, indirect fire support can be cued on to a target from any of the weapons platforms within range, be they land, maritime or air systems. The point of impact can be changed if the target moves. Instantaneously.

This year, if they want to, individuals up and down the chain of command, located many miles from each other, can enter electronic conference rooms to discuss the whys and wherefores of a coming operation. Simultaneously. We are at the point where the planning staffs of allies, located back in their national headquarters in different time zones, can all peer into computer screens and see the same intelligence assessment or map display of assigned forces. They can discuss, collaboratively, the options to be put before the force commander and indicate which ones the allied contributors would find acceptable. Instantaneously.

We have adapted to these changes largely by automating existing best practice, forged over the years in the furnace of real-war experience. But when the London Stock Exchange automated its dealing processes, it abandoned the face-to-face deal-making of the stock exchange floor, and with it all the nuance of person-to-person contact, in favour of brokering from offices scattered throughout the city of London, indeed the world. Is a similar leap required within the traditional way of military command and control? Perhaps, but we are faced with a clutch of problems more complicated even than the example of a stock exchange.

### Problem 1 – Differences Remain

The three fighting environments of land, maritime, air (or six, if space, electronic and cyber are included) are not equally amenable to adopting information technology, nor will the effects of doing so be the same. As the UK Commander-in-Chief Land described last year, the land environment is different: more of the time it is more confused and less amenable to a matrix of controls, while individuals can be more dispersed, the enemy closer, fear more immediate and prevalent, cohesion more critical but harder to achieve, and the complications of neutral actors and populations more pressing. By contrast, many of the new tools of information technology have been found in the warfare rooms of destroyers and the combat air operation rooms of squadrons for a decade now. These diverging speeds of adoption would not matter if we were not racing to cohere into Joint fighting groups – ‘agile mission groups’ – where the millisecond accuracy of the air and maritime pictures struggles to envelop and work alongside a land picture updated in hours.

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### Problem 2 – Oversimplification

Much more data is accumulated than can be made sense of. The inadequate technologies in this respect are the computer screen, which can only deliver the narrow view of a drinking straw into a much wider world, and the sense-making software. These have pernicious effects. Attention is drawn to what is *displayed*, not necessarily what is *important*, giving the former an unnatural priority. Attention is drawn to what *can be displayed*, instead of a balance of all factors impinging. Icons are used to display physical things such as companies, battalions, vehicles, etc., but in doing so, the uniqueness of each individual entity fades. Through laziness or tiredness we might slip into ‘fighting’ them as Playstation icons, not as real entities.

### Problem 3 – Infatuation with New Technologies

A competition has developed between the use of ‘traditional’ cognitive methods (including intuition) and of assisting decision-making with ‘modern’ information machines. Dangers exist of being so absorbed in the information technology processes as not to see an answer that stares us in the face, and the habitual use of information machines encouraging dependency to the exclusion of other methods. Furthermore, mental arithmetic gives both an answer and a feel for the correctness of the solution; in the age of calculators the underlying calculation is hidden and the sense of fidelity lost.<sup>1</sup> This all matters because a rough and ready cognitive solution might be better and timelier. An information technology machine is driven by its unswerving algorithms – the internal rules of decision-making – that are still many times less capable and flexible than the processes of the trained human mind.

### Problem 4 – Poor Decision-Making

Enhanced communication allows decisions to be left more open or left more to the last moment than hitherto, just because it is possible to do so. Under the tenets of Chaos Theory this can be beneficial, leaving options open as late as possible where circumstances are rapidly changing or chaotic. But it can also devalue the importance of thinking through, setting and updating the grand strategic or operational intention. They fought well, but up the wrong valley. When secure communications were first introduced in the 1960s to the armoured formations of the British Army, there was a noticeable change towards over-prescriptive plans, because the new communications means allowed commanders ‘last minute fiddling’.<sup>2</sup> This was only corrected by the disciplined introduction of Mission Command, a necessary device to set the new technology in its proper and more useful context.

### Problem 5 – Double the Training Load

The new information technology machines are so capable that we would be foolish not to use them, but we would be equally foolish to rely on them entirely.

The frustration of a blank screen is the common experience of the Information Age, often without any malign origin. So the information technology-enabled force has to be able to fall back on non-information technology procedures in seconds, if it is not suddenly to become supremely vulnerable. Soldiers must be able to use GPS, which takes some training, and also to use a map and compass, which takes a lot of training. Staff officers must be able to put together Joint agile mission groups, and also to draw up a fire plan with pencil and paper. Commanders must be able to issue rapid, decisive orders to chase targets snared by our information technology sensors and enabling data links, but also to fight intuitively a winning engagement where the enemy is no longer seen and his moves cannot be predicted.

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### Problem 6 – The Enemy

Potential adversaries will have been watching our development of information technology. They will attempt to find seams of weakness between and around our new strengths.<sup>3</sup> Information technology-assisted warfare relies crucially on situational awareness or, as an oversimplification, the layout of our forces on a screen map. What if the enemy penetrates our database and changes the few bytes describing the location of a blue company icon or, even, the one byte that made it not blue, but red (enemy forces)? Fire might then be directed on to the red (really blue) icon, before it was learned too late that the screen image was corrupt. How much other displayed information could then be trusted? The enemy does not need to bring down our networks, only neuter our use of them through a cognitive virus.

### Conclusions

Some conclusions emerge from this,

giving a few indicators for the path ahead. A gradual, evolutionary, cautious introduction of information technology would be wise, carefully carrying forward proven methods and skills with it. We should set out to fuse as many sources of information as possible and more than we appear to need – the multi-spectral approach – to stop ourselves being spoofed by any one sensor or source. We need a much better form of visualising what is in our data warehouses than can be seen through current computer screens, moving instead to three-dimensional representations where displayed entities can be moved by hand. We need to discipline ourselves better to show prominently, and always, the fidelity of the source of displayed information, its timeliness and accuracy, so that we can

better resist the rogue icon placed by a cognitive virus.

But perhaps the biggest question we face is whether the traditional hierarchies of command are still the best mechanism to release the potential of the fighting force – to what extent could a force self-synchronise its actions under an overarching intention if all in that force had the same information? Training may indicate the way, but unfortunately only wars will prove the path here. Expensively so, for those that call the wrong card. ■

## NOTES

1. As one example, the decision support tools currently being used for the Multinational Experiment series led by USA give the capability to poll a large database, into which it is intended to place all relevant knowledge. The result is a

matrix of weighted factors for a commander to consider. A traffic-light system usefully shows relative perceived worth. The result is certainly comprehensive, yet it is spread over so many screen pages that it is impossible for the observer to comprehend them as a whole or come to some form of balanced judgement. Human methods had ways of refining and reducing the material at an earlier stage.

2. During the Kosovo War, General Wesley Clark as SACEUR must have been acutely aware of the political signature of military actions within the wider alliance and this was probably his motivation for holding frequent and extended video conferences down the chain of command. But the process distressed his subordinates, who saw it as gross interference in tactical issues. This trap sprung not least because IT allowed it to be done.
3. In his latest book, *Curbing Innovation*, Kaufman provides many stimulating thoughts on possible seams. Argos Press, 2004, ISBN 09580238 4 0. A review of the book is on Page 100 in RUSI Defence Systems Autumn 2004 Vol 17 No 2.