

FOREWORD

This concept paper describes the theory and guiding principles of command and control as practiced by the U.S. Marine Corps. *Put very simply, the intent is to describe how we can reach and execute effective military decisions faster than an adversary, in any conflict setting on any scale.* In so doing, this paper provides a conceptual framework for all Marines for the development and exercise of effective command and control in peace, in crisis, or in war. This concept paper represents a firm commitment by the Marine Corps to a bold, even fundamental shift in the way we view and will deal with the dynamic challenges of command and control in the Information Age.

The Marine Corps view of command and control is based on our common understanding of the true nature of war and on our warfighting philosophy of maneuver warfare as described in Fleet Marine Force Manual 1, *Warfighting*. This view takes into account both the timeless verities of war as we understand them and the peculiarities of the information explosion that is a consequence of modern technology. Because we understand that war is fundamentally a clash between independent, hostile wills, our concept for command and control accounts for an animate enemy who will actively interfere with our plans and actions in order to further his own aims. Because we recognize the inherent nature of war, our concept for command and control provides for fast, flexible and decisive action in an environment characterized by friction, uncertainty, fluidity and rapid change. Because we know that equipment is but a means to an end and not the end itself, our concept for command and control is not associated with any particular technology. Rather, it takes a broader view of the issue and accounts first for the human factors that are central in war. In so doing, this concept provides a proper framework within which different kinds of hardware, and other components of command and control support, can be judged.

Our concept applies across the full spectrum of conflict, from humanitarian-aid or peacekeeping operations on one extreme to general war on the other. It applies equally to small-unit leaders and senior commanders. Moreover, since any activity not directly a part of warfighting is part of the preparation for war, our concept must also apply to the conduct of peacetime activities, in garrison as well as in the field.

This paper provides the authoritative basis for the subsequent development of command and control doctrine, education, training, equipment, procedures and organization. This paper provides no specific techniques or procedures for command and control; rather, it provides broad guidance in the form of theory and concept. It requires judgment in application.

One of the main points of this paper is that command and control is not the exclusive province of senior commanders and staffs: effective command and control is the responsibility of all Marines. And so this paper is meant to guide Marines of all grades.

Command and Control

CONTENTS

Foreword	
Operation VERBAL IMAGE	1
Section 1. The Nature of Command & Control	14
Section 2. Command & Control Theory	22
Section 3. Creating Effective Command & Control	35
End Notes	46

The following story is intended to illustrate certain of the concepts and capabilities described in the command and control concept. It is a work of fiction, and any similarities to persons living or dead is purely coincidental.

OPERATION VERBAL IMAGE

Scene: A troubled corner of the globe, sometime in the near future. The Marine Expeditionary Force makes preparations for an upcoming offensive.

2248 Monday: Maj. John Gustafson had taken over as the regimental intelligence officer just in time for Operation VERBAL IMAGE. *Who thinks up the names for these operations anyway?* he wondered. This would be his first command briefing and he wanted to make a good impression. The colonel had a reputation for being a tough, no-nonsense boss—and the best regimental commander in the division. Gustafson would be thorough and by-the-numbers. He would have all the pertinent reports on hand, pages of printouts containing any piece of data the regimental commander could possibly want. He went over his briefing in his mind as he walked with his stack of reports through the driving rain to the command tent.

The colonel arrived, just back from the front and soaking wet, and said, "All right, let's get started. S-2, you're up."

Gustafson cleared his throat and began. He had barely gotten through the expected precipitation when the colonel held up his hand as a signal to stop. Gustafson noticed the other staff officers smiling knowingly.

"Listen, S-2," the colonel said, "I don't care about how many inches of rainfall to expect. I don't care about the percentage of lunar illumination. I don't want lots of facts and figures. Number one, I don't have time, and number two, they don't do me any good. What I need is to know what it all *means*. Can the Cobras fly in this stuff or not? Will my tanks get bogged down in this mud? Don't read me lists of enemy spottings; tell me what the enemy's up to. Get inside his head. You don't have to impress me with how much data you can collect; I know you're a smart guy, S-2. But I don't deal in data; I deal in pictures. Paint me a picture, got it?"

"Don't worry about it, major," the regimental executive officer had said later, putting a hand on Gustafson's shoulder. "We've all been through it."

0615 Tuesday: The operation was getting underway. In his battalion command post LtCol. Dan Hewson observed with satisfaction as his units moved out toward their appointed objectives. He watched the progress on the computer screen before him. On the 19-inch screen was depicted a color map of the battalion zone of action. The map was covered with luminous-green unit symbols, each representing a rifle platoon or smaller unit. If a unit was stationary the symbol remained illuminated; when the unit moved, the symbol flashed momentarily.

Hewson clicked on a unit symbol with the computer mouse, and the unit designator and latest strength report came up on the screen. A platoon from Alpha Company; they should be moving by now.

"Get on the hook and find out what Alpha's problem is," Hewson barked. "Tell them to get moving."

With rapid ease he "zoomed" down in scale from 1:100,000 to 1:25,000 and centered the screen on Bravo Company's zone. Hewson prided himself on his computer literacy; no lance corporal computer operator necessary for this old battalion commander, he mused. Hewson was always amazed at the quality of detail on the map at that scale; it was practically as if he was there. That was the old squad leader in him coming out. He clicked on the symbol of Bravo's second platoon as it inched north on the screen.

No, they should turn right at that draw, he said to himself. That draw's a perfect avenue of approach. Where the hell are they going? Don't they teach terrain appreciation anymore at The Basic School?

"Get Bravo on the line," he barked. "Tell them I want second platoon to turn right and head northeast up that draw. Now. And tell them first platoon needs to move up about 200 yards; they're out of alignment."

Satisfied that everything was under control in Bravo's zone, Hewson scrolled over to check on Charlie Company. Back when he was a young corporal, some twenty-two years ago, this technology didn't exist. It was amazing how much easier command and control was today compared to in his old squad leader days, how much more control there was now. He wondered if the junior Marines realized just how lucky they were.

0622 Tuesday: 2ndLt. Rick Connors was feeling anything but lucky. Just past the mouth of a draw, he angrily signalled for second platoon to halt. Company was on the radio, barking about something. He was wet, he was cold; his rain top had somehow sprung a leak and a stream of icy water poured down his spine. And on top of everything else, now this.

"Come again?" he said to his radio operator.

"Sir, Hotel-3-Mike says we're supposed to turn right and head up this draw," LCpl. Baker repeated.

Damn PLRS, Connors cursed to himself. He had never actually ever seen a PLRS, that venerable piece of equipment having been replaced by a newer, lighter generation of position-locating system which attached to any field radio and which sent an updated position report every time the transmit button was cued. But like all the more experienced Marines he insisted on calling the new equipment by the old name.

"Up that draw," Connors repeated, as if to convince himself he had heard correctly.

"Hotel-3-Mike says it's an excellent avenue of approach, sir," Baker reported dutifully.

Connors studied the impenetrable web of thorny, interlocking undergrowth in the draw, and snorted scornfully. *Maybe on somebody's computer screen it is, he thought. But not on the ground it's not. Somebody at battalion must have his map on 1:25,000 again. So much for the decentralized mission control they told us about at TBS. What do they even need lieutenants for if they're going to try to control us like puppets?* He despised the prospect of hacking his way through the thick brush of the draw, especially when he had spotted what looked like an excellent concealed avenue of approach not two hundred yards

ahead. Of course, if he followed instructions higher headquarters would be squawking about his slow rate of advance—there were no thickets of prickly bushes on a computer map. He could just imagine the radio message: *"What's taking you so long, 3-Mike-3? It's only an inch on the map."* And if he chose the other route they'd be on him in no time about disobeying orders. He cursed the PLRS again. But then he decided it wasn't the PLRS that was the problem; it was the jerk using it.

1118 Tuesday: A section of SuperCobra IIIs churned through the driving rain on their way back to the abandoned high school campus that served as an expeditionary air field, returning from an uneventful scouting mission.

"I'll tell you what, skipper," 1stLt. Howard Coble said from the front seat of the lead helicopter, "this soup isn't getting any better."

In fact, it was getting considerably worse. Capt. Jim Knutsen decided as he piloted the buffeting attack helicopter. A squall was moving back in. Goo at 500 feet, visibility down inside a mile and worsening.

"I'm glad I'm not those poor bastards," Coble said, indicating a mechanized column on the muddy trail below them to starboard.

"You got that right," Knutsen said, not paying much attention.

Until Coble cursed sharply.

"Those aren't ours," Coble said. "Take a look, skipper. BMPs, T-80s."

Coble was dead right. What they were looking at was an enemy mechanized column, Knutsen guessed, of at least battalion strength. Probably more. Knutsen banked the Cobra away sharply to avoid detection, and his wingman followed.

What's wrong with this picture? Knutsen said to himself. The mission briefing had said nothing about enemy mechanized forces anywhere near this vicinity. The enemy had apparently used the cover of the bad weather to move a sizable force undetected through a supposed "no-go" area into the division's zone. Knutsen was familiar enough with the ground scheme of maneuver to know instantly that this unexpected presence posed a serious threat to the upcoming operation. *We got ourselves a major problem. These guys are not supposed to be here.*

His wingman's voice crackled over the radio: "Pikeman, did you see what I saw at two o'clock?"

"Roger, Sylvester."

"We need to let DASC know about this," Coble said.

Knutsen considered the problem. Reporting the sighting to the Direct Air Support Center would, of course, be the standard course. But because of the weather they'd had trouble talking to the DASC all day; they couldn't get high enough to get a straight shot. In these conditions, he figured they were nearly a half hour from the field. And when he finally got the message through, he could imagine the path the information would take from the DASC before it reached the units at the front—and that was provided they even believed such an unlikely report. *DASC hell, we need to tell the guys on the ground,* he thought. *They might like to know about an enemy mech column driving straight through the middle of the MEF's zone. Forget normal channels.* Unfortunately he had no call signs or frequencies for any of the local ground units.

"Howie, find me some friendlies on the ground," he said. He radioed his wingman with his plan.

"Got somebody, skipper," Coble said shortly. "AAV in the treeline at nine

o'clock. Got it?"

"Roger, I'm setting down."

1132 Tuesday: *You got to be crazy to be flying in this weather*, Capt. Ed Takashima said to himself when he heard the sound of an approaching helicopter rotor. He was twice amazed to see the Cobra appear low overhead and settle into the clearing not a hundred yards away. He hopped down from his AAV and jogged out into the clearing to meet the Marine emerging from the cockpit, and was three-times astonished to recognize him as an old Amphibious Warfare School classmate.

"Knut-case," he said, pumping his friend's hand enthusiastically. "I should have known nobody else would be crazy enough to fly in this stuff. What the hell are you doing here?"

Knutsen quickly explained the situation and, when he was finished and saw Takashima's expression, said: "Don't look at me like I'm crazy, Tak."

Anybody else Takashima would have thought *was* crazy—or else completely lost—but not Knutsen. He had known Knutsen too long for that. Knutsen was too squared away.

"Give me your map, I'll show you," Knutsen said. "We're right here, right? And the enemy is right *there*, heading in this direction"—jabbing the map and tracing the enemy movement.

As Knutsen had begun to diagram the enemy move, Takashima was already considering the situation. *With all the sensors and satellites and reconnaissance assets that support a MEF*, Takashima wondered, *how does an enemy mechanized battalion drive through the middle of our sector without being detected?* He remembered reading something somewhere about uncertainty being a pervasive attribute of war. He recalled a little white book that he'd found in the Rare Book room of the Marine Corps University library in Quantico. *Chalk one up to Clausewitz's "fog of war,"* Takashima decided. Of course, Takashima knew, since it was a "no-go" area—meaning that somebody up the chain had looked at the terrain and decided it was impassable—it would remain relatively unobserved. But how it had happened didn't matter: it had happened. What to do about it?—that was the problem. *Six or seven clicks tops*, he thought, looking at the map. Not much time. This changed everything. The original battalion plan would have to be scrapped; it was as simple as that. Takashima decided that his original mission, no matter how adamant the colonel had been, was obsolete. He made his decision. The situation called for quick thinking, and quicker action. The objectives might change, but the overall aim remained the same. The ultimate object, Takashima knew, was to locate the main enemy force and attack to destroy it. That could still be the object; it would just have to happen a lot further south than had been planned. If the battalion could make a ninety-degree left turn in time, they might just pull it off. Now if he could just get battalion to go along with it ... The S-3 wouldn't be very receptive to the idea; he needed to talk to the battalion commander.

Knutsen had finished tracing the enemy movement and his finger rested on the map, pointing at a small town called Culverin Crossroads.

"That's it then," Takashima said. "Culverin Crossroads."

"I hear you, Tak," Knutsen said. "You're thinking of that West Africa map ex we did last year at AWS, aren't you? The one where we wheeled the whole regiment and took the red force in the flank."

"Yeah, that's the one," Takashima said.

"What the hell; let's do it. I got enough fuel for maybe one pass. You want me to work them over, or don't you want them to know that we're on to them?"

"Let's wait and surprise them. Can you bring back some friends?"

What a kick, Knutsen thought. A couple of captains standing in the middle of a muddy field in a downpour working out the beginnings of a major operation. It reminded him of playing pick-up football as a kid and drawing improvised plays in the dirt.

"We'll be here," he said with a grin. "You'll recognize me—I'll be the one in front."

"See you then, Knut-case," Takashima said.

They shook hands and Knutsen climbed back into the cockpit.

"Olsen!" Takashima bellowed at his radioman. "Get me battalion. I need to talk to the colonel direct."

1310 Tuesday: "General, the latest weather pictures are coming in," the lance corporal reported, the note of anxiousness unmistakable in his voice.

MajGen. Harry Vanderwood doubted if there was a single Marine anywhere in the wing who did not recognize the significance that attached to the latest forecasts.

"I'll be right there, Marine," he replied.

No sooner had Vanderwood arrived in the Tactical Air Control Center when the MEF commander bustled in unannounced, as he had a disconcerting habit of doing. You never knew when he was going to show up, or where, Vanderwood mused. Wing commander or mechanic on the flight line, you were never safe.

"Have you gotten the latest on the situation, Harry?" the MEF commander asked.

"As of the last fifteen minutes, general," Vanderwood replied. "Not that I'm any smarter than I was before. I'd still like to know what the hell is going on."

"That makes two of us. I'd like to talk to those Cobra pilots myself."

"It's being arranged, general. They managed to take off on another sortie before we could grab them. Under terrible conditions, I might add. When they get back I'm either going to give them a court martial or a medal; I haven't decided which yet."

The MEF commander grunted. "How's the weather looking?" he asked.

"We're just in the process of pulling down the latest pictures from the weather satellite," Vanderwood said.

A large-scale map of the area of operations appeared on the large screen, color-coded to illustrate the precipitation forecast.

"No good news there," Vanderwood said. "Let's take a look at the incoming weather."

A broader map, much like a weather map on a television newscast, appeared on the screen. Heavy white blotches swept sputtering across the screen from left to right.

"Freeze it right there," Vanderwood said, and the image stopped moving.

"Good. That could be the break we're looking for. I figure in about ninety minutes we'll be able to get something going. If this pattern holds, I plan to blot out the sun—what little sun there might be—with aircraft by 1500. Now all we need is to know what we're going to be attacking."

"How about cuing up the MEF situation package and we'll see if we can't

make some sense of this," the MEF commander said. "And see if we can get General Bishop on teleconference."

"Somebody ask the Top to come over here," Vanderwood said, meaning the intelligence chief.

"General, the division commander's away from the CP, but we're setting up video with the chief of staff," a Marine reported.

"Very well," the MEF commander said. He fully expected Bishop to be away from the command post; in fact, the division command post was the last place he'd expect to find the division commander in the middle of a battle.

The computer operator, Cpl. Beale Davis, tapped quickly on his keyboard and the wall-sized screen blinked, the weather map replaced by a situation map of the MEF's area of operations. From the menu across the top of the screen he opened a "conference" window and the division chief of staff appeared in a live video feed.

"How are you, Tom?" the MEF commander said.

"Hanging in, general," Col. Tom Hester replied. "Sir, General Bishop has gone forward. Do you want him paged? If he's at one of the regimental CPs we can get him on video too."

"No, that's all right. We're just going to try to piece this picture together. Are you looking at the same thing we are?"

"Yessir, he is," Davis said, meaning that the screen in the division command post would depict the same information and images that were being called up on the wing situation map.

Davis had logged into the theater data base and could "pull down" almost instantaneously any individual piece of data, or complete or partial package of information, that had been entered into the system anytime, anywhere, by any means. He had access to text, imagery, and live or pre-recorded video and audio, which he could call up by opening additional windows on the screen. Through the theater data base he had access to State Department reports, Defense Intelligence Agency summaries, Central Intelligence Agency accounts, and Defense Mapping Agency charts. Likewise, he could call up the latest tactical reports and analysis by a variety of categories—time, unit, contents, location, reliability—and could specify the level of information resolution—"granularity," they called it. Any time he asked for tactical reports over a period of time, the software would automatically "crunch out" a trend analysis, both in picture and bullet form. With a little manipulation he could get direct feeds from satellites or aerial reconnaissance drones. And perhaps most important of all, he could access the Cable News Network for the latest breaking developments. There was no lack of information out there, Davis knew. You were being bombarded by it. The trick was sifting through it all to find the right information, and figuring out what it meant.

In an effort to try to make some sense of the enemy situation they pulled down various "packages" of information, mostly in picture form, which promptly appeared and disappeared on the screen at Davis' command. Enemy armor spottings within the last 48, 24 and twelve hours. All ground contacts reported in the last 48 and 24 hours. All enemy artillery units spotted and fire missions reported in the last 48 hours. Road and rail usage in the last 72 hours. Enemy radio traffic in the last week. Enemy aviation activity in the last two days. Every once in a while the MEF commander would ask for a "template," a computer-generated estimate of possible enemy dispositions and movements based on the partial information that was available. Each template automatically

came with a reliability estimate—"resolution," they called it—calculated as a percentage of complete reliability. The best resolution they had gotten for any one template was 45 percent; most were in the twenties and thirties. Not very good—but hardly abnormal.

Another set of red enemy symbols flashed on the screen.

"What the hell," the MEF commander said, looking at the screen, which indicated a heavy flow of enemy helicopter traffic along a single route. *A major heliborne operation? In this weather? As if things aren't sticky enough. And why is this the first I'm hearing of it?* "You're telling me the enemy's been flying fleets of helicopters continuously the last six hours?"

Vanderwood looked to MSgt. Edgar Tomlinson, the intelligence chief.

"No, general," Tomlinson said. "He's not flying anything. What you're seeing on the screen, believe it or not, is actually a row of power lines. We checked it out. Radiating and blowing in this wind, our sensors picked them up as helicopters."

"You're kidding me, Top," the MEF commander said skeptically. "Our sensors think a set of power lines is a bunch of helicopters?"

"I guarantee it, general," Tomlinson said. "If you want to call up an aerial photo, I can show you the powerlines."

"No, I believe you, Top."

"I've seen it happen before," Tomlinson said. "This gear is great, as long as you don't trick yourself into thinking that it's actually smart."

Despite an aggregate resolution of under 25 percent, Vanderwood sensed that a possible pattern had slowly begun to develop, but hardly anything conclusive. A possibility. A hunch. A little better than a wild guess. Despite the admittedly amazing technology you could never be certain of anything, Vanderwood knew. Despite the artificial intelligence, the decision aids, the computer analysis. As long as war remained a clash of human wills, Vanderwood mused, no matter how much technology you had, it still boiled down in the end to intuition and judgment.

"General, the division commander's coming in on video link," a Marine interrupted.

A window opened on the wall screen and MajGen. Miles Bishop appeared, apparently from inside a command AAV somewhere on the battlefield, the trademark cigar stub clamped in his teeth.

"Hey, can anybody hear me?" he was saying gruffly over the background noise in the AAV. "Is this blasted thing on?"

"Bish, this is Vanderwood with the MEF commander," Vanderwood said. "You're coming in fine on this end."

"The video whatzit thing is on the blink on this end, but I can hear you okay," Bishop replied.

"Glad you could spare a few minutes out of your busy schedule," the MEF commander said. "We've been trying to figure out what the hell's been going on. We've been running some software for the last half hour and we think we might have something."

"You want to know what the hell's going on, general?" Bishop said. "Hell, I can tell you what's going on."

"Okay, let us have it," the MEF commander said, and Bishop proceeded to describe in his own colorful but accurate way the same situation that had begun to take shape, with much less clarity, on the wall screen of the TACC. Vanderwood and the MEF commander exchanged glances. *Bishop,*

Vanderwood mused, shaking his head. *What a piece of work. Glad he's on my team.*

"How did you come by that, Bish?" the MEF commander asked.

"Me and a couple of the boys sitting around a heat tab making some coffee just swagged it," Bishop said with a lopsided grin. "Ever-lovin' coop da oil—isn't that what you're always calling it, Harry?"

1428 Tuesday: He heard the unmistakable sound of the ATGMs firing off in unison like a naval broadside. *Damn if those bastards didn't walk right into it,* thought Capt. Takashima as he scampered forward to get a better look at the situation at the crossroads, where first platoon had just sprung an ambush on the leading elements of the enemy column. *I owe Knutsen a beer when this is all over.* He couldn't explain how he knew, but just from the sound of things he could tell that first platoon had caught them pretty good. Amazing how you learned to sense these things. The ground nearby erupted in a massive explosion, and he hit the deck—or rather, the six inches of water that covered the deck.

"Olsen, you all right?" he yelled after checking to make sure he was still in one piece.

"Yessir," his radioman replied. "Captain, third platoon wants to talk to you."

2ndLt. Tim Dandridge, Golf Company's least experienced platoon commander, was several hundred yards off to the right. Takashima had originally put third platoon where he could keep his eye on Dandridge, but when he'd spun the company it had left third platoon off on the right flank by itself. Takashima switched on his headset.

"Oscar-3, this is Romeo-2-Oscar, go."

"Romeo-2-Oscar, I've got mechanized activity to my front and more activity moving through the woods around my right flank, over," Dandridge reported.

Even over the radio Takashima could sense the nervousness in the lieutenant's voice. *And the tech weenies want to do away with voice communications,* he said to himself.

"Echo's on your right flank," Takashima said.

"Roger, Romeo-2-Oscar, I don't think it's Echo," came the reply.

"Have you made contact with Echo?"

"Negative. Can't raise them."

"Any visual with the enemy?"

"Negative, but they're definitely out there," Dandridge said. "Estimate at least a company."

"Roger, are you in position yet?" Third platoon should have been well set in by now, ready to ambush the advancing enemy forces.

There was a pause. "Er, roger ... pretty much, Romeo-2-Oscar," came the halting reply.

Which meant "No," Takashima knew. Good news got passed without hesitation; bad news always seemed to move more reluctantly. Not a good sign. For a second, he considered heading over to third platoon's position to check things out, but he quickly dismissed it. His intuition still told him the critical action was taking place in front of him at first platoon's position. Events were still unfolding as expected, thanks to Knut-case. This was where he needed to be. Chances were that the young lieutenant was exaggerating; but yet, if Dandridge was right then Takashima had read things wrong and the enemy had

other ideas in mind. You could never count on the bastards doing what they were supposed to.

"Gunny!" Takashima bellowed over the sound of the shelling.

A moment later GySgt. Roberto Hernandez splashed down beside him.

"Gunny, third platoon is reporting enemy activity to their front and flank," Takashima began.

"Roger that, skipper," Hernandez said. "I was listening in."

Naturally, Takashima thought. Nothing the gunny did surprised him anymore.

"I'm concerned about what's going on over there," Takashima said. "But I don't have time to check it out myself. That activity they reported might or might not be Echo Company. Gunny, I want you to hustle over there, have a look around and report back to me what you see. Use an alternate net. If it's real trouble I need to know in a hurry. Don't step on any toes, but you might want make a few tactful suggestions if it's appropriate."

"You want me to be, sir, what is sometimes referred to in the literature as a 'directed telescope,'" Hernandez said.

"Directed tele-what? Get outta here, gunny," Takashima said with a grin.

Sometimes it was a pain having the best-read staff NCO in the Marine Corps as a company gunny, he decided as he watched Hernandez charge away. But not usually.

1505 Tuesday: If 2ndLt. Connors had been unhappy before, he was positively miserable now. He decided he felt about as useful as a mindless pawn in some giant chess game, being moved around one square at a time. *Certainly don't want to get too far ahead of ourselves, do we?* The analogy was pretty appropriate, he thought. Too bad the chess player who was ordering him around showed every sign of being an indecisive beginner who seemed to be taking an awful lot of time between moves.

What made things worse was that, from the distant shelling and the radio traffic, he could tell that there was one heck of a battle going on. And he was missing it. Every time he radioed for instructions he'd get the same reply—"Wait out"—and when the orders eventually arrived it seemed that he was always one step too late. He might just as well have been wandering around the pine forests of beloved Camp Lejeune for all the action he was getting. Was that a Red-Cockaded Woodpecker he just saw?

He crawled to the edge of the vegetation and peered across the clearing. That was the objective, all right, some 300 yards away. Hill 124, now known as Objective Rose after the company commander's newborn daughter. He checked his watch; the prep fires were scheduled to commence at half past. He searched the hilltop carefully through his binoculars and saw no sign whatsoever of enemy activity.

Of course, he didn't know what he had expected to see. He'd been given no information on the enemy situation on the objective and he had no idea why he was attacking this hill in the first place. He certainly had no idea what made Hill 124 so important—other than that it was a convenient place to draw a goose egg on some higher-up's map. He was expected to attack and seize Objective Rose, commencing at 1530, and that was that.

With his squad leaders, Connors crawled back to rejoin the platoon.

"Lieutenant, company wants to talk to you," his radioman reported.

Connors switched on his headset.

"Hotel-3-Mike, this is 3-Mike-2," he said.

"3-Mike-2, are you ready yet?"

For about the tenth time, Connors said to himself. Keep your shorts on; the attack doesn't go for another twenty minutes.

"Roger that," he replied out loud. "The objective is deserted."

"Roger. The prep fires commence at 1530, as scheduled, and last for five mikes."

"I say again, the objective is deserted, Hotel-3-Mike," Connors said. "We don't need the prep fires; we can just walk up on the objective."

There was a pause. Connors could imagine the captain wrestling with that one. He couldn't blame the captain, really. Battalion wanted things done a certain way. To change things now, Connors knew, would throw off the timetable and would mean shutting off the scheduled fires—in short, it would disrupt the plan. And you certainly didn't want to interfere with the plan, he knew—not in this battalion anyway. The plan was everything. All the elements of the battalion were supposed to attack in close synchronization, Connors knew—"synchronization" was the popular buzzword these days. Of course, when Connors thought of synchronization he invariably thought of synchronized swimming, and he smiled at the ridiculous image of a couple of swimmers pirouetting in graceful unison in a pool. He couldn't imagine anything less like combat than that. *I might not have a world of experience, he thought, but how could anybody in his right mind think you could synchronize the confusion and mayhem of any military operation?* It boggled the mind.

"Listen, the prep starts at 1530," came the eventual reply over the radio, somewhat testily. "Just do it."

"Roger, out," Connors said resignedly. *Three bags full.*

Setting in the base of fire and getting the other two squads in position for the assault was the work of only a few minutes. Connors checked his watch: still only a quarter past. *Hope nobody falls asleep waiting, he thought, abundantly aware of Marines' remarkable ability to doze off on a moment's notice anytime, anyplace, in any conditions.* Fifteen minutes later, exactly on schedule, the preparation fires commenced. Battalion would be pleased: the attack went flawlessly; there was no enemy resistance to screw it up. His two squads swept through the tall guinea grass toward the hill and within minutes were consolidating on the objective. There was no sign that the enemy had ever occupied the hill. Whether the enemy was anywhere in the vicinity he couldn't tell: because of the tall grass, visibility was about ten yards in any direction. No matter; they had accomplished the assigned task.

"Lieutenant, company gunny wants our ammo and casualty report," his radioman said.

Connors chuckled scornfully. *Seeing as there was nobody to shoot at us and nobody for us to shoot at ... Now, Connors, you're being a malcontent again. Just go through the motions and don't make waves.*

"I'll take it," he said, switching on his headset. "Hotel-3-Mike, this is 3-Mike-3. No casualties; no ammo expended. Mission accomplished. What next, over?"

There was pause, then finally the reply came: "Wait out."

1635 Tuesday: "Romeo-2-Oscar, this is 2-Oscar-3."

Capt. Takashima recognized the gunny's voice on the command alternate net. He had been hearing the firefight coming from that direction for some time

now—he didn't know how long: it could be twenty minutes, it could be two hours—but he didn't have time to think about it. He'd feel a lot better once he got the gunnery's opinion of the situation.

"This is 2-Oscar, go," Takashima said.

"Confirm situation as described earlier by 2-Oscar-3," Hernandez reported.

"Engaged, situation well in hand. Oscar-3 caught 'em pretty good.'"

"Have you make contact with Echo?"

"Roger," Hernandez said. "Have been attached."

"Say again," Takashima said, confused.

"2-Oscar-3 has been attached to Alpha-7-Hotel."

What the hell? Who the hell does Schuler think he is taking it on himself to attach one of my platoons to his company? Takashima was about to cut loose with some choice words, but he thought better of it. He knew that he was in no position to try to control what third platoon was doing; he was too busy dealing with the situation at the crossroads. Sometimes the enemy didn't use the same boundaries that we did, Takashima realized: third platoon was really part of Echo's fight. That being the case, Takashima knew that for the purposes of unity of command third platoon ought to be answering to Schuler and not to him. It was hardly conventional, Takashima decided—certainly not the sort of solution they'd teach at AWS—but under the circumstances it was the right thing to do. He'd just have to remember to give Schuler a hard time about needing four platoons to do what he could do with only two.

0255 Wednesday: The MEF commander shed his dripping poncho as he stepped out of the rain into the MEF command post. The military policeman snapped to attention and saluted.

"Carry on, Sgt. McDavid. Cpl. Cooper, get some sleep," he said to his soaked driver. "It's been a long day."

He made his way into the operations center and dropped wearily into his chair, where he'd started the operation some 24 hours before. In the last 24 hours he'd been all over the MEF area of operations. He'd been to the division forward command post to talk to the division commander face to face about how to deal with the unexpected situation. He'd insisted on a face-to-face because he wanted to make sure they understood each other. He'd been to the wing headquarters twice to try to get a handle on the overall situation and to see what could be done about the air situation. He'd personally debriefed the Cobra pilots who'd first spotted the enemy column. He'd videotaped a new intent statement—an "intent-o-mmmercial," as the Marines jokingly referred to it—to be broadcast to the entire MEF (at least down to battalion and squadron level, the lowest level that had video capability). He and the wing commander had taken a terrifying Osprey flight over the battlefield (and unfortunately gotten precious little out of it). He'd been back to the MEF command post once during the day, to see if the situation had gotten any clearer since he'd left: it hadn't. He'd visited the division's main-effort regiment and that regiment's main-effort battalion near Culverin Crossroads (it hadn't been until he'd met that CO from Golf Company, Capt. Taka-something, and seen the indomitable fighting spirit of his Marines that he'd realized that the MEF would carry the day—"Just get me some air, general," the captain had said). He'd visited the engineers to make sure that the roads were going to hold up for at least the next 72 hours in this rain. He'd even spent fifteen minutes directing traffic at a jammed road intersection, until the MPs arrived, during the critical early stages of the pursuit.

And he'd met the FSSG commander at a maintenance contact point, of all places, where he'd watched an M1A3 main battle tank repaired and put back into action; they'd discussed the logistics needed to support the upcoming exploitation.

It seemed like days since he'd been at the command post. On the wall screen before him, the amorphous wave of flashing green unit symbols had crept considerably farther north since the last time he had looked at the map. There were far more red enemy symbols now as well, most of them encircled in the lower left-hand part of the screen, an indication that the intelligence effort had managed to locate many of the enemy forces which had been unknown at the beginning of the operation. He knew that many of those units, although still reflected on the map and still present on the ground, had ceased to be effective fighting forces by now. He also knew that the clean image portrayed on the screen could not begin to capture the brutal fighting and the destruction that he had witnessed during the day. That was the great danger of being stuck in a command post, he knew; you began to confuse what was on a map with reality.

Based on the tempo of activity in the operations center, he wondered if the staff knew the battle was all but won. He knew that in the next room the future plans cell would be working feverishly on the plans for the next week to exploit the advantage they had won today. *The responsibility of command is never finished*, he decided; *always something else to be done*. Curiously, he thought, he found himself thinking back to his days as a brand-new lieutenant at The Basic School, remembering the adage that had been drilled into them: "Camouflage is continuous." *Command is continuous*, he found himself thinking. He'd have to remember that one, he decided, for the next time he was invited to speak at a TBS mess night.

He thought of stopping in to see how things were going in the future plans cell, but he knew his chief of staff would have things moving along briskly and he would just be getting in the way. Even when the issue had still hung in the balance, Col. Dick Lepanski had been pushing the future ops guys to develop a plan for exploiting the outcome. Around the MEF command element Lepanski was known with a certain grudging admiration as "Yesterday," because that was when he seemed to want everything done.

As if by cue, the small, balding colonel appeared, bearing a cup of steaming coffee.

"You look like you could use this, general," he said.

"Thanks, Dick," the MEF commander said.

A staff sergeant appeared. "Here's the new MEF op order, colonel," he said, handing a flimsy document to Lepanski.

Lepanski perused the two-page order, which consisted of a page of text and a diagram, nodding as he read.

"General, do you want to have a look at this?" he asked.

"Hell, no. I couldn't even focus my eyes on it. That's what I've got you for. You know my intent."

"Looks good, Staff Sergeant Walters," Lepanski said, initialing the document and returning it to the staff sergeant. "Let's get it out ten minutes ago."

"Aye aye, sir; it'll go straight out on the secure fax," Walters said, and quickly departed.

The MEF commander sipped his coffee and gazed at the large situation screen.

"Well, what do you think, Dick?" he asked.

"What do I think?" Lepanski said. "I think we went in with an unclear picture of the situation and it only got worse. I think the enemy showed up where we least expected him and caught us with our shorts down. I think our planes were stuck on the ground and our vehicles were bogged down in the mud. I think our comm went to hell and you were *incomunicado* for six hours at a time. I think all our best-laid plans went down the tubes and we had to improvise and turn the whole thing over to the junior commanders. If not for a Cobra pilot with a good pair of eyes and a company commander with a penchant for ignoring his orders ..."

"Yes," the general said with obvious satisfaction, "don't you love it when the system works to perfection?"

Section 1

The Nature of Command & Control

From Plato to NATO, the history of command in war consists essentially of an endless quest for certainty—certainty about the state and intentions of the enemy's forces; certainty about the manifold factors that together constitute the environment in which the war is fought ...; and, last but definitely not least, certainty about the state, intentions, and activities of one's own forces.

—Martin Van Creveld, *Command in War*

In war, no single activity is more important than command and control. Command and control itself will not conduct a single attack against an enemy force, destroy a single enemy target, or effect a single emergency resupply. Yet, none of these essential warfighting activities, or any others, would be possible without effective command and control. Without command and control, campaigns, battles and organized engagements are impossible, military units degenerate into mobs, and the subordination of military force to policy is replaced by random brutality. In short, command and control is essential to all military operations.

With command and control, the thousands of activities that a military force must perform are given purpose and direction. Command and control means "putting the pieces together." Done well, command and control can bring success, even against otherwise superior forces. Done poorly, it invites disaster. Though not a substitute for adequate resources, effective command and control is a force multiplier. It allows a commander to make the most of what he has—people, material and, perhaps most important of all, time. With effective command and control, we can rapidly adapt to changing circumstances and exploit fleeting opportunities. Without it, we cannot achieve decisive results.

WHAT IS COMMAND & CONTROL?

Command and control is the exercise of authority and direction by a commander over designated forces in the accomplishment of the mission. Command and control is performed through an arrangement of personnel, equipment,

communications, facilities, and procedures employed by a commander in planning, directing, coordinating and controlling forces and operations in the accomplishment of the mission.¹ In short, command and control is the means by which a commander decides what must be done and sees that his decisions are carried out effectively.

We can liken command and control to the functioning of the central nervous system in the human body. Sensory nerves detect what is happening, inside the body and out, and send that information to the brain. The brain interprets the sensations, compares the existing situation to the desired situation, decides on a course of action, and sends the appropriate instructions to the muscles via the motor nerves.² In our analogy, the commander is the brain of the military body and command and control is the system of nerves which carry information to him from the senses—the information-gathering units and sensors—and from him to the military muscles—the units which will execute the plan.

The first half of command and control is *command*. Command is a function of authority and responsibility. Command is the authority vested in an individual in the military for deciding what must be done and making it happen. Authority derives from two sources. Official authority is a function of rank or position and is bestowed by organization and by law. Personal authority is a function of personal influence as the result of factors such as experience, reputation, character and personal example; it is bestowed by the other members of the organization. Official authority is not enough; to be effective, a commander must also have personal authority. Responsibility, or accountability for results, is a natural corollary of authority: where there is authority there must also be responsibility in like measure.³

The other half of command and control is *control*. Control is the means by which the commander exercises command—how he gets his subordinates to execute his decisions. We can define control as the ability to or the act of governing or influencing the conduct of others. Different situations require different methods of control. Some types of control must occur so quickly and precisely that they can be accomplished only by computers—such as the control of a guided missile in flight. Other types require such a degree of judgment and intuition that they can be performed only by skilled, experienced people. Likewise, some types of control are primarily procedural or technical in nature—such as the control of air traffic and air space, the control of a fire mission, or the fire control of a weapon system. Others are operational—that is, they are concerned with the overall conduct of military actions, whether on a large or small scale, and involve developing plans, assigning missions to subordinates, deploying forces, allocating resources, and so on. It is with this form of control, the conduct of military actions, that we are primarily interested.

We typically think of control as occurring concurrently with the action being controlled, but it may also occur beforehand. For example, a well conceived plan based on an accurate assessment of the situation, which clearly indicates what needs to be accomplished and why, provides a certain amount of control. Likewise, effective training and education, which make it more likely that subordinates will take the proper action in combat, provide control before the fact. A commander's intent, expressed clearly before the operation begins, also exerts control.

Typically when we think of control we think of a strong, coercive type of control—a sort of push-button control—by which the controller positively

person in the command and control system is the commander. On the commander rests the final authority and responsibility for success.

The second element of command and control is *information*. In one way or another, command and control is essentially about information: getting it, judging the accuracy of it, processing it into useful form, disseminating it to others. Information is what people communicate so that they can unify their efforts. It is what fuels command and control. The flow of information is not neat or contained, restricted to one format or medium of transmission. Information flow is not hierarchical; it is dynamic.

Information takes many forms, from intelligence about the enemy to the nature of the surrounding conditions to the status of our own forces. A commander's guidance to his staff and orders to his subordinates are a form of information, as are situation reports from subordinate units or coordination between adjacent units. Without the information that provides the basis of his knowledge of the situation, the commander—no matter how experienced or how wise—cannot make sound decisions. Without information which provides knowledge of his concept and intent, his subordinates cannot make their own plans. Without information in the form of a strike brief which provides knowledge of the situation on the ground, a pilot cannot provide close air support. Without information which provides understanding of upcoming operations and the status of supply, the logistician cannot provide adequate combat service support. In short, information is the lifeblood of command and control. A military organization cannot function without it. Moreover, the larger and more complex a force is, the more information it requires to function. Likewise, the larger and more complex a situation is, the more information a commander needs to make effective decisions about it. However, effective command and control is not simply a matter of generating enough information. Not all information is important, or even relevant. Much is inaccurate, and some can actually be misleading. And, given information-gathering capabilities today, there is the distinct danger of overwhelming the commander with more information than he can possibly assimilate. In other words, too much information is as bad as too little—and just as likely to occur. Some kinds of information can be counterproductive—information which misleads us, information which spreads panic, or information which leads to overcontrol.

The value of information exists in time and often describes fleeting opportunities. In general, information grows stale with time. Information which is valuable one moment can be irrelevant or even misleading the next.

While information is essential to effective command and control, it is not valuable for its own sake. Information is valuable only insofar as it contributes to knowledge or understanding. *The critical thing, then, is not the amount of information, but rather key elements of information, available when needed and in a useful form, which improve the commander's knowledge of the situation.* Command and control is thus about getting the right information to the right person at the right time.

The final element of the system is the *command and control support structure*, which, as the name indicates, provides support to the people who make use of information. It includes the organization, procedures, equipment, facilities, training, education and doctrine which support command and control.

Organization provides those groups of people through which the commander exercises command—primarily staffs and subordinate commanders—and establishes the channels by which information flows.

directs the actions of others, and those being controlled respond promptly, precisely and blindly. In this way a chess player controls the movements of his chess pieces—or any air traffic controller may control an approaching aircraft. But because of the inherently uncertain, disorderly and frictional nature of war, it is a delusion to believe that a commander can control his forces with anything even resembling the certainty with which a chess player controls his chessmen. This is especially the case on what S.L.A. Marshall described as the “empty,” modern battlefield on which units or even individuals can be dispersed practically to the point of isolation.⁴ In war, unlike in chess, each “piece” consists of animate beings, each reacting to the situation as it pertains to him, each prone to make mistakes, and each subject to the vagaries of human nature. Moreover, attempts at applying tight control to military operations tend to stifle initiative, which is essential to our maneuver warfare doctrine. The remarkable thing, given the nature of war, is not that a commander cannot achieve greater positive control but rather that he can achieve any sort of unity of effort at all. Given the very nature of war, any effort to gain positive control must necessarily fall short of the desired effect. We conclude, therefore, that we need a “looser” form of control—something more akin to willing cooperation than to coercion—which can provide the necessary degree of influence in an uncertain, disorderly, time-competitive environment without stifling the initiative of subordinates.

WHAT MAKES UP COMMAND & CONTROL?

The words “command” and “control” can be nouns, and used in that way the phrase *command and control* describes an entity or, even better, a system—an arrangement of different elements which interact to produce effective and harmonious actions.⁵ What are these basic elements of command and control?

The first element of command and control is *people*—people who gather information, make decisions, take action, communicate and cooperate with one another in the accomplishment of a common goal. People drive the command and control system—they make things happen—and the rest of the system exists only to serve them. The essence of war is a clash between human wills, and any concept of command and control which does not account for this human dimension first is inherently flawed. Because of this human element, command is inseparable from leadership. The aim of command and control is not to eliminate, or even lessen, the role of people, but rather to help them perform better. In other words, human beings—from the senior commander to the lance corporal calling in a situation report—are integral components of the command and control system, not merely users of it.

All Marines feel the effects of fear, privation, and fatigue. Likewise they, like all human beings, have unique, intangible qualities which cannot be captured by any organizational chart, procedure, or piece of equipment. The human mind has a capacity for judgment, intuition and imagination far superior to the analytical capacity of even the most powerful computer. It is precisely this aspect of the human element that makes war in general, and command in particular, ultimately an art rather than a science. But while technology may increase the volume of information that can be gathered and processed, the human capacity for understanding remains relatively constant. An effective command and control system must account for the vagaries and limits of human nature and at the same time exploit uniquely human skills. At any level, the key

Procedures are the wide range of techniques used to perform various command and control functions. They include, for example, the symbols used to display information on situation maps, the physical arrangement of those maps within a command post, the way information is disseminated, staff planning steps, and the format by which reports are submitted and orders are issued. Training, education and doctrine support command and control by preparing people to perform their various duties. Facilities refer to the command posts and other spaces where command and control is sometimes performed. Equipment includes the communications and other gear which support command and control, from pyrotechnics to computers. It is important to note that, despite the fact that families of hardware are often referred to as "systems" themselves, the command and control system is much more than simply equipment. Quality equipment and advanced technology do not ensure effective command and control. The process of command and control carries on independently of technology—albeit, not as effectively as it otherwise might. The important point is to recognize that hardware, like the other components of the command and control support structure, does not exist for its own sake but solely to facilitate effective command and control.

WHAT DOES COMMAND & CONTROL DO?

The words "command" and "control" are also verbs, and used that way the phrase *command and control* describes a collection of related activities, or functions, which must occur.⁶ These activities include, but are not limited to, gathering and analyzing information, making decisions, organizing resources, planning, communicating instructions and other information, coordinating, monitoring results, and supervising execution. Or, looked at another way, command and control is people using information with the help of a supporting structure of organizations, procedures, equipment, and so on in order to coordinate their efforts toward the accomplishment of a common mission. Command and control must serve the commander in the performance of his duties; he must not become a slave to it.

In order to create effective command and control, we must understand these activities and strive to make them as effective as possible. While we should strive to improve these command and control activities, we should not become so wrapped up in feeding and improving the process that we lose sight of the object of command and control in the first place. For example, we should not become so concerned with the ability to gather and analyze huge amounts of information efficiently that we lose sight of the reason for the information in the first place—namely, to help the commander gain a true understanding of the situation. The ultimate object is not an efficient command and control system; the ultimate object is effective command and control.

So rather than ask what are the functions that make up command and control, we might better ask: "What should effective command and control accomplish for us?" First, it should provide insight into the nature and requirements of the problem facing us—to include, as much as possible, recognizing enemy intentions and critical vulnerabilities. It should provide vision, meaning that it should foresee suitable and meaningful goals and devise appropriate plans to achieve those goals. It should provide direction and focus of efforts to create vigorous and harmonious action among the various elements of the force.⁷ It should generate tempo, since we recognize that speed itself is a

weapon. It should provide the adaptability to adjust actions to ever-changing situations. Finally, to the greatest extent possible it should provide security to deny the enemy knowledge of our true plans and actions. In short, effective command and control should generate swift, decisive, harmonious and secure action.

THE ENVIRONMENT OF COMMAND & CONTROL: UNCERTAINTY AND TIME

The unifying principle of command and control, the defining problem which overwhelms all others, is the need to deal, one way or another, with uncertainty. In the words of Carl von Clausewitz: "War is the realm of uncertainty; three quarters of the factors on which action in war is based are wrapped in a fog of greater or lesser uncertainty. A sensitive and discriminating judgment is called for; a skilled intelligence to scent out the truth."

Very simply, uncertainty is the difference between what we want to know about a given situation and what we actually know. Uncertainty pervades the battlefield, in the form of unknowns about the enemy, about the environment, and about our own forces. It is a fundamental attribute of war. We try to reduce uncertainty by gathering information, but we know that we can never eliminate it. Why is this so? First, since war is fundamentally a human enterprise, it is, in the words of Fleet Marine Force Manual (FMFM) 1, "shaped by human nature and is subject to the complexities, inconsistencies and peculiarities which characterize human behavior."⁸ Simply put, human beings, friendly as well as enemy, are unpredictable. Second, because war is a clash between *independent* human wills, each with freedom of action, we can never expect to be able to anticipate with certainty what our enemy will do. In fact, the one thing we can expect is that our enemy will do his utmost to be inscrutable.

Command and control aims to reduce the amount of uncertainty that a commander must deal with—to a reasonable point—so that he can make sound decisions. We try to reduce uncertainty by gathering information, which we in turn transform into knowledge by a human cognitive process based on experience, intuition and judgment. But there will always be some knowledge that we lack, whether we realize it or not. Imagine a continuum between absolute uncertainty, or ignorance, on the one hand and absolute certainty on the other. The difference between our actual level of knowledge and absolute certainty we can call the "Certainty Gap." (See Figure 1.) We must understand the forces which guarantee the existence of the "Certainty Gap" and be resolved to act despite it on the basis of what we do know.

It is important to note that, according to our definition, certainty is a function of knowledge and not directly of information. Although the two are clearly related, the distinction between them is important. Information is the raw material which provides the basis for knowledge. *Knowledge is the result when human beings add meaning to information through the process of cognition.* In other words, knowledge is not only a function of information but also of experience, intuition, and judgment. Properly provided and processed, information can lead to knowledge, but the terms are not synonymous. Not all information leads to knowledge; some may even hamper it. The essential lesson from this distinction is that decreased uncertainty is not simply a matter of increased information flow. More important is the value of the information

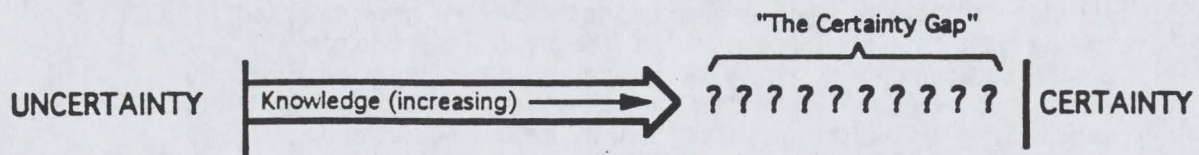


Fig. 1. "The Certainty Gap"
A fundamental problem of command and control.

and the abilities of the person using it.

The second attribute of the problem of command and control, second only to uncertainty in order of importance, is the factor of time. Theoretically, we can always narrow the "Certainty Gap" by gaining more information about the situation (accepting that there is some information we will never gain) and turning that information into knowledge. The problem is that to gain and process information takes time. This is a problem for three reasons. First, the information we gain in war, and the knowledge that derives from it, is perishable: as we take the time to gain new information, information already gained is becoming obsolete. Second, since war is a contest between opposing wills, time itself is a precious commodity shared by both sides. While we are trying to get information about a particular situation, the enemy may already be acting—and changing the situation in the process. And third, the rapid tempo of modern operations limits the amount of information that can be gathered and processed. Command and control thus becomes a race against time. So, the second absolute requirement in any command and control system is to be fast—at least faster than the enemy.

A tension thus exists between the battle against uncertainty and the race against time. This is the fundamental challenge of command and control. The successful commander must find a way to satisfy both, as we will see.

COMMAND & CONTROL IN THE INFORMATION AGE

Many of the factors which influence command and control are timeless—the nature of war and of human beings and the twin problems of uncertainty and time, for example. On the other hand, numerous factors are peculiar to a particular age, or at least dependent on the characteristics of that age. As war has evolved through the ages, so has command and control. In general, as war has become increasingly complex, so have the means of command and control. What can we conclude about the environment in which command and control must function today and into the next century?

The prevailing characteristics of the Information Age are variety and rapid change. An unstable and changeable world situation can lead to countless varieties of conflict across the full spectrum of conflict, from peacekeeping or humanitarian-aid operations on the one extreme to general war on the other. The distinction between war and peace may blur. Since we cannot predict when and where the next crisis will arise, or what form it will take, our command and control must function effectively in any environment.

Technological improvements in mobility, range, lethality and information-gathering continue to compress time and space, necessitating higher operating tempos and creating a greater demand for information. Military forces move more quickly over greater distances than ever before, engaging the enemy at greater ranges than ever before. The consequence of this is a fluid, rapidly changing military situation. Political upheaval around the globe has likewise created rapidly shifting alliances and policy objectives, meaning an unstable and changeable situation at the political level as well. In both cases, the more quickly the situation changes, the greater the need for continuously updated information and the greater the strain on command and control.

The increasing lethality and range of weapons over time has forced military forces to disperse in order to survive, likewise stretching the limits of command and control. Military forces are bigger and more complex than ever before, with more "moving parts." They consist of a greater variety of specialized

organizations and weapons. As a result, modern military forces yet again require great amounts of information in order to operate and sustain themselves.

Moreover, the real-time media saturation that is a feature of the Information Age tends to accelerate the speed at which events develop and to cause these events to take on crisis proportions requiring immediate action. The bottom line is that whether the situation is an international crisis or a fluid tactical action, the norm will be "short-fuze" rather than deliberate situations.

In the current age there is no denying the increasing importance of technology to command and control. Advancements in technology provide capabilities never before dreamed of. But technology is not without its dangers, namely the overreliance on equipment on the one hand and the failure to make use of the latest capabilities on the other. It is tempting, but a mistake, to believe that technology will solve all the problems of command and control. In fact, used unwisely, technology can be part of the problem: advancing technology can contribute to information overload and to the dangerous illusion that certainty and precision in war are not only desirable, but attainable.

In this complex age, the command and control system is vulnerable, and not just to the physical destruction of facilities and personnel. As the command and control system becomes increasingly complex, it likewise becomes increasingly vulnerable to disruption. Among other things, command and control is vulnerable to disruption by information overload, the overreliance on technology, misinformation, communications interference, lack of human understanding, lack of technical proficiency or training, and mechanical breakdown.

CONCLUSION

Although command and control systems have evolved continuously throughout history, the fundamental nature of the problem of command in war is timeless. Noteworthy improvements in technology, organization and procedures have not eased the demands of command and control one bit over time, and probably never will. While these improvements have increased the span of command and control, they have barely kept pace with the increasing dispersion and complexity of war itself. No matter what the age or technology, the key to effective command and control will come down to finding a way to deal with the fundamental problems of uncertainty and time. No matter what the age or technology, effective command and control will come down to people using information wisely. And no matter what the age or technology, the ultimate measure of command and control effectiveness will always be the same: Can we operate faster and more effectively than the enemy?

Section 2

Command & Control Theory

Confronted with a task, and having less information available than is needed to perform that task, an organization may react in either of two ways. One is to increase its information-processing capacity, the other to design the organization, and indeed the task itself, in such a way as to enable it to operate on the basis of less information. These approaches are exhaustive; no others are conceivable. A failure to adopt one or the other will automatically result in a drop in the level of performance.

—Martin Van Creveld, *Command in War*

Having defined the problem—having reached a common understanding of the nature of command and control—we turn to developing a theory about the command and control process which will in turn serve as the basis for creating an effective command and control system.

POINT OF DEPARTURE: THE OODA LOOP

Our study of command and control theory starts with a simple model of the command and control process developed by retired Air Force Colonel John Boyd and known as the "OODA Loop."¹ The OODA Loop applies to any two-sided conflict, whether the antagonists are individuals in hand-to-hand combat or large military formations. OODA is an acronym for Observation-Oriented-Decision-Action, which describes the basic sequence of the command and control process. (See Figure 2.) According to the model, finding ourselves in a conflict we first make observations about the situation—that is, we take in information about our own status, our surroundings, and our enemy. Having observed the situation, we next orient on it—we make certain estimates, assumptions, analyses and judgments about the situation in order to create an accurate mental image. In other words, we figure out what the situation means. Based on our orientation, we decide what to do—we come up with a plan. Then we put the plan into action. This includes disseminating the plan, supervising to ensure proper execution, and monitoring results, which takes us full circle to the Observation phase. Having acted, we assume we have changed the situation, and so the cycle begins again. It is worth noting that, in any organization with multiple parts, there will be multiple OODA Loops spinning

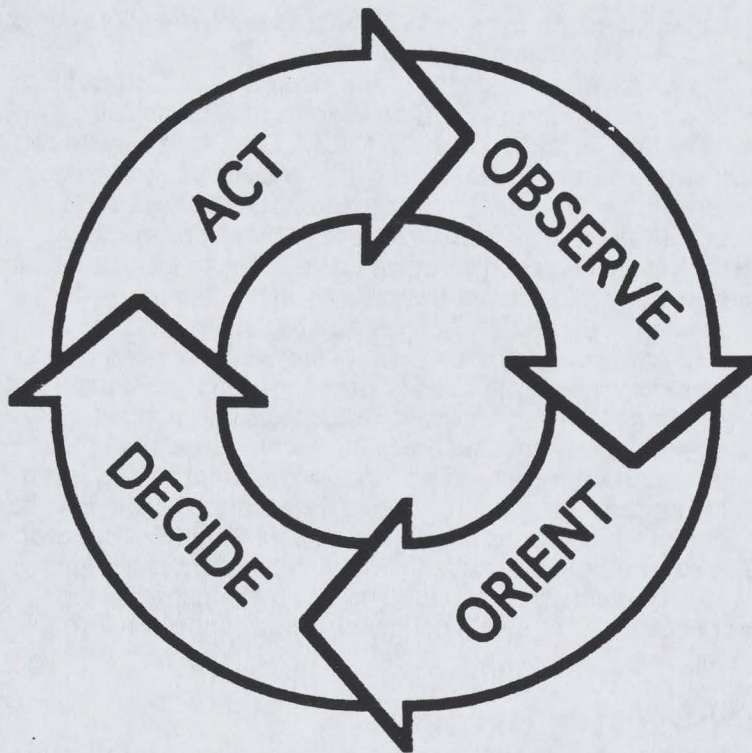


Fig. 2. The Command & Control Process.
The OODA Loop.

simultaneously, although not necessarily at the same speed, as each commander exercises command and control at his own level.

Importantly, the OODA Loop recognizes that command and control is a continuous, cyclical process. In any conflict, the antagonist who can consistently and effectively cycle through the OODA Loop faster—who can maintain a higher tempo of operations—gains an ever-increasing advantage with each cycle. The slower antagonist falls further and further behind in his reactions and becomes increasingly unable to cope with the deteriorating situation. With each cycle his actions become less relevant to the true situation and his command and control becomes increasingly ineffective.

The essential lesson of the OODA Loop is the absolute importance of generating tempo in command and control. In other words, *speed is an essential element of effective command and control*. Speed in command and control means shortening the time needed to make decisions, plan, coordinate, and communicate—shortening the time needed to accomplish any of the necessary command and control activities. Since war is competitive, it is not absolute speed that matters, but speed relative to the enemy: the aim is to be faster than our enemy, which means interfering with the enemy's command and control as well as streamlining our own. (The ability to generate a higher operational tempo does not negate the willingness to bide time when the situation calls for patience. The aim is not merely rapid action, but also meaningful action.)

CREATING EFFECTIVE IMAGES

Human beings do not normally think in terms of knowledge or information. They think in terms of ideas, or images—mental “pictures” of a given situation. Not only do people generally think in images, they understand things best as images and are inspired most by images. In this respect, an image is the embodiment of our knowledge or understanding of a given situation or condition. Images apply not only to the military problems we face but also to the solutions. For example, a well-conceived concept of operations and commander's intent should provide a clearly understood mental image of the plan and the desired outcome.

Our image of a situation is based not just on the facts of the situation, but also on our interpretation of those facts. In other words, it is based not only on available information, but also on our individual cognitive processing of that information—it is based on our intuition, appreciation, judgment and so on, which in turn are the product of our biases, preconceptions, training, and past experiences. Needless to say, if we are going to create effective command and control, the images which we create and which we communicate to others must match reality. Conversely, if we want to deceive our enemy we try to implant in his mind an image of the situation which does not match reality.

We generate images from our own observations as well as from information we receive from others. In general, the higher the level of command, the more we must receive our information from others and the less we can rely on our own observations. Any but the smallest-unit commander receives most of his combat information by proxy; much of the Observation phase thus consists of receiving various types of reports, each of which requires a human, or series of humans, to send it to the appropriate commander.² This causes several problems. First, as we have discussed, uncertainty is inherent in any situation.

When we observe a situation firsthand we have an intuitive appreciation for the level of uncertainty—we have a sense for how reliable the image is—and we can act accordingly. But when we receive our information secondhand, we usually lose that sense. This is especially dangerous in a high-technology age, since impressively displayed information tends to take on an appearance of infallibility. Second, as human beings we can sense intuitively more about a situation from firsthand observation than we can effectively communicate to others. Third, since each of us interprets events and information differently, that information which we do communicate is distorted to one degree or another with each echelon that it passes through on its way up or down the chain of command. And fourth, this same information is likewise delayed with each echelon through which it must pass. Since the value of information exists in time, this can be critical.

The commander needs to be able to generate an accurate image of essentially three different "pictures." The first is a "close-up" of the situation, a "feel" for the battle which he can gain effectively only through personal observation and experience. From this picture the commander gets a sense of what his subordinates are experiencing—their physical and moral state. It is from this image that the commander gets a sense of what he can demand of his people and what he cannot. In the words of Israeli Gen. Yashayahu Gavish about his experience in the 1967 Arab-Israeli war: "There is no alternative to looking into a subordinate's eyes, listening to his tone of voice."³ The second picture is an "aerial" view of the overall situation at any given level—such as we might get from a situation map—from which the commander makes sense (or tries to) of the relative dispositions of forces. Much of the information which goes into creating this image comes from higher headquarters. The third picture is the operation as seen through the eyes of the enemy commander, from which the commander tries to uncover enemy intentions and anticipate enemy moves. Of the three pictures, the first is clearly the most realistic but may offer a very narrow field of vision. The commander who focuses only on this image risks losing sight of the "big picture." The second picture provides an overall image but lacks critical detail—just as a situation map does not capture the reality of actual events on the battlefield. The commander who focuses only on this image risks being out of touch with reality. The third picture is largely a mental exercise limited by the fact that we can never be certain of what our enemy is up to.

A squad leader or a fighter pilot, as examples, may be able to generate all three images largely from their own observations and at the same time. A higher commander, however, feels a tension between satisfying the need for both the "close-up" and "overall" images—the former best satisfied by personal observation at the "front" and the latter probably best satisfied in the operations center of the command post.

By nature, as we have mentioned, any system which attempts to communicate images by transmitting information will suffer from a certain degree of distortion and delay: something gets lost in the translation. There are several ways to deal with this problem. The first is for the commander to view critical events directly to the greatest extent possible (consistent with the competing need to stay abreast of the overall situation); in this way he avoids the distortions and delays which occur when information filters through successive echelons. But because as war has evolved it has become increasingly complex and dispersed, commanders have found it increasingly difficult to observe all,

or even most, critical events directly. One historical solution to this problem is a technique known as the "directed telescope."⁴ This technique involves the commander's use of trusted and like-minded officers to act as his "eyes and ears," to observe selected events and report directly. The commander may direct the "telescope" at the enemy, at the surroundings, or at his own forces. In theory, because these officers or units report directly, the information arrives with minimal delay, and because they are trusted and like-minded, it arrives with minimal distortion. Directed telescopes should not replace regular reporting chains, but should augment them—to avoid burdening lower echelons with additional information gathering, to check the validity of information generated through regular channels, and to keep subordinates on their toes. Improperly used, directed telescopes can damage the important feeling of trust a commander seeks to build with his subordinates.

The second way to deal with the problems of delay and distortion of information is to rely on implicit communications to the greatest extent possible. Implicit communication minimizes the need for explicit transmission of information. Theoretically, because implicit communication requires individuals who share a common perspective, the information will suffer minimal distortion as it passes up or down the chain. We will discuss implicit communication in greater detail later.

The third way to deal with the problems of delay and distortion of information, as we will also discuss later in more detail, is to decentralize decision-making authority so that the individual on the spot, the individual who has direct and accurate observation of the situation at that spot, is the person making the decisions.

THEORIES OF CONTROL

Historically, there have been two responses to dealing with the fundamental problem of uncertainty. The first is to pursue certainty (or as close to it as possible) as the basis for effective command and control. The second is to accept uncertainty as a fact of life and to learn to function in spite of it.

The first response to the problem of uncertainty is to try to eliminate it by creating a powerful, highly efficient command and control apparatus able to process huge amounts of information and intended to reduce nearly all unknowns. The result is command and control based on *detailed* control. Such a system stems from the belief that if we can impose order and certainty on the disorderly and uncertain battlefield, then successful results are predictable. Such a system tends to be technology intensive in an effort to maximize efficiency as a means of eliminating uncertainty.

Detailed control can also be described as *coercive* control⁵, a term which effectively describes the manner by which the commander achieves unity of effort. In such a system, the commander controls with a "tight" rein. Command and control is centralized, formal, and inflexible. Orders and plans are detailed and explicit and their successful execution requires strict obedience and minimizes subordinate decision making and initiative. Detailed control emphasizes "vertical" information flow: in general, information flows up the chain of command and orders flow down. Discipline and coordination are imposed from above to ensure compliance with the plan.

In a system based on detailed control, the command and control process moves slowly and ponderously: information must be fed up to the top of the

chain, where sole decision-making authority resides, and orders must filter to the bottom to be executed. Understandably, such a system does not react well to a rapidly changing situation. Nor does it function well when the vertical flow of information is disrupted. While distrust is not an inherent feature of detailed control, organizations characterized by distrust tend toward detailed control.

Since we have already concluded that war is inherently uncertain, then this approach represents an attempt to overcome the fundamental nature of war. Since we have already concluded that absolute control is impossible in war, this method must necessarily fall short of its desired result. The question is whether it nears the desired result enough to achieve overall success.

By contrast, the opposite approach accepts war for what it is. The opposite response to the problem of uncertainty is to learn to cope with it by creating a system which can function effectively in that environment. In other words, rather than increasing the degree of certainty we achieve, we reduce the degree of certainty that we need. The result is command and control based on *mission* control. Mission control can also be described as *spontaneous* control⁶, which again effectively captures the manner of control: unity of effort is not the product of conformity imposed from above but of the spontaneous cooperation of all the elements of the force. Subordinates are guided not by detailed instructions and control measures but by their knowledge of the requirements of the overall mission. In such a system, the commander controls with a "loose" rein, allowing subordinates significant freedom of action and requiring them to act with initiative. Discipline imposed from above is thus replaced by self-discipline throughout the organization.

In a system based on mission control, command and control is decentralized, informal, and flexible. Orders and plans are brief and simple, relying on subordinates to effect the necessary coordination and on the human capacity for implicit communication—the ability to communicate through mutual understanding with minimal information exchange. By decentralizing decision-making authority, mission control seeks to increase tempo and improve the ability to deal with fluid and disorderly situations. Moreover, with its reliance on implicit communications, mission control is less vulnerable to disruption of the information flow than is detailed control.

The two approaches to the problem mark the two theoretical extremes of a spectrum of control. (See Figure 3.) In practice, no commander will rely entirely on either purely detailed or purely mission control. Exactly what type of control we use in a particular situation will depend on a variety of factors, such as the nature of the operation or task, the operating environment, the nature and capabilities of the enemy, and, perhaps most of all, the qualities of our own people. This is not to imply that the two types of control are of equal value and merely a matter of personal preference. While, as we have mentioned earlier, detailed control may be appropriate in the performance of specific, precise tasks of a procedural or technical nature, such as the control of air traffic and airspace, it is less than effective in the overall conduct of military operations in an environment of uncertainty, friction, disorder and fleeting opportunities, in which judgment, creativity and initiative are required. (Although historically this has hardly prevented various militaries from adopting detailed control.) Our understanding of the true nature of war, the relative theoretical merits of the two approaches, and the lessons of history all point toward mission control as the decidedly superior form, capable when done well of generating greater

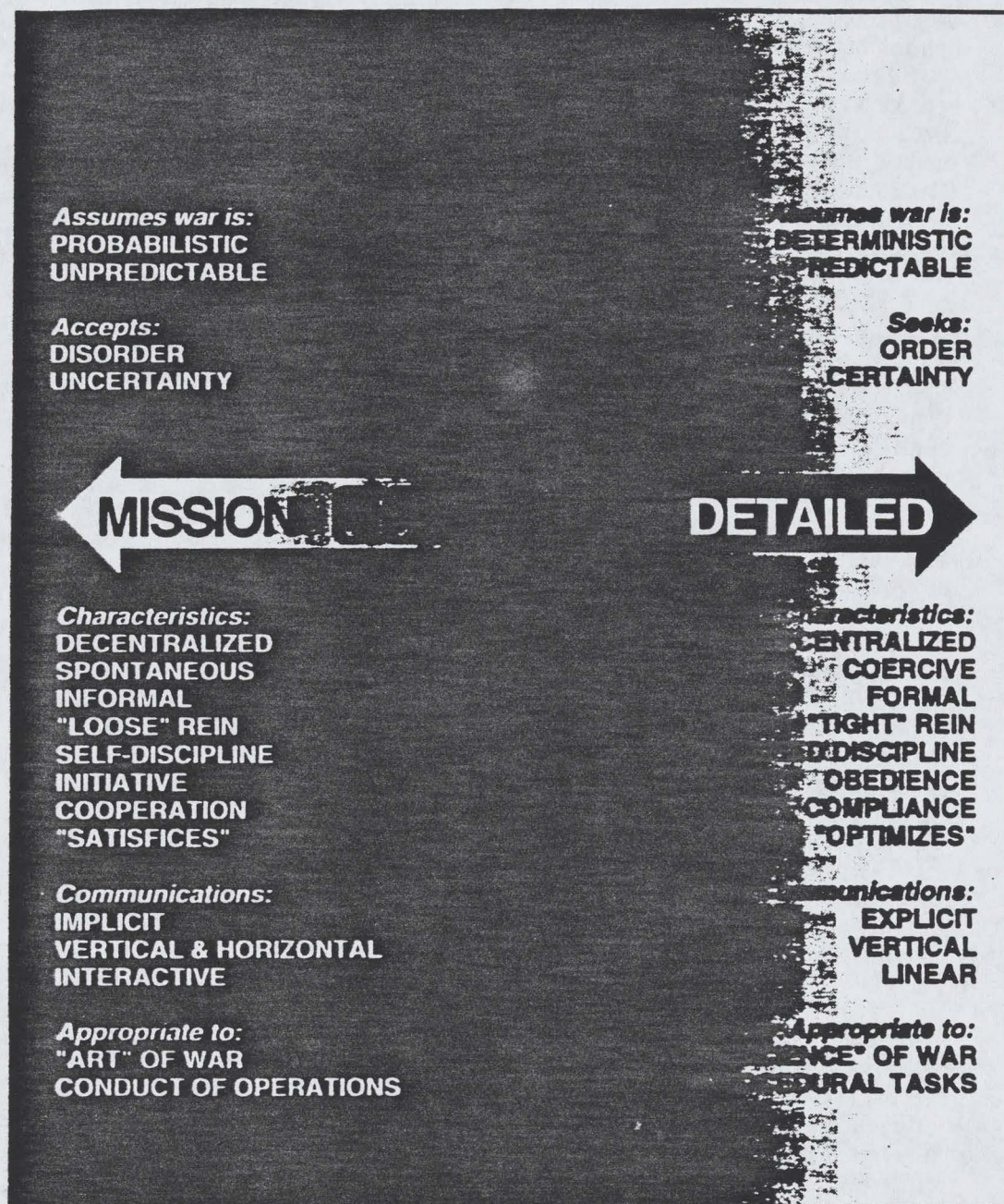


Fig. 3.
The Control Spectrum

adaptability, tempo, focus and harmony. Conversely, being the more ambitious form, mission control demands more of leaders at all levels.

ORGANIZATIONAL THEORY

Organizing resources based on the task at hand is one of the functions of command and control. Likewise, although we do not usually think of it as such, organization can be an important tool of command and control. How we organize can complicate or simplify the problems of execution. By task organizing our force into capable subordinate elements and assigning each its own task, we in effect also organize the overall mission into manageable parts. The organization of our force, then, should reflect the conceptual organization of the plan.

Organization establishes the chain of command and the command and support relationships within the force. The chain of command establishes authority and responsibility in an unbroken succession directly from one commander to another. The commander at each level responds to orders and direction received from a higher commander and, in turn, issues orders and direction to his subordinates. In this way the chain of command fixes authority and responsibility at a particular level while at the same time distributing authority broadly throughout the force; each commander has full authority and responsibility within his given sphere. Command and support relationships specify the type and degree of authority one commander has over another and the type and degree of support that one commander must provide another.

Importantly, organization should establish unity of command, which means that any given mission falls within the authority and responsibility of a single commander and that for any given mission a commander receives orders from one superior only. Similarly, organization should ensure that a commander has direct authority over or access to all the resources he needs to accomplish the assigned mission. Providing a commander all the resources he needs on a routine basis (based on the availability of resources) eliminates the need to continuously request and coordinate necessary support.

Organization provides the commander with a staff appropriate to his level of command. The staff at any given level assists the commander in the execution of his duties by providing specialized expertise and allowing a division of labor. The staff is not part of the chain of command and thus has no authority in its own right, although the commander may delegate authority to a staff officer if he chooses.

Organization should also ensure reasonable span of control, which refers to the number of subordinates or activities under the control of a single commander. There is a limit to the number of subordinates that an individual can control effectively; a commander's span of control should not exceed his capability to provide effective command and control. The optimal number of subordinates is situation dependent. For example, the more fluid and faster-changing a situation is, the fewer subordinate elements a commander can keep track of continuously. Likewise, a commander exercising detailed control, which requires him to pay close attention to the operations of each of his subordinate elements, generally has a narrower span of control than a commander who exercises mission control and lets his subordinates work out the details of execution.

Although a reasonable span of control will vary with the situation, as a rule of thumb an individual can effectively control at least three and as many as

seven subordinates. Within this situation-dependent range, a greater number of "moving parts" means greater flexibility—three subordinate units vice two allows for more options and combinations, for example. But at some point we lose the ability to effectively control each unit individually and instead start to think of the units together as a single, inflexible mass. At this point, the only way to reintroduce flexibility is to group elements together into a smaller number of "moving parts," thereby creating the need for another, intermediate echelon of command. The evolution of the Marine rifle squad during the Second World War is a good example of this. Entering the war, the rifle squad consisted of nine Marines—a squad leader and eight squad members with no additional internal organization. Experience showed that this "unitary" squad lacked the flexibility needed for small-unit fire and maneuver, and the answer was the creation of an intermediate organizational level, the fire team.

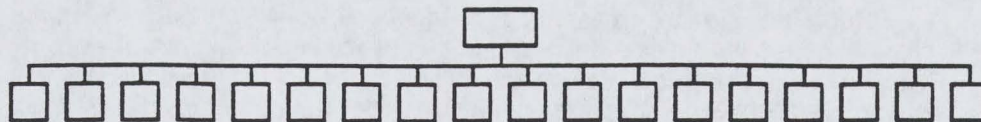
In general, "narrowing" span of control means "deepening" the organization by adding layers of command. But the more layers of command an organization has, the longer it takes for information to move from top to bottom and vice versa—and, consequently, the slower and less responsive the organization becomes. The decision to "flatten" the organization to eliminate echelons of command (and thereby increase tempo) necessitates "widening" spans of control, thus putting a premium on lateral coordination among subordinate units and arguing for the use of mission control. A tension thus exists between organizational "width" and "depth." (See Figure 4.)

The triangular structure that is the traditional basis of many military forces will likely not be the most effective organization in many situations. There may be cases in which traditional echelons of command are entirely unnecessary. Clearly, since organization is a tool of command and control, effective command and control requires the ability to organize into whatever structure the situation demands.

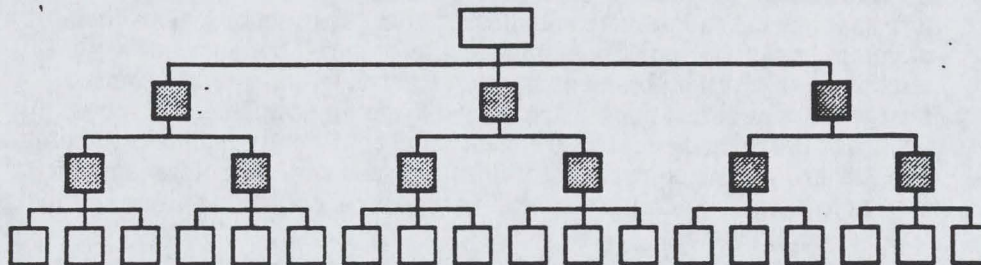
COMMUNICATIONS THEORY

We have discussed the importance of images to effective command and control, but it is not enough simply to generate accurate images. Because military operations require cooperative effort, it is equally important that we be able to communicate those images accurately to others. We want our subordinates and seniors to have the same image of the situation that we have. We want units on our flanks to share the same image, so that we can coordinate effectively with them. Additionally, we want our subordinates to have an accurate image of our plan—an accurate understanding of our concept and our intent—so they can execute it effectively. It is through communications that we share these images with others.

Communications are any method or means of conveying information or ideas from one person or place to another as a means of improving understanding. Since information is the lifeblood of command and control, communications are clearly essential to effective command and control. In general, effective organizations are characterized by intense, unconstrained communications—that is, the free and enthusiastic sharing of information throughout the organization. Moreover, communications have an importance far beyond merely the exchange of information. Separate from the quality or meaning of the information exchanged, the act of communicating builds connections or bonds within an organization and so is an important device in building trust, cooperation, cohesion and mutual understanding.



Example of an extremely "flat" organization with a "wide" span of control; direct link between top and bottom.



Example of the same unit organized "deeper" with "narrower" spans of control; never more than three "wide"; two intermediate echelons between top and bottom.

Figure 4.
Organizational "width" and
"depth."

Information flows by a variety of channels. It flows vertically within the chain of command. It also flows laterally between adjacent units, or even "diagonally"—between a platoon and an adjacent company headquarters, for example, or between a supported unit and a supporting unit outside the chain of command. Information flows informally and unofficially—that is, according to personal relationships between people—as well as according to formally established channels. (These informal communications are especially important in team building.) In other words, communication channels can follow the lines of the hierarchical structure but need not be restricted to those lines.

The traditional view of communications within military organizations is that the subordinate supplies the commander with information and the commander in turn supplies the subordinate with decisions and instructions. This linear form of communication is consistent with detailed control, but does not work effectively in a system based on mission control, which instead requires interactive communications characterized by continuous feedback loops. Feedback provides the means to enhance and confirm mutual understanding and image sharing. The comparison of linear versus interactive communications applies to lateral coordination as well as to vertical communications within the chain of command.

We communicate by any variety of means: face-to-face conversation, radio, telephone, data link, written word, visual signal, picture or diagram. Human beings have the ability to communicate not only in the words they use, but also by tone of voice, inflection, facial expression, body language, and gestures. In fact, evidence suggests that in face-to-face conversation, humans actually communicate most by nonvocal (or visual) means, second by vocal nonverbal means (such as tone or inflection), and least by the actual words they use.⁷

Moreover, if they have a mutual understanding formed of familiarity, shared experiences and a common outlook, people can communicate implicitly—that is, they achieve mutual understanding and cooperation with a minimal amount of information having to be transmitted—in much the same way that the members of a seasoned and well coached basketball team can move without the ball and anticipate teammates' actions, even when improvising. A key phrase or even an understood look can sometimes communicate more than a detailed order. Implicit communication also minimizes the problems of delay and distortion typically associated with information flow. In other words implicit communication seeks to maximize understanding and image sharing while at the same time minimizing the actual flow of explicit information and thereby making the organization less vulnerable to the disruption of information flow.

INFORMATION THEORY

For our purposes, there are two basic uses for information. The first is to help create an understanding of the situation as the basis for a decision. Information serving this purpose can be described as *image-building* information. This type of information primarily supports the Decision phase of the OODA Loop. Image-building information consists of intelligence—information about the enemy and the surrounding environment—as well as of information regarding the status and disposition of our own forces. Image-building information may flow according to several different modes, which we will discuss later. The second basic use for information, equally important as the first, is as a means of coordinating actions in the execution of the plan after the decision has been

made. Such information can be described as *execution* information, and primarily supports the Action phase of the OODA Loop. Execution information may take several forms. It may take the form of orders or guidance issued to subordinates, telling them what actions to take or what tasks to accomplish. It may take the form of execution coordination—lateral, vertical or diagonal. It may take the form of requests by one unit for the support of another. Execution information does not only refer to the passing of instructions or plans; importantly, it may also mean “selling” the commander’s vision—generating agreement and enthusiastic support for the established goals and plan—to immediate subordinates, to the members of the unit at large, to adjacent commanders or to other external organizations. No matter what form this type of information takes, the object is the same: to gain the full cooperative effort that is essential to the effective execution of the mission. It is important to note that either type of information can flow in any direction; image-building information does not necessarily flow from the bottom of the organization to the top, and execution information does not necessarily flow from top to bottom.

While distinct in concept, the two uses of information are rarely mutually exclusive in practice. In fact, there will usually be quite a bit of overlap, as the same exchange of information serves both purposes simultaneously. For example, execution coordination between adjacent units can also help shape each unit’s understanding of the situation and so assist future decisions. An order issued to subordinates describes the tasks to be accomplished and provides necessary coordinating instructions; but the same order should provide a subordinate insight into the larger situation and insight into how the subordinate’s actions fit into that larger situation. Likewise, a call for fire, the primary purpose of which is to request supporting arms from a supporting unit, also provides information about the developing situation in the form of a target location and description.

Since effective command and control, as we have said, is concerned with getting the right information to the right person at the right time, a word is in order about how we generate information flow. Execution information flow is generated through the issuance of orders or requests or by means of coordination between either of two units which must cooperate in the execution of a task. (See Figure 5.) On the other hand, there are two basic methods by which image-building information is generated: *supply-push* and *demand-pull*. (See Figure 6.)

A supply-push system pushes information from the gatherer to the commander (i.e., user), either as the information becomes available or according to a schedule. Such systems are said to be *information-driven*: the delivery of information is triggered by the availability of that information. The advantages of supply-push are that the commander does not need to request the information and that the information generally can be counted on to arrive in a timely fashion. The challenge with a supply-push system is to be able to anticipate the commander’s information needs. It is primarily from supply-push that the danger of information overload arises. Although a supply-push system can be quite fast, it rarely represents the optimal allocation of collection and processing resources.

Supply-push information generally follows two modes, best described as *pipeline* and *alarm*.⁸ The pipeline is a one-way transmission of information according to a set order and format, usually along established command or staff channels. Examples of the pipeline mode are the formal staff briefing, the

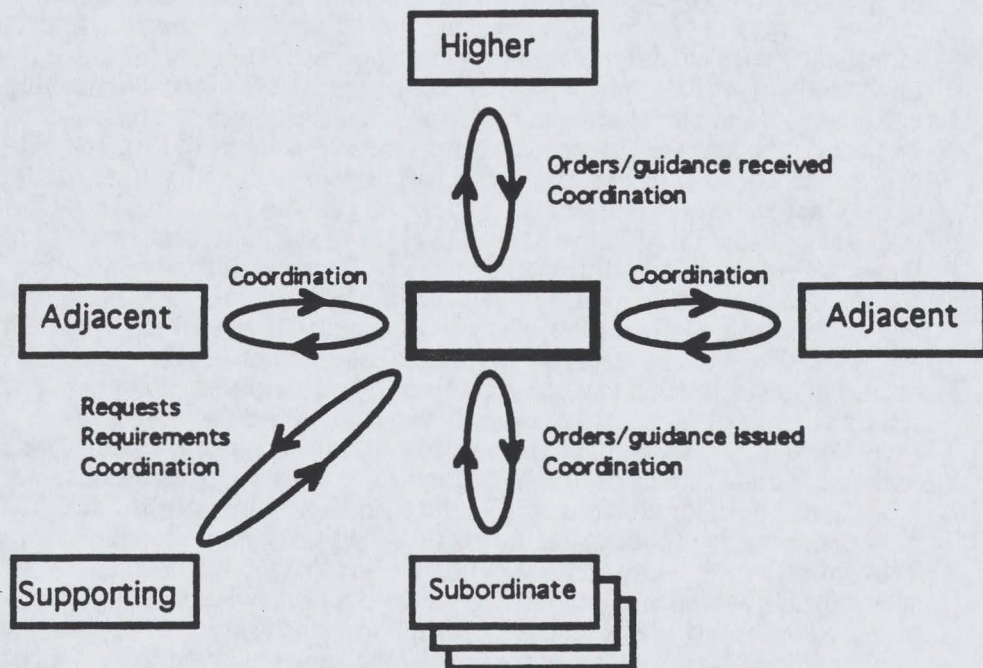


Fig. 5.
Schematic showing modes of execution
information flow.

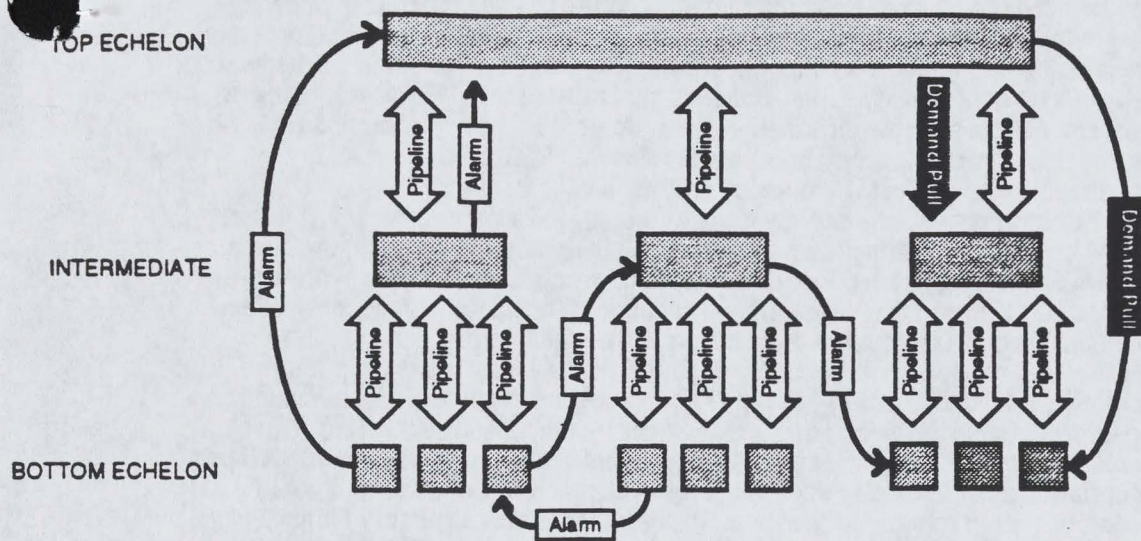


Fig. 6.
Schematic illustrating examples of different modes of image-building
information flow.

standardized report, and the standard operation order. The pipeline is often used to transmit large amounts of generic information which is gathered or available on a routine basis. Pipeline information usually arrives on a scheduled basis or as it becomes available, and so is generally timely. However, being of a general nature, pipeline information is not tailored to the specific conditions of the situation and may or may not even be relevant. Moreover, critical information may get lost in a mass of routine data.

The alarm is another one-way transmission of information, but it has no set format or schedule. Rather than operating routinely like the pipeline, the alarm mode works only by exception. If developing events are consistent with the commander's image, the alarm remains inactive. The alarm triggers only when some unexpected information threatens to violate the commander's image—information about some event which would likely upset the plan, for example. When an alarm-triggering event occurs, the gatherer communicates the information to the appropriate commander by the most direct means available, even if it means "jumping" intermediate echelons of command. Alarm information most definitely does *not* follow the pipeline path, where it could get lost among more routine information. A commander may explicitly identify certain alarm triggers—contingencies which he anticipates could disrupt his plan. Or alarm triggers may be implicit, based on mutual understanding. In any event, successful alarm information flow requires that subordinates share the commander's image and recognize image-violating events.

By contrast, a pure demand-pull system does not rely on the ability to anticipate information needs; it is inactive until a demand is made on it. In a pure demand-pull system, the user (i.e., the commander or his staff) generates all information requirements. Such systems are said to be *demand-driven*: the flow of information is triggered by the demand for that information. Typically, the demand triggers a "demand-cascade,"⁹ as the requirement filters down the chain of command until it reaches the appropriate level for gathering. This takes time and can be a burden to lower echelons. The alternative to the "demand-cascade" is for the commander to keep dedicated gathering assets which answer directly to him, such as the directed telescopes already mentioned.

Demand-pull can ensure the optimal allocation of scarce resources to those tasks which the commander has identified as critical; it can deliver information specifically tailored to the commander's information needs; and it will produce only that information which the commander requests. These characteristics can be both strengths and weaknesses of a demand-pull system. They can be strengths because information flow is tailored specifically to identified requirements. However, they can also be weaknesses because there will often be information requirements that the commander has not identified—such as the alarm mode discussed earlier—and in a pure demand-pull system those requirements will go unsatisfied. One definite disadvantage of demand-pull is the cost in time, since the search for information does not begin until the commander has already identified the need for that information. In the time between the demand for information and the delivery of the information, the information may have become obsolete. Finally, a commander in a pure demand-pull system will find himself without access to any information in the event of a communications failure, while a commander in a pure supply-push system can fall back on the most recent information delivered before the failure.

In practice, the different modes of information are far from incompatible; in fact, they can effectively complement one another in the same command and control system.

DECISION-MAKING THEORY

Decision making is central to command and control. A principal aim of command and control is to enhance the commander's ability to make sound and timely decisions. Several general principles apply. First, since war is a clash between opposing wills, we must realize that we cannot make decisions in a vacuum. We must take our enemy into account, recognizing that while we are trying to impose our will on him, he is trying to do the same to us. Second, whoever can make and implement his decisions faster gains a tremendous, often decisive advantage. Decision making is thus a time-competitive activity. Third, a military decision is not merely a mathematical computation. Decision making requires the intuitive and analytical ability to recognize the essence of a given problem and the creative ability to devise a practical solution. This ability is the product of experience, education, intelligence, boldness, perception and character. Fourth, since all decisions must be made in the face of uncertainty and since every situation is unique, there is no perfect solution to any battlefield problem; we should not agonize over one. We should adopt a promising course of action with an acceptable degree of risk, and do it more quickly than our foe.¹⁰ As Gen. George Patton said: "A good plan violently executed *Now* is better than a perfect plan next week." And finally, in general, the lower the echelon of command, the faster and more direct is the decision process. A small-unit leader's decisions are based on factors that he usually observes firsthand. At successively higher echelons of command, the commander is further removed from events by time and distance. As a consequence, the lower we can push the decision-making threshold, the faster will be our decision cycle.¹¹

As we might expect, the defining features of the command and control problem, uncertainty and time, exert a significant influence on decision making. As knowledge about a situation increases, our ability to make an effective decision also increases. Since knowledge is based on information, as information increases (provided it is relevant and accurate) the effectiveness of the decision should also increase. At some point in the process, however, when basic knowledge has been satisfied and the effort focuses on details, we reach a point of diminishing returns—when the potential effectiveness of the decision does not increase in proportion to the information gained or the time and effort needed to gain it. Meanwhile, as the amount of information increases to a point, knowledge increases and the time needed to make an effective decision decreases. Beyond that point, however, additional information has the opposite effect; it only serves to cloud the situation, impeding understanding and causing the commander to require longer to reach the same decision that he could have reached sooner with less information.¹² This reinforces the point made earlier that it is not so much the amount of information that matters, but the right element of information available at the right time.

Several theories exist as to how human beings make decisions.¹³ The model, or models, we choose must be consistent with our philosophy of command and will be reflected in the planning procedures and decision aids we adopt. The traditional view is that decision making is an analytical process, based on generating several different options, identifying criteria for evaluating

these options, assigning values to the evaluation criteria, rating each option according to the criteria, and tabulating the scores to find the best option. The basic idea is to compare multiple options concurrently to come up with the optimal solution. As a result, analytical decision making tends to be methodical, complex and time consuming. Theoretically, experience is not necessary to effective analytical decision making; only reasoning power is.

The other basic approach is called intuitive decision making, which rejects the computational approach of the analytical method and instead relies on an experienced commander's (and staff's) intuitive ability to recognize the key elements of a particular problem and arrive at the proper decision. Intuitive decision making thus replaces analysis with experience and judgment. The intuitive model focuses on situation assessment, as opposed to the analytical model which focuses on the comparison of multiple options. Intuitive decision making aims at "satisficing," finding the first solution which will satisfactorily solve the problem, rather than on "optimizing," as the analytical approach does. The intuitive model is consistent with our view that, war being ultimately an art rather than a science, there is no absolute right answer to any problem. The intuitive model works on the assumption that, due to the judgment gained by experience, the commander will generate a workable first solution, and therefore it is not necessary to generate multiple options. Intuitive decision making is generally much faster than analytical decision making. If time permits, the commander may evaluate his decision; if he finds it defective, he moves on to the next reasonable solution.

Each model has different strengths and weakness, and which model is better in a given situation depends on the nature of the situation, particularly on how much time and information is available. The analytical approach may be more appropriate for mobilization, pre-hostility, or contingency planning, when time is not a factor and extensive information can be gathered. However, the intuitive approach clearly is more appropriate for the typically fluid, rapidly changing conditions of war, when time and uncertainty are critical factors. The analytical approach may be more useful in situations in which it is necessary to document or justify a decision (more likely to be the case in an environment of detailed control). Moreover, the analytical approach may have merit in situations in which commanders are inexperienced or in which they face never-before-experienced problems.

While the two models represent conceptually distinct approaches to decision making, they are not necessarily mutually exclusive in practice. The commander may, for example, incorporate certain analytical methods into an essentially intuitive process when the situation warrants and time permits.

CONCLUSION

Our beliefs about the true nature of war lead us to one of two responses to dealing with the fundamental problem of command: either pursuing certainty or coping with uncertainty. No other possible responses exist. These responses lead to two distinctly different theories of control. Each theory in turn imposes its own requirements on the various aspects of command and control—decision making, communications, information management, planning, organization, training, education, doctrine, and so on—and so forms the basis for a distinct and comprehensive command and control system. The question is: Which approach do we adopt? The Marine Corps concept of command and control is based on accepting uncertainty as an undeniable fact and being able to operate

effectively despite it. The Marine Corps command and control system is thus built around mission control, which allows us to create tempo, flexibility and the ability to exploit opportunities but which also requires us to decentralize and rely on low-level initiative. A discussion of such a command and control system will be the subject of the next section.

Section 3

Creating Effective Command & Control

The fact that, historically speaking, those armies have been most successful which did not turn their troops into automatons, did not attempt to control everything from the top, and allowed subordinate commanders considerable latitude has been abundantly illustrated.

—Martin Van Creveld, *Command in War*

Having arrived at a common understanding of the fundamental nature and having laid out the key theories of command and control, our final step is to develop the characteristics of an effective command and control system. How do we create effective command and control, both in our units and within the Marine Corps as a whole?

THE CHALLENGES TO THE SYSTEM

Before we discuss the design features of our command and control system, it might help to review the challenges that the system must face. What obstacles must our command and control system overcome and what must it accomplish? First and foremost, the system must deal effectively with the twin problems of uncertainty and time. It must function effectively across a broad spectrum of conflicts and environments—that is, in “any clime and place.” Moreover, while designed principally to work effectively in war, it should also apply to peacetime activities, operational or administrative; we should not expect Marines to learn one system on a peacetime basis and then have to shift to another for war. It must provide the ability to adapt to rapidly changing situations and to exploit fleeting opportunities. It should be able to generate a higher tempo of action than the enemy. It should be able to withstand disruption of all kinds, created by the enemy or self-induced, which we recognize will be a normal course of events. It should be able to gather information quickly, accurately and selectively and get the right information to the right person at the right time and in the right form—without creating information overload. It should enhance effective image building and sharing. The command and control system should provide insight into the nature of the problem facing us and into the nature and designs of our enemy. It should help us to identify critical enemy vulnerabilities, and should provide the means for focusing our efforts

against those vulnerabilities. At the same time, it should conceal our true designs from the enemy. It should establish goals which are both meaningful and practicable, and it should devise workable plans to accomplish those goals. It should facilitate making timely and sound decisions despite incomplete and unclear information, and it should provide the means to modify those decisions quickly to suit changing situations. It should permit us to direct, shape and modify our actions quickly and effectively. It should allow us to monitor events closely enough to ensure proper execution and allow modifications, yet without interfering with subordinates' execution. It should communicate instructions quickly, clearly and concisely, and in such a way that provides subordinates the necessary guidance without inhibiting their initiative.

In short, it must enhance the commander's ability to perform his duties—to "put the pieces together"—and so serve as a force multiplier. With this in mind, what should be the features of such a command and control system?

MISSION CONTROL

First and foremost, our command and control system must be based on mission control. We realize that theoretically pure mission control as described earlier is impossible in practice and that the type of control we exercise in a particular situation must depend on the unique requirements of the situation. But we should employ mission control to the greatest possible extent that the situation allows. Why is this so? Mission control is the one method of control which deals with equal effectiveness with the problems of uncertainty and time. Since we recognize that precision and certainty are impossible in war anyway, we willingly sacrifice them for speed and agility. Moreover, mission control is central to the tactics of maneuver warfare. Mission control provides the flexibility to deal with rapidly changing situations and to exploit fleeting windows of opportunity. It provides the degree of cooperation necessary to ensure harmony of effort yet gives commanders at all levels the latitude to act with initiative and boldness.

The higher the level of command, the more general should be the supervision and the less the burden of detail. Mission control seeks to minimize the degree of positive control exercised during execution; the senior intervenes in the subordinate's conduct of operations only in exceptional cases. Thus every commander in his own sphere is accustomed to the full exercise of authority and the free application of judgment and imagination.¹ Mission control relies on the use of mission tactics, in which the senior assigns missions and explains his intent, but leaves subordinates free to choose the means and manner of accomplishment. The senior achieves control—in the form of cooperative effort—before the fact, through the proper preparation of his subordinates and through his use of commander's intent. While assigned tasks may be obviated by events, the commander's intent is enduring and inviolable and allows the subordinate to act with initiative yet in harmony with the senior's desires. Mission control thus seeks to maximize low-level initiative while achieving a high level of cooperation in order to ensure better battlefield results.²

Orders should include restrictive control measures and should prescribe the manner of execution only to the minimum degree needed to provide for necessary coordination which cannot be achieved by any other means. Orders should be brief and simple, relying on subordinates to work out the details of

execution (and at the same time providing them the latitude to do so) and to effect the necessary coordination. Mission control thus places a premium on lateral coordination between units as well as vertical communications up and down the chain.

INITIATIVE

Initiative is an essential element of mission control, since mission control depends on the willingness of subordinates to act without instructions. Our maneuver warfare doctrine places a premium on energetically seeking and rapidly exploiting opportunities, and this is possible only through initiative. Initiative amounts to distributing the authority to decide and act throughout an organization rather than localizing it in one spot. And as we have already discussed, where there is authority, there is also responsibility. In other words, not only must subordinates be free to act on their own authority, they must view it equally as their responsibility to act. Our command and control must be characterized by a bias for decision and action at all levels. Put another way, the command and control process must be self-starting at every level of command, meaning that each commander within his own sphere acts upon the need for action rather than on orders from above directing him to act. Senior commanders can foster initiative by assigning minimum objectives rather than maximum limits.

It is important to point out that initiative does not mean that a subordinate has the freedom to act without regard to guidance from above. Initiative is not an excuse to act like a "loose cannon." In fact, if anything, initiative places an even greater burden on the subordinate. Initiative requires that the subordinate always keep the larger situation in mind and act in consonance with his senior's intent. The freedom to act with initiative thus implies a greater obligation to act in a disciplined and responsible way. Initiative places a greater burden on the senior as well. Delegating authority to his subordinates does not absolve him of ultimate responsibility. He must frame his intent in such a way that it provides his subordinates sufficient guidance to act in consonance with his desires while at the same time not restricting their freedom of action. Commanders must be adept at expressing their intent clearly and forcefully. This is a skill that requires practice.

Additionally, initiative has an important psychological effect on the members of an organization. Recognizing what needs to be done and taking the action necessary to ensure success is a satisfying experience and a powerful stimulant to human endeavor. People who are not merely carrying out orders but are acting on their own initiative feel a greater responsibility for the outcome and will naturally act with greater vigor. Thus, initiative spread throughout, rather than localized with the senior commander, is a source of great strength and energy for any organization, especially in times of crisis.³

MUTUAL TRUST

Mission control demands mutual trust among the members of the organization—trust in the abilities and judgment of subordinates, peers and seniors. Trust is the essential basis for cooperation. It is a function of familiarity and respect, which in turn are the products of shared values and outlook. A senior trusts that his subordinates will carry out the assigned missions competently with minimal supervision, will act in consonance with his

ldesires, will inform him as necessary of any developments, and will effect the necessary lateral coordination. Subordinates meanwhile trust that the senior will provide the necessary guidance and will support them loyally and fully, even when they make mistakes.

Trust has a reverse side: it must be earned as well as given. We earn the trust of others by demonstrating competence, a sense of responsibility, loyalty and self-discipline. This last is essential. Discipline is of fundamental importance in any military endeavor. But since mission control is decentralized rather than centralized and spontaneous rather than coercive, discipline is not imposed from above; it must be generated from within. In order to earn his senior's trust, a subordinate must demonstrate the self-discipline to accomplish the mission with minimal supervision and to act always in accord with his senior's larger intent. The senior, in order to earn his subordinate's trust, must likewise demonstrate that he will provide the subordinate the framework within which to act and will support and protect the subordinate in every way when he exercises initiative.

IMPLICIT UNDERSTANDING & COMMUNICATION

The final essential ingredients of effective mission control are implicit understanding and communication. Cooperation is essential to any military operation, but since mission control seeks to minimize restrictive control measures, centralized coordination and detailed instructions, we must find another way to create cooperation. We do it by relying on implicit understanding and communications. These peculiar human abilities allow us to harmonize our actions intuitively with others.⁴

Implicit understanding and communication do not occur automatically. They are abilities which we must actively foster, and are the product of a common ethos and repeated practice—as with the members of the seasoned basketball team mentioned earlier who think and move as one or the members of a jazz band who can improvise freely without losing their cohesion. This has significant implications for doctrine, education and training, as we will discuss.

INTUITIVE DECISION MAKING

Based on the firm belief that precision is less important than initiative and rapid action, our command and control system should emphasize intuitive decision making as the norm, while admitting that certain deliberate situations may benefit from a more analytical approach. We choose the intuitive model as the norm because we realize that the vast majority of situations will be fluid, changeable and uncertain and that time will be short. Emphasizing experienced judgment and intuition over deliberate analysis, the intuitive model helps to generate tempo, while also having the inherent flexibility to deal with uncertainty. Moreover, the intuitive model is consistent both with the belief that there is no perfect solution to battlefield problems and with a system which presumes the capacity for sound judgment from decision makers at all levels of the organization. However, we should understand the factors which favor an analytical approach and when the situation warrants—especially when time is not a critical factor—we should maintain the ability to reinforce intuitive decision making with analysis.

INFORMATION MANAGEMENT

Since information is the lifeblood of any command and control system, effective command and control must have an effective way of managing information flow. Our management of information should facilitate the rapid, distributed and unconstrained flow of information of all kinds in all directions while at the same time providing the ability to discriminate as to importance, quality and timeliness as a means of providing focus and preventing information overload. It should support the flow of both image-building and execution information. In the case of the latter, it should enhance the commander's ability to communicate his vision with clarity and intensity. In any event, the ultimate aim, stated earlier but worth repeating, is to supply the right information to the right person at the right time in the right form. Remember, the purpose of information in the first place is to enhance knowledge, which in turn means that information should be supplied, to the greatest extent possible, in the form of meaningful images rather than in masses of raw data. This means that our system must have the means of filtering, fusing and prioritizing information. By filtering we mean assessing the value of information and culling out that which is not pertinent or important. By fusing we mean condensing information into an easily usable form and to a level of detail appropriate to the level of command. And by prioritizing we mean expediting the flow of important information. All information management should focus on critical information requirements, a focus which demands vision on the part of the commander and understanding on the part of subordinates in order to identify and recognize those critical needs.

We recognize that information travels by a variety of means and channels. We acknowledge the importance of implicit as well as explicit communications and informal communications as well as formal, and our system must make use of all of these channels. Our system must provide for lateral and "diagonal" as well as vertical communications and should ensure that information flow is interactive rather than linear. Our system should provide redundant channels as a safeguard against disruption; which channel information follows is less important than whether it reaches the right person. Our system should provide for echelon-jumping capability to ensure that important information passes to the appropriate level directly and without delay. Echelon-jumping does not mean, however, that intermediate echelons are left "out of the loop." After critical information has passed directly between the primarily concerned echelons, both those echelons should inform intermediates by standard channels. To the greatest extent possible, since information is "changed" by each person who handles it, important information should pass directly between principal users, eliminating middlemen specialists, such as equipment operators or clerks. Wherever possible, person-to-person information should be communicated by word of mouth and face to face, since humans communicate not only by what they say but also by how they say it. The desire to have principals communicate directly and by voice whenever possible does not mean that we do not need to keep a record of communications; permanent records are important as a means of affirming understanding and for historical reasons.

Our information management system should be a hybrid exhibiting the best characteristics of supply-push and demand-pull.⁵ We recognize that supply-push is the most efficient way to provide much of the information needed routinely. Through the implicit understanding and shared images of its

members, the system should attempt to anticipate the commander's needs and should attempt to "push" that information to an easily accessible, local data base. The commander then "pulls" from the base only that information which he needs. In this way we avoid the danger of information overload associated with supply-push and the delay associated with demand-pull.

We also recognize that the commander will likely be unaware of the need for certain information, so we must ensure that truly critical, time-sensitive "alarm" information gets "pushed" directly to the commander without delay. In order for this to work, subordinates must be cued in to what constitutes critical information, which in turn re-emphasizes the importance of mutual understanding.

Additionally, since no system can effectively anticipate all the commander's information needs, we must have a means of gathering and supplying specific elements of information on demand. This means should provide the required information quickly and directly, and without creating a "demand cascade" which burdens lower echelons. In other words, our system should provide the commander with directed telescopes, be they people or equipment, by which he can satisfy his own specific information needs quickly. It is important, however, that the directed telescope not interfere (or be perceived to interfere) with the normal functioning of the chain of command: the perception of spying or intruding on the province of subordinate commanders can lead to distrust within the organization.

FOCUSING COMMAND & CONTROL

Focus of efforts is a central concept of maneuver warfare, and it applies to command and control as to any resource. The focus of the command and control effort should reflect the overall focus of efforts. We should focus the command and control effort on critical tasks and at critical times and places, which we can do by a variety of means. We concentrate information-gathering assets and other command and control resources where they are needed most. We concentrate planning, coordination, analysis and other command and control activities on the most important tasks and we exercise economy elsewhere. We prioritize information requirements and concentrate gathering, processing and communications on the critical elements. We filter and fuse information and we manage information flow to ensure that critical, time-sensitive information moves quickly and effectively and less important information does not clutter communications channels. We manage that most precious of all commodities, time, to ensure that the most important tasks receive our earliest and utmost attention. We especially ensure that the commander devotes his time and energies only to critical tasks and that he is protected against mundane distractions. The commander should only do those things which only the commander can do, or which nobody else can do adequately. Routine tasks must be delegated to others. Clearly, in order to focus command and control, we must have adequate guidance, and therefore one of the essential functions of command is to focus the command and control effort.

The key way a commander can provide focus is by his personal attention and presence. In the words of Field Marshal Sir William Slim, the Allied commander in Burma in the Second World War: "One of the most valuable qualities of a commander is the flair for putting himself in the right place at the vital time." As we have mentioned, by positioning himself at the critical spot

the commander can observe events more directly and avoid the delays and distortions that occur as information filters up the chain of command. In so doing, the commander can gain firsthand the essential "feel" for the situation which cannot be gained any other way. Equally important, he can *influence* events more directly and avoid the delays and distortions that occur as information filters *down* the chain of command. By his personal presence the commander can provide the leadership that is so essential to success in war. And simply by the moral authority that his personal presence commands, the commander directs emphasis to the critical spot and focuses effort on the critical task. The commander thus becomes the focal point of the command and control effort, and the whole system supports and reinforces him.

We have already discussed the need to gain accurate images of several different "pictures." The commander goes wherever he must to get the most important picture. For the "close-up" picture, this often means at the "front"—which does not necessarily mean at the forwardmost point of contact on the ground, but wherever the critical action is taking place or the critical situation is developing. For ground commanders, even senior ones, this may in fact mean at or near the point of contact. But for others, and even for ground commanders, this may mean with a subordinate commander in the critical sector, in a ready room listening to flight debriefs during an important phase of an air campaign, at a critical point along a route of march, or in an aircraft flying over the battlefield. If the critical view at a particular moment is the "overall" picture, the commander may want to be in the operations center of his command post piecing together various reports from far-flung sources, or even at a higher headquarters learning about the larger situation (although in general it is better for senior commanders to come forward than for subordinate commanders to go rearward to exchange information). And for that matter, if he is trying to get inside the mind of an adversary who has made a bold and unexpected move that has shattered his image of the situation, the best place may be sitting against a tree by himself, sequestered from distractions, alone with a map and his thoughts.

Clearly, our philosophy of command calls for energetic and active commanders with a flair, as Slim says, for being in the critical place, lending leadership, judgment and authority wherever it is needed most. The commander might start at his command post, where he can piece together an overall image and supervise the development of the plan, but should then usually move "forward" to supervise execution at the decisive spot, returning to the command post only long enough to adjust his overall image of the developing situation before moving out again to the next critical spot. The important point is that the commander must not feel tied to his command post, unable to leave it for fear of missing a valuable report. When the commander leaves the command post, it is imperative that he empower the staff to act on his behalf. The staff must be able to act with initiative in the absence of the commander, and therefore must share the commander's image of the situation and understand his designs. Mutual trust and implicit understanding apply to the staff as much as to subordinate commanders. If he does not empower the staff to act on his behalf, the commander will become a prisoner in his own headquarters, out of touch with reality and limited in his ability to influence events.

THE COMMAND & CONTROL SUPPORT STRUCTURE

It is important to keep in mind that the command and control support structure merely provides the supporting framework for our command and control system; it does not constitute the system itself. The sole purpose of the support structure is to assist people in making effective use of information. Developing effective command and control will require strong advocacy for programs which are consistent with our approach to command and control as described in these pages. In addition to supporting our approach to command and control, the components of our command and control support structure must be compatible with one another. And since people are the driving element behind command and control, the components of the structure, together and alone, must be "user friendly"; they should be designed first and always with people in mind.

TRAINING, EDUCATION & DOCTRINE

Collectively, training, education and doctrine prepare people for the role they play in command and control. First, since mission control demands initiative and sound decision making at all levels, training, education and doctrine must aim at fostering initiative and improving decision-making ability among all Marines. Second, training, education and doctrine must prepare Marines to function effectively in an environment of uncertainty, disorder and limited time. Exercise scenarios should purposely include elements of disorder and uncertainty—an unexpected development, an unexpected unit introduced into the scenario, or a "short-fuze" mission change, as examples. Field exercises and command post exercises should purposely include disruption of the command and control system—for example, "destruction" of a main command post or loss of communications during a critical phase of an operation. Planning exercises should incorporate severe time limits, for example, to simulate stress and tempo. As Field Marshal Erwin Rommel said: "A commander must accustom his staff to a high tempo from the outset, and continuously keep them up to it." Third, doctrine and training should prescribe techniques and procedures which place a premium on flexibility, speed and adaptability—fast and simple staff planning models, for example. Last and perhaps most important, training, education and doctrine should provide a shared ethos, common experiences and a shared way of thinking as the basis for the trust, cohesion and implicit communication that are essential to mission control. Doctrine especially should establish a common perspective on how Marines approach the problems of command and control.

PROCEDURES

Command and control procedures, the techniques by which we perform various command and control functions, must be consistent with our view of an uncertain environment and with our overall style of command and control. First of all, we must recognize that procedures *per se* apply only to rote or mechanical tasks, and not to acts of judgment. Procedures may help with the decision process, for example, but the decision itself is the product of an intuitive and creative act. In that respect, the purpose of procedures "is not to restrict human judgment, but to free it for the tasks only it can perform."⁶

Our command and control procedures should be designed for speed and simplicity. They should be designed for simplicity so that we can master them

easily and perform them quickly and smoothly—"instinctively"—under conditions of stress. They should be designed for speed so that we can generate tempo, which we recognize to be a fundamental characteristic of effective command and control. Streamlined staff planning sequences, for example, are preferable to deliberate, elaborate ones. The standard should be simple models which we can expand if time and circumstances permit, rather than inherently complex models which we try to "crunch" when time is short—which is likely to be most of the time. As Second World War German Gen. Hermann Balck said to his staff: "Don't work hard, work fast."

MANPOWER

Since people are the first and driving element of our command and control system, effective manpower management is essential to command and control. And since our command and control is based on decentralized control we can argue that command and control is not just the province of senior commanders and their staffs: all Marines are involved in command and control in one way or another. Any Marine who contributes to effective operations by practicing mission tactics and using initiative to further his commander's intent and exploit opportunities is likewise contributing to effective command and control. It is important, then, that all Marines, regardless of grade, be well versed in the principles and methods of mission control.

More specifically, since mission control relies heavily on individual skills and judgment, our manpower management system should recognize that all Marines of a given grade are not interchangeable, and should seek to put the right person in the right billet based on specific ability and temperament. Additionally, the manpower management system should seek to achieve personnel stability within units and staffs as a means of fostering the cohesion, teamwork and implicit understanding that are vital to mission control. We recognize that casualties in war will take a toll on personnel stability, but the greater stability a unit has initially, the better it will absorb those casualties and incorporate replacements.

ORGANIZATION

We have already discussed the impact of organization on the effectiveness of command and control. The general aims of organization with regard to command and control should be to ensure unity of effort, reasonable spans of control, and effective information flow. Organization should not inhibit communications in any way, but instead should facilitate the rapid distribution of information in all directions. We should seek to strike a balance between organizational "width" and "depth" that is suited to the particular situation. The aim is to "flatten" the organization to the greatest extent compatible with reasonable spans of control; we should have the organizational flexibility to eliminate or bypass selected echelons of command or staff as appropriate in order to improve operational tempo and the speed and accuracy of information flow. Additionally, it is not necessary that all echelons of command exercise all functions of command. Just as we task organize our force, so should we task organize our command and control structure.

A word is in order about the size of staffs. We have already made the point that the more complex the mission, the more information is needed to accomplish it. The historical trend toward complexity has led over time to

larger and more complex headquarters units—especially in organizations which rely on detailed control. Likewise, the larger and more complex the headquarters, the more information it requires to function. This increase in information in turn requires an even larger headquarters, and the result is a spiraling increase in the size of headquarters units. However, the larger a command and control organization, the longer it generally takes that organization to perform its functions. In the words of Gen. William T. Sherman: "A bulky staff implies a division of responsibility, slowness of action and indecision; whereas a small staff implies activity and concentration of purpose." Additionally, a large staff takes up more space and is less mobile than a small one, and consequently is more vulnerable to detection and attack. A large staff, with numerous specialists, may be more capable detailed analysis and planning than a small one, but we have already established that we value speed and agility over precision and certainty. We should therefore seek to keep the size of staffs to a minimum in order to facilitate a high operating tempo and to minimize the space and facilities that the headquarters requires. The ideal staff would be so austere it could not exercise fully detailed control.

EQUIPMENT & TECHNOLOGY

Equipment, to include facilities, is an integral part of any command and control support structure, but we must remember that it is only one component. As we have mentioned, there are two dangers in regard to command and control equipment, the first being an overreliance on technology—the belief that all the answers to the problems of command and control rest in technology—and the second being a failure to make use of technological capabilities. The aim is to strike a balance which gets the most out of our equipment and at the same time integrates technology with the other components of the system.

We believe very strongly that the object of technology is not to eliminate people from the command and control process, or to reduce their role, but rather to enhance their performance. As a first priority, therefore, equipment and facilities should be user friendly. Technology should seek to automate routine functions which machines can accomplish more efficiently than people, freeing people to focus on the aspects of command and control requiring judgment and intuition. We may even use technology to assist us in those activities so long as we do not make the mistake of trying to replace the person who can think with the machine that cannot.

Command and control equipment should improve the flow and value of information within the system. But as we have said repeatedly, improving information is not simply a matter of increasing volume; it is also a matter of quality, timing, location, and form. To the greatest extent possible, therefore, communications equipment should connect principals directly, minimizing the need for specialized operators. Additionally, equipment should minimize the input burden placed on subordinates; ideally, the input of information into the system should be automatic. Last, but hardly least, technological developments should focus on presenting information in a way that is most useful to humans—that is, in the form of meaningful images rather than lists of data.

As with all the components of our command and control support structure, our command and control equipment should be consistent with our overall approach to command and control. For example, equipment which facilitates the accurate, real-time monitoring of the activities of subordinate units (without becoming meddlesome in the operations of those units) is not inconsistent with

our approach to command and control. However, equipment which facilitates and encourages the micromanagement of subordinate units *is* inconsistent with our approach to command and control. Moreover, such technological capability tends to fix the senior's attention at too low a level of detail. A regimental commander, for example, does not as a rule need to be able to keep track of the movements of every squad (although with position-locating technology it is a temptation); a regimental commander needs a more general appreciation for the flow of action. A commander who focuses at too low a level of detail (whether because the technology tempts him to or not) risks losing sight of the larger picture. The reality of technological development is that equipment which improves the ability to monitor what is happening usually also increases the temptation and the means to try to control what is happening. Consequently, increased capability on the part of equipment brings with it the need for increased understanding and discipline on the part of users. Just because we have the technological ability to micromanage does not mean that we should.

CONCLUSION

Our approach to command and control recognizes and accepts the inherent nature of war as uncertain, disorderly and time-competitive and seeks to provide the commander the best means to win in that environment. We seek to exploit trust, cooperation, judgment, focus, and implicit understanding to lessen the effects of the friction that is the consequence of war's nature.⁷ We rely on mission control to provide the flexibility and responsiveness to deal with uncertainty as well as the speed which we recognize is a key element of success in war. We focus on the value and timeliness of information and on getting that information to the right people. We seek to strike a workable balance among people, procedures and technology but recognize that our greatest command and control resource is the common ethos and intellectual framework, and the resulting bond, shared by all Marines.

END NOTES

Section 1. The Nature of Command & Control

1. Joint Pub 1-02, *Dictionary of Military and Associated Terms* (Washington: Government Printing Office, 1989), 77.
2. Thomas P. Coakley, *Command and Control for War and Peace* (Washington: National Defense University Press, 1992), 41.
3. Henri Fayol, *General and Industrial Management* (Pitman Publishing Corp., 1949), 21-2.
4. See S.L.A. Marshall, *Men Against Fire: The Problem of Battle Command in Future War* (Gloucester, MA: Peter Smith, 1978), 44-9.
5. Coakley, *Command and Control for War and Peace*, 17.
6. *Ibid.*
7. John Boyd, "An Organic Design for Command and Control," *A Discourse on Winning and Losing*. Unpublished lecture notes, Aug 1987, 3-4.
8. U.S. Marine Corps, *Warfighting*, FMFM 1 (Washington: Headquarters, Marine Corps, 1989), 10.

Section 2. Command & Control Theory

1. Boyd, "Patterns of Conflict" and "An Organic Design for Command and Control," *A Discourse on Winning and Losing*. The OODA Loop is, naturally, a simplification of the command and control process. It is not meant to provide a complete description of the various phases and interactions, but rather a basic conceptual model. Numerous individual functions take place within each of the four basic steps. Various other similar command and control models exist, differing mainly in the names or number of the steps in the process. Any effort to divide a complex process like command and control into neat, sequential steps is necessarily going to be partly arbitrary. We have selected the Boyd model because it is widely known to many Marines. See also William S. Lind, *Maneuver Warfare Handbook* (Boulder, CO: Westview Press, 1985), 4-6.
2. Kevin B. Smith, "Combat Information Flow," *Military Review*, Apr 1989, 43.
3. Quoted in Martin Van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985), 199.
4. Van Creveld, *Command in War*, 75, 255-57. See also Gary B. Griffin, *The Directed Telescope: A Traditional Element of Effective Command and Control*, Combat Institute Studies Report No. 9 (Ft. Leavenworth, KS: U.S.

Army Command and General Staff College, 1985).

5. Gregory D. Foster, "Contemporary C2 Theory and Research: the Failed Quest for a Philosophy of Command," *Defense Analysis*, vol. 4, no. 3, Sep 1988, 211.

6. *Ibid.*

7. Psychologist Dr. Albert Mehrabian has estimated that in face-to-face conversation, words account for a mere seven percent of communications, nonverbal voice (such as tone, volume or inflection) accounts for 38 percent, and nonvocal/visible means (facial expression, gestures, etc.) account for the remaining 55 percent of the communication that takes place. *Nonverbal Communication* (Chicago: Aldine Atherton, Inc., 1972), 182.

8. James P. Kahan, D. Robert Worley & Kathleen Stasz, *Understanding Commanders' Information Needs* (Santa Monica, CA: The RAND Corp., 1989), 37-55.

9. *Ibid.*, 61.

10. *Warfighting*, 68-70.

11. John Schmitt, "Observations on Decisionmaking in Battle," *Marine Corps Gazette*, Apr 1988, 19.

12. *Ibid.*, 19-20.

13. See Gary A. Klein, "Strategies of Decision Making," *Military Review*, May 1989 and "Naturalistic Models of C3 Decision Making," *Science of Command and Control: Coping With Uncertainty* (Washington: AFCEA International Press, 1988).

Section 3. Creating Effective Command & Control

1. Spenser Wilkinson, *The Brain of an Army: A Popular Account of the German General Staff* (London: Archibald Constable & Co., 1895), 106.

2. Boyd, "An Organic Design for Command and Control," 18.

3. Fayol, *General and Industrial Management*, 39.

4. Boyd, "An Organic Design for Command and Control," 18.

5. Kahan, *et al.*, *Understanding Commanders' Information Needs*, 66-7.

6. Richard E. Simpkin, *Race to the Swift: Thoughts on Twenty-First Century Warfare* (London: Brassey's Defence Publishers, 1985), 239.

7. Boyd, "An Organic Design for Command and Control," 8.