

Notes

Epigraphs: The quotation on page **33** is from Carl von Clausewitz, *On War*, Book 1, chapter 6. The quotation on page **61** is from Martin van Creveld, *Command in War*, p. 269. The quotation on page **105** is from FMFM 1, *Warfighting*, p. 69.

The Nature of Command and Control

1. Command and control the business of the commander: In Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms*, defined as: “The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. Command and control functions are 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.”

2. Authority and responsibility: Henri Fayol, *General and Industrial Management* (Pitman Publishing Corp., 1949), pp. 21–22.

3. The traditional view: Command in Joint Pub 1-02 is defined as “the authority that a commander in the Military Service lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment

of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. It also includes responsibility for health, welfare, morale, and discipline of assigned personnel.” Control in Joint Pub 1-02 is defined in our context as “physical or psychological pressures exerted with the intent to assure that an agent or group will respond as directed.”

4. Feedback as control: See Norbert Wiener, *Cybernetics, or, Control and Communication in the Animal and the Machine*, 2d ed. (Cambridge, MA: MIT Press, 1962), pp. 95–115, and *The Human Use of Human Beings: Cybernetics and Society* (Boston: Houghton Mifflin, 1950), pp. 12–15 and pp. 69–71. As applied to command and control: See John R. Boyd, “An Organic Design for Command and Control,” *A Discourse on Winning and Losing*, unpublished lecture notes, 1987.

5. The illusion of being “in control”: Peter M. Senge, *The Fifth Discipline: The Art and Practice of The Learning Organization* (New York: Doubleday/Currency, 1990), pp. 190–193.

6. Command and control as a complex (adaptive) system: See M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Simon & Schuster, 1992); Roger Lewin, *Complexity: Life on the Edge of Chaos* (New York: Macmillan, 1992); or Kevin Kelly, *Out of Control: The New Biology of Machines: The Rise of Neo-Biological Civilization* (Reading, MA: Addison-Wesley, 1994). Also described as “far-from-equilibrium, nonlinear” systems in Ilya Prigogine and Isabelle Stengers, *Order Out of Chaos: Man’s New Dialogue with Nature* (New York: Bantam Books, 1984) and Gregoire Nicolis and Ilya Prigogine, *Exploring Complexity: An Introduction* (New York: W.H. Freeman & Co., 1989).

7. “Success is not due simply to general causes . . .”: Carl von Clausewitz, *On War*, trans by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), 595.

8. “Organic” versus “mechanistic” systems: T. Burns, “Mechanistic and Organismic Structures,” in Derek Salman Pugh, comp., *Organization Theory: Selected Readings* (Harmondsworth, England: Penguin Books, 1971), pp. 43–55; David K. Banner and T. Elaine Gagné, *Designing Effective Organizations: Traditional & Transformational Views* (Thousand Oaks, CA: Sage Publications, 1995), pp. 152–194; Gareth Morgan, *Images of Organization* (Beverly Hills, CA: Sage Publications, 1986).

9. “Command” and “control” as nouns and verbs: Thomas P. Coakley, *Command and Control for War and Peace* (Washington: National Defense University Press, 1992), p.17.

10. Information as a control parameter: Jeffrey R. Cooper, “Reduced Instruction Set Combat: Processes & Modeling.” Presentation given at Headquarters Marine Corps, 5 Jan 95.

11. Command and control support structure: In Joint Pub 1-02: “Command and control system—The facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned forces pursuant to the missions assigned.”

12. Coakley, p. 17.

13. Uncertainty as the defining feature of command: See Martin van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985), especially chapters 1 and 8.

14. "War is the realm of uncertainty . . .": Carl von Clausewitz, *On War*, p. 101.

15. Uncertainty as doubt which blocks action: See Ra'anan Lipshitz and Orna Strauss, "Coping with Uncertainty: A Naturalistic Decision Making Analysis," unpublished paper, 1996.

Command and Control Theory

1. The OODA loop: John R. 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 (since we have already described command and control as a process characterized by feedback and other complex interactions). It is not meant to provide a complete description of the various phases and interactions, but rather a basic conceptual model. Numerous individual interactions take place within and among each of the four basic steps. Any effort to divide a complex process like command and control into neat, sequential steps is necessarily going to be partly artificial. Various other similar command and control models exist. 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), pp. 4-6.

2. The information (cognitive) hierarchy: Jeffrey R. Cooper, "The Coherent Battlefield—Removing the 'Fog of War.'" Unpublished paper, SRS Technologies, June 1993. Also Cooper, "Reduced Instruction Set Combat: Processes and Modeling."

3. Not only do people think in images, they understand best and are inspired most . . . : Thomas J. Peters, *Thriving on Chaos: Handbook for a Management Revolution* (New York: Alfred A. Knopf, 1988), p. 418.

4. Gavish: "There is no alternative . . .": quoted in Martin van Creveld, *Command in War*, p. 199.

5. "Topsight": David Hillel Gelernter, *Mirror Worlds, or, The Day Software Puts the Universe in a Shoebox—How It Will Happen and What It Will Mean* (New York: Oxford University Press, 1991), pp. 51–53. Gelernter argues that topsight is "the most precious intellectual commodity known to man. . . . It is *the* quality that distinguishes genius in any field." (*Italics in original.*)

6. The directed telescope: Van Creveld, *Command in War*, p. 75 and pp. 255–57. See also Gary B. Griffin, *The Directed Telescope: A Traditional Element of Effective Command*, Combat Institute Studies Report No. 9 (Ft. Leavenworth, KS: Combat Studies Institute, U.S. Army Command and General Staff College, 1985).

7. Control as "coercive" or "spontaneous": Gregory D. Foster, "Contemporary C² Theory and Research: the Failed Quest for a Philosophy of Command," *Defense Analysis*, vol. 4, no. 3, September 1988, p. 211.

8. Command by personal direction or detailed directives: See Thomas J. Czerwinski, "Command and Control at the Crossroads," *Marine Corps Gazette*, October 1995.

9. Foster, p. 211.

10. Authoritarian (Theory X) versus persuasive (Theory Y) leadership: Douglas McGregor, *The Human Side of Enterprise* (New York: McGraw-Hill, 1960), chapters 3 and 4. Situational Leadership Grid (telling, selling, participating, delegating) and follower maturity: Paul Hersey and Kenneth H. Blanchard, *Management of Organizational Behavior*, 2d ed. (Englewood Cliffs, NJ: Prentice-Hall, 1972), p. 134.

11. Integrated teams (work groups): R. Likert, "The Principle of Supportive Relationships," in Derek Salmon Pugh, comp., *Organization Theory: Selected Readings* (Harmondsworth, England: Penguin Books, 1971), pp. 279-304. Figure 5 adapted from Likert, p. 289.

12. Effective organizations characterized by intense communications: Thomas J. Peters and Robert H. Waterman, Jr., *In Search of Excellence* (New York: Harper & Row, 1982), p. 122.

13. On the relative importance of verbal and nonverbal communication: Psychologist Dr. Albert Mehrabian has estimated that in face-to-face conversation the actual meaning of words accounts for a mere 7 percent of communication, nonverbal voice (such as tone, volume, or inflection) accounts for 38 percent, and visible

signals (facial expression, body language, gestures, etc.) account for the remaining 55 percent of the communication that takes place. Albert Mehrabian, *Nonverbal Communication* (Chicago: Aldine-Atherton, 1972), p. 182.

14. Supply-push/demand-pull and “demand-cascade”: James P. Kahan, D. Robert Worley, and Cathleen Stasz, *Understanding Commanders’ Information Needs* (Santa Monica, CA: Rand Corporation, 1989), pp. 37–55.

15. The effects of uncertainty and time on decisionmaking: John F. Schmitt, “Observations on Decisionmaking in Battle,” *Marine Corps Gazette*, March 1988, pp. 18–19.

16. Intuitive (naturalistic) versus analytical decisionmaking: Gary A. Klein, “Strategies of Decision Making,” *Military Review*, May 1989, and “Naturalistic Models of C³ Decision Making,” in Stuart E. Johnson, Alexander H. and Ilze S. Levis (eds.), *Science of Command and Control* (Washington: AFCEA International Press, 1988).

17. “Satisfice” versus “optimize”: Herbert A. Simon, “Rational choice and the structure of the environment,” *Psychological Review*, vol. 63, 1956, pp. 129–138.

18. Intuitive decisionmaking more appropriate for the vast majority of tactical/operational decisions: A 1989 study by Gary A. Klein (based on 1985 observations) estimated that decision makers in a variety of disciplines use intuitive methods 87 percent of the time and analytical methods 13 percent of the time. Evidence now suggests that this study was actually biased *in favor of analysis*.

More recent studies estimate the breakdown at more nearly 95 percent intuitive to 5 percent analytical. G. A. Klein, "Recognition-Primed Decisions" in William B. Rouse (ed.), *Advances in Man-Machine System Research* (Greenwich, CT: Jai Press, 1989); G. L. Kaempf, S. Wolf, M. L. Thordsen, and G. Klein, *Decision Making in the Aegis Combat Information Center* (Fairborn, OH: Klein Associates, 1992); R. Pascual and S. Henderson, "Evidence of Naturalistic Decision Making in Command and Control" in C. Zsombok and G. Klein (eds.), *Naturalistic Decision Making*, forthcoming publication (Hillsdale, NJ: Lawrence Erlbaum Associates); Kathleen Louise Mosier, *Decision Making in the Air Transport Flight Deck: Process and Product*, unpublished dissertation (Berkeley, CA: University of California, 1990).

Creating Effective Command and Control

1. All commanders in their own spheres . . . : Spenser Wilkinson, *The Brain of an Army: A Popular Account of the German General Staff* (Westminster: A. Constable, 1895), p. 106.
2. Initiative as a source of energy in crisis: Fayol, *General and Industrial Management*, p. 39.
3. Implicit understanding and communication: Boyd, "An Organic Design for Command and Control," p. 18.
4. "A good plan violently executed . . .": George S. Patton, *War As We Knew It* (New York: Bantam Books, 1980), p. 335.
5. Hybrid information management: Kahan, et al.,

Understanding Commanders' Information Needs, pp. 66-67.

6. The purpose of procedures “not to restrict human judgment . . .”: Richard E. Simpkin, *Race to the Swift: Thoughts on Twenty-First Century Warfare* (London: Brassey's Defence Publishers, 1985), p. 239.

7. “A bulky staff implies . . .”: William T. Sherman, *Memoirs of General William T. Sherman* (New York: Da Capo Press, 1984), p. 402.