

Much of the current discussion about future doctrine for U.S. ground forces involves concepts such as dispersed operations, networking, and greater autonomy for small units than has been customary. One important part of that doctrinal discussion relates to the feasibility and utility of “swarm tactics,” tactics that would have small distributed units and maneuverable fires converge rapidly on particular targets. To help inform the debate over the potential relevance of swarming to U.S. military doctrine, this monograph analyzes swarming examples throughout military history. A close reading of those examples might reveal historical patterns and lessons that remain important today.

The research described here was motivated by earlier RAND work on the implications of the information revolution, the advantages that revolution confers on network-based organizations, and the potential value of swarming as a key method of warfare at both the tactical and operational levels.¹ Closely related ideas are being vigorously

¹Two RAND authors, John Arquilla and David Ronfeldt, propose that the information revolution favors the rise of network-based organizations and that swarming will be the major mode of conflict in the future. They propose that the U.S. Army’s current AirLand Battle doctrine may need to evolve to a doctrine based on swarming. Their swarming proposal, named “BattleSwarm,” is still not completely formulated, but does suggest that smaller and more-maneuverable tactical units be deployed in dispersed networks and trained to use swarming as an operational concept. See John Arquilla and David Ronfeldt, *In Athena’s Camp: Preparing for Conflict in the Information Age*, Santa Monica, CA: RAND, MR-880-OSD/RC, 1997. The rise of network-based organizations is discussed in two other Arquilla and Ronfeldt pieces: *The Advent of Netwar*, Santa Monica, CA: RAND, MR-789-OSD, 1996, and “Cyberwar Is Coming!” *Comparative Strategy*, Vol. 12, No. 2, Summer 1993.

pursued by the Marines and certain elements of the Army.² If these ideas prove out, it might mean, for example, that the current hierarchical organization of Army field units should be replaced—at least in part—with a hybrid network-hierarchical organization. Divisions and corps would be replaced by smaller maneuver units.

SOME DEFINITIONS

A definition of swarming is necessary before the proper historical examples can be selected. For the purposes of this monograph, a *swarming case* is any historical example in which the scheme of maneuver involves the convergent attack of five (or more) semi-autonomous (or autonomous) units on a targeted force in some particular place.³ “Convergent” implies an attack from most of the points on the compass.

Admittedly, the phrase “convergent attack” could be stretched to include every case in history in which an army or unit ended up surrounded by the enemy and attacked from all sides during the course of a battle. Encircling and surrounding an enemy has always been a desirable goal: It cuts off the enemy’s supply lines and destroys his morale by cutting off any possible retreat. The distinction is that *swarming* implies a convergent attack by many units as the primary maneuver from the start of the battle or campaign, not the convergent attacks that result as a matter of course when some unit becomes isolated and encircled because of some other maneuver.

²Including the Army’s Army XXI and Army After Next (AAN) programs and the U.S. Army War College.

³The scheme of maneuver describes how arrayed forces will accomplish the commander’s intent. It is the central expression of the commander’s concept for operations and governs the design of supporting plans or annexes. Planners develop a scheme of maneuver by refining the initial array of forces, using graphic control measures (i.e., military symbols such as unit icons, phase lines, avenues of attack, etc., usually drawn on acetate and placed over maps) to coordinate the operation and to show the relationship of friendly forces to one another, the enemy, and the terrain. Digitized units in Force XXI will do all this development on a computer screen and avoid the paper and plastic products. See U.S. Department of Defense, *Staff Organization and Operations*, Washington, DC: Department of the Army, FM 101-5, May 1997.

For example, the German *Blitzkrieg* campaigns of World War II (WWII) were not swarming operations according to our definition. Mobile armored warfare was characterized by rapid encirclements, which led, in turn, to convergent attacks on isolated pockets of enemy troops. However, the initial attack and maneuver of the *Wehrmacht* were not convergent. The Germans usually had to concentrate mass before attempting to penetrate opposing lines; after a breakthrough, panzer units usually tried double envelopments or pincer movements.

This particular definition of swarming is useful because it allows the collection of as much empirical data as possible without including every siege and encirclement battle in history.⁴ As the analysis compares and contrasts various historical cases, a more sophisticated concept and definition of swarming may emerge. Only by starting with a loose definition of swarming will the analysis proceed to a more informative stage.

It is important to differentiate between swarming tactics and conventional tactics that involve only frontal attacks with one or more flank attacks. For example, single envelopments occur when one army makes a frontal attack to pin the enemy while a mobile part of the force attacks one enemy flank.⁵ Sometimes a double envelopment is possible, whereby the enemy front and both flanks are attacked simultaneously (see Figure 1.1).

These traditional set-piece battles are much different from the swarming examples examined in this monograph.

Swarm cases can be broken down into four general categories, based on whether the swarming army begins from a dispersed or a massed position, and whether swarming occurs at the tactical or operational

⁴Sieges upon castles, fortifications, and cities can be thought of as convergent attacks, especially because these types of attacks usually succeeded only when the defender was completely surrounded and cut off from all supply. Breaching a defensive perimeter often required the besieger to attack from all sides to distract the defender from the main assault. However, a siege involves little maneuver, except to simply ring the objective with a fortified camp.

⁵Alexander the Great usually tried this using his phalanx as the pinning force, or “anvil,” and his flanking cavalry as the “hammer.”

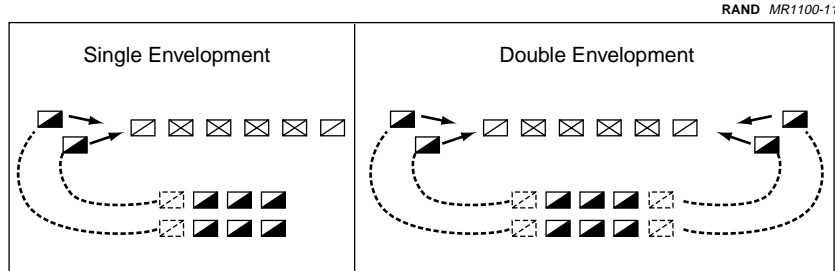


Figure 1.1—Single and Double Envelopments

level.⁶ The first approach may be called “Massed Swarm,” whereby a swarmer army begins as a single massed body, then disassembles and conducts a convergent attack to swarm the enemy from many directions. Most historical examples are tactical Massed Swarm cases, such as the horse-archer cases. The second approach may be called “Dispersed Swarm,” whereby the swarmer army is initially dispersed, then converges on the battlefield and attacks without ever forming a single massed army (see Figure 1.2). The Dispersed Swarm maneuver is more relevant for a network-based organization operating over a dispersed area.

Either of these approaches can be executed at the operational or tactical level (although Dispersed Swarm cases at the operational level have rarely occurred). The four possibilities are pictured in Figure 1.3.

Most historical examples of swarming are tactical cases because of their primitive command, control, and communication (C3) technologies. The communication needs of a tactical swarmer are minor,

⁶It might be useful to provide some terminology. War is conducted on three levels. The highest level, strategy, is concerned with delivering the highest possible number of troops to a battle site and denying the enemy the ability to do the same. Tactics are employed at the lowest level of war—the actual battlefield; they are the crucial moves two armies make when close contact has been established. Operational art is the linkage between strategy and tactics; it is the campaign maneuvering required to either seek or avoid battle. Operational-level maneuvers occur at a larger scale than do tactical maneuvers, both in time and distance.

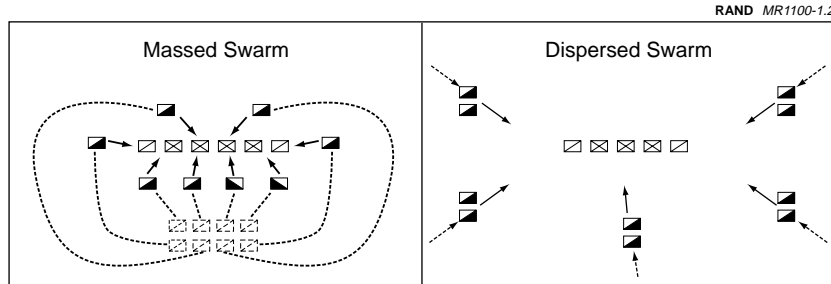


Figure 1.2—Two Types of Swarming Maneuver

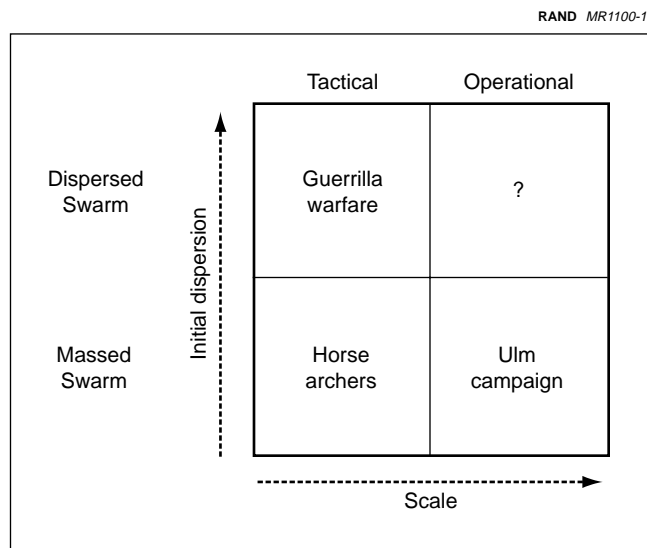


Figure 1.3—The Four Categories of Swarm Cases

assuming all parties on a battlefield can see and hear where the fight is. Operational swarming is much more difficult, because widely separated units must be able to communicate with each other if they are to arrive at the battlefield at the same time from different directions. Before about 1800 A.D., the technological limitations of command prevented army commanders from controlling more than one

body of soldiers or, for that matter, any permanent formation of more than about 3,000 men in the field.⁷ Without radio communications, it was difficult—if not impossible—for field commanders to split their army into many parts because the available means of communication—whether couriers, visual signals such as standards, or acoustic signals such as trumpets—were either too slow or of limited range.⁸ In addition, good roads were usually nonexistent.⁹ Military maps with contour lines were not available until the late eighteenth century, and accurate, portable timekeeping pieces did not appear until the late seventeenth century.¹⁰ It was not until after 1800 that these technological building blocks were in place, ready to be exploited by a commander with the genius to recognize them: Napoleon.

ORGANIZATION OF THIS MONOGRAPH

This monograph is organized as follows. It begins with an explanation of the methodology used to select and analyze historical cases (Chapter Two). Next, it notes important research questions (Chapter Three); then generates some historical conclusions from a systematic, brief review of each historical case (Chapter Four). Chapter Five incorporates the lessons of the past with ongoing work by the U.S. military into a discussion of a possible swarming doctrine. Chapter Six provides conclusions.

⁷As Martin Van Creveld explains in *Command in War* (Cambridge, MA: Harvard University Press, 1985), the term *formation* is used here to mean any body of men who are effectively controlled. Three thousand men is the densest mass of humanity that can physically see and follow a standard or flag on the battlefield.

⁸The notable exception is the Mongols, who were able to effectively use a combination of “arrow riders” and a mission-order system of command (in which small-unit commanders were granted the freedom to deal with the local tactical situation on the spot while following the overall commander’s intent) to assemble their columns at the right place and time. By the second half of the nineteenth century, the combination of the telegraph and railroad also provided some capability to strategically assemble armies in a theater of operations.

⁹The single exception is Roman roads.

¹⁰Van Creveld, 1985, p. 26.