

The US Army War College Quarterly: Parameters

Volume 29
Number 4 *Parameters Winter 1999*

Article 1

11-18-1999

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Recommended Citation

Blumenson, Martin. "The Emergence of Infrastructure as a Decisive Strategic Concept." *The US Army War College Quarterly: Parameters* 29, 4 (1999). <https://press.armywarcollege.edu/parameters/vol29/iss4/1>

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The Emergence of Infrastructure as a Decisive Strategic Concept

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From *Parameters*, Winter 1999-2000, pp. 39-45.

The term "infrastructure" came into prominence during the Vietnam War as a handy way of denoting those permanent installations needed to support the growing presence of US forces. But since Vietnam, the proliferation of American expeditionary interventions in various overseas theaters has now made this once trendy term a permanent feature of the soldier's lexicon. In fact, the definition of infrastructure now enshrined in the *Department of Defense Dictionary of Military and Associated Terms* (10 June 1998) is applicable not only throughout DOD but in NATO as well: "All fixed and permanent installations, fabrications, or facilities for the support and control of military forces." [1] Planners in particular are concerned with the condition the word describes, that is, the presence or absence of certain facilities in an area. Where these installations exist, they make sustained ground operations immediately feasible. Where they are nonexistent, they must be established before modern protracted warfare can occur. Obviously all professional soldiers know the importance of infrastructure. What they may not fully appreciate, however, is that the availability of infrastructure cannot be taken for granted, especially in an age when short-notice expeditionary interventions anywhere on the globe may be contemplated by policymakers. [2]

The *concept* of infrastructure, as distinct from the term itself, apparently originated with the French in World War I, when haphazard support of combat troops was no longer sufficient to feed the greedy maw of armies with rations, ammunition, and other necessities incident to waging industrial-age warfare. In contemporary military parlance, the term infrastructure has become so ubiquitous that in some fuzzy contexts it seems almost interchangeable with "logistics" itself, but it is important for conceptual clarity to keep the two terms distinct. Infrastructure is but one narrow, albeit vital aspect--the permanent supportive installations and facilities--of the total logistics enterprise, which is the broad endeavor of planning and carrying out the movement and maintenance of forces. [3] Supplying armies in the field during World War I required a scientific system and a massive physical plant. If an infrastructure was in place, logistical service was relatively easy, and the battle could proceed.

Territorial installations indispensable for employing armed forces--military infrastructure--most generally pertain to naval vessels and aircraft: deep-water port facilities, heavy-duty piers, off-loading cranes, warehouses, etc. in the case of ocean-borne freight; runways, air traffic control structures, hangars, parking aprons, workshops, ordnance and fuel storage facilities, etc. in the case of air freight and air operations. [4] Land forces, which are dependent upon naval and air transportation for strategic movement, supply, and support, thus have a huge stake in the infrastructures underpinning those two modes of support. But ground forces also have infrastructural needs of their own in the form of supply, maintenance, and repair depots, as well as hospitals, storage facilities, and communications nodes. Moreover, today's information-based warfare, with its addition of advanced electronics and other technologically sophisticated hardware, introduces new complications in the infrastructural challenge. [5] Finally, we must note the internal transportation system--roads, highways, railways, bridges, tunnels, canals, etc.--that permit delivery of supplies from ports to the using units. In sum, infrastructure is the totality of fixed and permanent facilities necessary for the military to live and maintain operational capability within a theater.

In 1899, writing of Kitchener's Nile campaign, Winston Churchill called victory "the beautiful, bright-coloured flower." But in that primitive land, he noted, the transportation brought in for the marching columns was the "stem without which [victory] could never have blossomed." Almost half a century later, Churchill forgot his own lesson. British forces fighting in undeveloped regions early in World War II created large administrative and logistical tails he sneeringly called "fluff and flummery." The British army, he complained, was like a peacock--"nearly all tail." General

Sir Alan F. Brooke, Chief of the Imperial General Staff, countered by pointing out that a peacock without its tail would be a badly balanced bird. But Churchill kept insisting on less fat, more muscle, a smaller tail, and sharper teeth. Commanders in the field at every echelon continued consistently to request more troops to man base and support facilities, while Churchill beseeched them to cut off the tail and sharpen the teeth. His pleas were to no avail, and properly so.

Despite Churchill's resistance to the growing size of the logistical slice, the relative manpower devoted to sustaining and supporting the combat echelons has been increasing since about 1850. By the 1940s, more men served in technical units than in combat formations. In an overseas theater, it took about 25,000 troops to service the 15,000 in a combat division, and almost half of the soldiers within a division themselves engaged in non-combat activities. North Africa, the first Allied theater overseas, was especially difficult for mounting operations. Base installations and transportation facilities were lacking. Building a rudimentary infrastructure, improving roads and rails, and importing a large quantity of trucks, which never reached adequate numbers, made the campaign possible.

Having been plagued by a shortage of trucks everywhere, the planners of the Anzio landings took into account the absence of an infrastructure in the beachhead. They scheduled a heavy shipment of trucks to come ashore early in the invasion. Several days after the troops touched down, Churchill asked how many vehicles had been deposited at Anzio. Eighteen thousand, he learned. With exquisite sarcasm, Churchill remarked, "We must have a great superiority of chauffeurs." Yet the drivers and mechanics were an important part of why the combat troops were able to remain there for four painful months.

The role of infrastructure is nowhere better illustrated than in the preparations for and the execution of the cross-Channel attack. Immediately after the bombing of Pearl Harbor in December 1941, when the Allies officially decided to follow a Europe First strategy and to carry it out by an eventual invasion of the continent, the Americans sent combat forces to the British Isles. Their arrival in January 1942 was the beginning of a continuing buildup of troops and materiel. The shift of resources across the submarine-infested waters of the Atlantic demanded its own infrastructure in Britain, specifically, warehouses, depots, storage space, and the like, all of which were built.

Overlord, the outline plan for the amphibious operation across the Channel, was essentially a logistical document. The initial object of the invading forces was the seizure of a logistical base to support a future offensive campaign. The combat troops ashore were to take possession of the logistical necessities permitting later action designed to defeat Germany. In other words, Overlord was the preliminary step to gain an infrastructure embracing all the facilities necessary for the ultimate battle.

The invaders were to capture a lodgment area in three months. The specified boundaries were the Seine River on the east and the Loire River on the south. Included were that territory of Normandy west of the Seine, all of Brittany, and parts of the ancient provinces of Anjou and Maine. In that region of western France were the ports and airfields required, the space for the transport, depots, storage, and other logistical organizations needed to enable the combat forces to fight--and, of course, some maneuver room. Once in possession of that sizable area, the Allies were to pause. They were to consolidate and build up not only their fighting forces but also their logistical establishment. This accomplished, the Allies were to launch their post-Overlord operations designed to overcome the enemy.

One of the early aims of the invasion was to deny an infrastructure to the Germans. Pre-Overlord air bombardment and French Resistance saboteurs destroyed roads, railways, bridges, and other targets. Yet these were precisely the facilities the Allies would need once they were well ashore. Plans thus included efforts to rebuild and repair the installations damaged and made inoperable. The Allies also recognized that the Germans would destroy the ports rather than abandoning them intact to the Allies. Blocked and mined waterways, dynamited piers and cranes, and fires set in coal dumps and fuel reservoirs were expected. The Allies consequently planned a huge endeavor to rehabilitate those facilities.

To make possible the discharge of vessels before the capture of continental ports and also before the rehabilitation of the German-destroyed harbors, the Allies constructed two artificial ports called Mulberries, one for the British and Canadians, the other for the Americans. In the wake of the invasion assault, they were towed across the Channel to the landing beaches and opened to receive shipments. A three-day storm in the Channel two weeks after the initial

landings put both facilities out of commission. The American Mulberry was abandoned, the British facility repaired. The latter worked continuously as a sheltered harbor just offshore. Although the planners expected the bad weather of the period to stop supply deliveries and reception over the beaches, the process continued well into the fall.

What determined the landing sites in Operation Overlord was the location of ports, the most important objective of the invasion. Specifically, to facilitate the early capture of Cherbourg, the Allies expanded the number of landing beaches to include Utah on the Cherbourg peninsula. The Americans on the right of the invasion forces faced a waterlogged and hedgerowed area, compartmented, close, and restricted, with few roads and a minimum of causeways across large marshes flooded by the Germans. Though this terrain was perfect for the German defenders, the Americans drove to Cherbourg and seized the major port at the end of June, three weeks after D-Day.

The Germans had, as expected, destroyed the port facilities of Cherbourg, and it was two weeks before the first Liberty ship could be unloaded there. Four weeks later, Allied military engineers had refloated most of the ships sunk by the Germans in the harbor, cleared the mines in the port area, and repaired the docks, cranes, and other loading machinery. Cherbourg, a tourist site before the war, became the major port for war materiel in northwestern Europe. Demining and salvage were finally completed by the end of September.

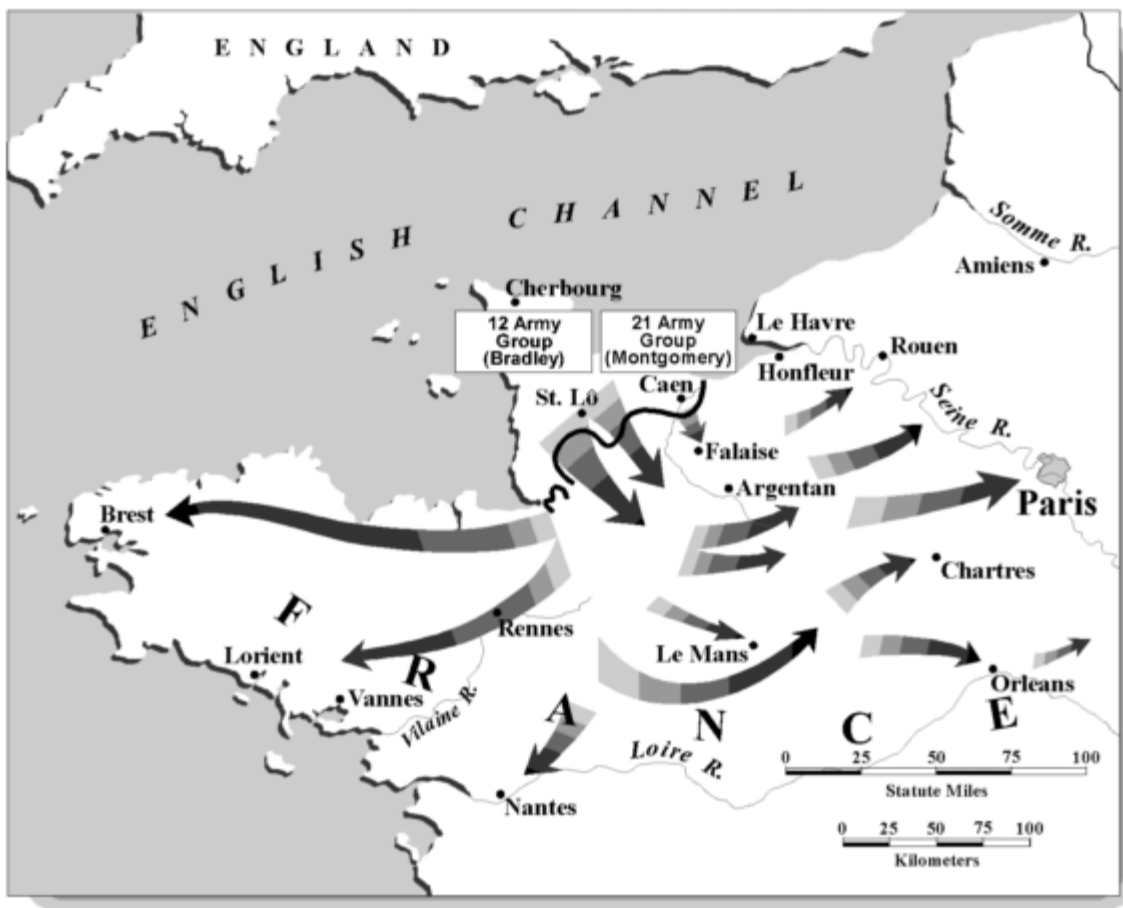


Figure 1. The Allied Breakout.

The British on the left of the forces coming ashore were to take Caen immediately, for Caen loomed large in the planning. The city was a minor port, a major road center, and the entrance to the Falaise plain, which provided excellent ground for waging mechanized warfare and for building airfields. The Caen-Falaise area also gave direct access to the Seine River and Paris, as well as to the ports of Honfleur, Rouen, and Le Havre. Unfortunately, it took the British and Canadians 33 days to seize Caen. The delay held up expanding the beachhead into the interior.

Three weeks after D-Day, the Allies had brought one million men, half a million tons of supply, and 150,000 vehicles to the continent. Yet they occupied an area only one-fifth the size projected by planners. The beachhead was small,

cramped, and congested. Instead of 62 air squadrons operating on 27 continental fields, 30 squadrons operated from 17 strips. Needing space for the buildup, more depth in the beachhead for security, and a larger area for maneuver, the Allies brought more combat troops to the continent at the expense of service units. The 5th Armored Division, for example, was originally scheduled to arrive on 10 September, but it stepped ashore on 25 July.

That was the date of Operation Cobra, the attack that sparked the St. Lô breakout, which changed everything. As the Americans swept southward into Brittany, then headed westward for the ports of Brest and Lorient, the campaign speeded up. Other combat forces swung eastward toward the Seine River. In a sudden surge, the Allies overran most of the lodgment area in August. Three months after D-Day, as stipulated in the plans, the lodgment area was for all practical purposes in Allied hands.

Instead of stopping at the Seine River to consolidate and build up in the lodgment area for the ultimate offensive, General Eisenhower, the Allied Supreme Commander, recalled McClellan's failure at Antietam to aggressively pursue a retreating Lee. Eisenhower decided to avoid McClellan's mistake and to continue the pursuit of the defeated Germans across the Seine River.

The logistical establishment was unable to keep up with the operational advance. A normal logistical structure based on the depot system was lacking. Ninety-five percent of the supplies on the continent were near the invasion beaches, now 300 miles from the front. Deliveries to field army dumps decreased in September, dwindled, and finally ceased. The destroyed railroads were rehabilitated by work on damaged rails, choke points, centers, junctions, bridges, tunnels, viaducts, roundhouses, machine shops, and rolling stock. But the system was unable to keep up with the furious pace of the advance. By 29 August, the Red Ball Express's 132 truck companies, about 6,000 vehicles, were moving more than 12,000 tons daily. But they too were insufficient. By early September the pursuit ground to a halt.

The pursuit, an attempt to end the war quickly, thus failed. The Germans took advantage of the Allied halt imposed by logistical insufficiency, remanned a line of defense on the near approaches to Germany, and made winter campaigning necessary. Operation Overlord succeeded in providing the Allies with the logistical necessities of combat. But the quick thrust beyond the boundaries of the lodgment area proved the tyranny of logistics. Without a functioning infrastructure in Normandy, the Allies were unable to mount the early decisive offensive to defeat the enemy.

Now fast-forward 46 years to Operation Desert Shield, the prelude to Desert Storm that would evict Saddam Hussein's Republican Guard from its entrenched positions in Kuwait. Operation Desert Shield was the unopposed allied logistical and troop buildup employing the modern seaport facilities, airfields, and highway network of Saudi Arabia. Had this advanced infrastructure not been in place and made available to allied forces, or had Iraqi forces seized it before allied forces could respond, the feasibility of Desert Storm itself would have been problematic in the extreme.[6]

Desert Storm/Desert Shield, not to mention recent US interventions in Africa, the Caribbean, and the Balkans, serves to remind today's strategic planners that the hands of the world's one great superpower could easily be tied if the port and staging facilities of overseas target areas are inadequate to receive our gargantuan military machine. Planners are sobered by the realization that existing infrastructure in future theaters, particularly those in the fringe areas of the world, is likely to be minimal and possibly even absent. True, in some situations such as at Cam Rahn Bay in Vietnam, we were able to build a huge port and ancillary facilities from scratch. The shaping of Cam Rahn Bay into a militarily useful port was hastened by the use of DeLong piers, prefabricated in the United States and towed to South Vietnam.[7] But even this process could take excessive time. In the meanwhile, we could face a disastrous fait accompli at the hands of an aggressive, fast-moving enemy. Advances in equipment, technology, and techniques are giving today's logisticians the ability to create a distribution system so efficient that it reduces the need to maintain mountainous stockpiles in-theater, thus minimizing reliance on warehousing, but the requirement for substantial infrastructure will always be with us in major operations.[8]

The days are long past--if such days ever existed--when expeditionary armies could land on foreign shores across the beach and support themselves during extended campaigns by pack train, horse-drawn wagons, and local foraging. Serious campaigning today requires a physical foundation of truly mega proportions, so much so that its presence or absence will determine not only whether campaigns are to be successful, but indeed whether they can be undertaken at all. Expedients such as Mulberry ports, DeLong piers, pierced-steel planking for runways, container storage, clamshell

maintenance structures, lay-down packages for key airfields, the Army's Force Provider soldier community packages, and ingenious producer-to-user distribution schemes--not to mention the Army's concerted efforts to reduce the physical weight of its weapons inventory--can mitigate the infrastructure requirement to some modest degree, but withal infrastructure remains an oppressive sine qua non for the conduct of overseas operations. If the interventionist foreign policy of the last two US administrations is to be sustained in an effort to maintain order in an increasingly disordered world, then infrastructure will need to assume an equal place with flexible forces and strategic transport in the calculus of military planners.

NOTES

Except where noted below, this article is drawn from Gordon A. Harrison, *Cross-Channel Attack* (Washington: Office of the Chief of Military History, 1951), Roland Ruppenthal, *Logistical Support of the Armies* (Washington: Office of the Chief of Military History, 1953), and my *Breakout and Pursuit* (Washington: Office of the Chief of Military History, 1961). The quotation from Winston Churchill is sourced in my *Kasserine Pass* (Cambridge, Mass.: Houghton Mifflin, 1967), pp. 118-19.

1. Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington: Office of the Chairman, Joint Chiefs of Staff, 10 June 1998), p. 219.

2. See, e.g., Williamson Murray, "USAF: Drifting into the Next Century," *Strategic Review*, 27 (Summer 1999), 22; and Ruth Wedgwood, "Procure-All" (Letter to Editor), *Foreign Affairs*, 78 (September-October 1999), 191.

3. Joint Pub 1-02, p. 221.

4. For a glimpse of the complex US Air Force infrastructural organization today, see Lionel A. Galway et al., "A Global Infrastructure to Support EAF," *Expeditionary Airpower*, 23 (Summer 1999), 2-7, 38-40.

5. See Robert Kuttner's "System Meltdown" (*The Washington Post*, 13 August 1999, p. A25) for a droll discussion of the fragility of modern electronic gadgetry.

6. William G. Pagonis, *Moving Mountains: Lessons in Leadership and Logistics from the Gulf War* (Boston: Harvard Business School Press, 1992), pp. 5-6.

7. William C. Westmoreland, *A Soldier Reports* (Garden City, N.Y.: Doubleday, 1976), p. 186.

8. Philip Schoenig, "A Global Military Logistics Network," *Army*, May 1999, pp. 49-52.

Educated at Bucknell and Harvard universities, Martin Blumenson served in Europe during World War II and in Korea during the Korean War and is a retired lieutenant colonel, USAR. He has held the Admiral Ernest J. King Chair at the Naval War College, the General Harold K. Johnson Chair at the Army War College, and the General Mark Clark Chair at The Citadel. He has been Visiting Professor of Military and Strategic Studies at Acadia University, Visiting Professor at Bucknell University, at the University of North Texas, and at the University of Texas (Austin), Professor at the National War College, and Professorial Lecturer in International Affairs at George Washington University. Professor Blumenson is the author of 16 books, including *Breakout and Pursuit* in the official history series *United States Army in World War II*, *The Patton Papers*, *Mark Clark*, and *The Battle of the Generals: The Untold Story of the Falaise Pocket*.

Reviewed 18 November 1999. Please send comments or corrections to carl_Parameters@conus.army.mil