

# AIR POWER IN DESERT STORM

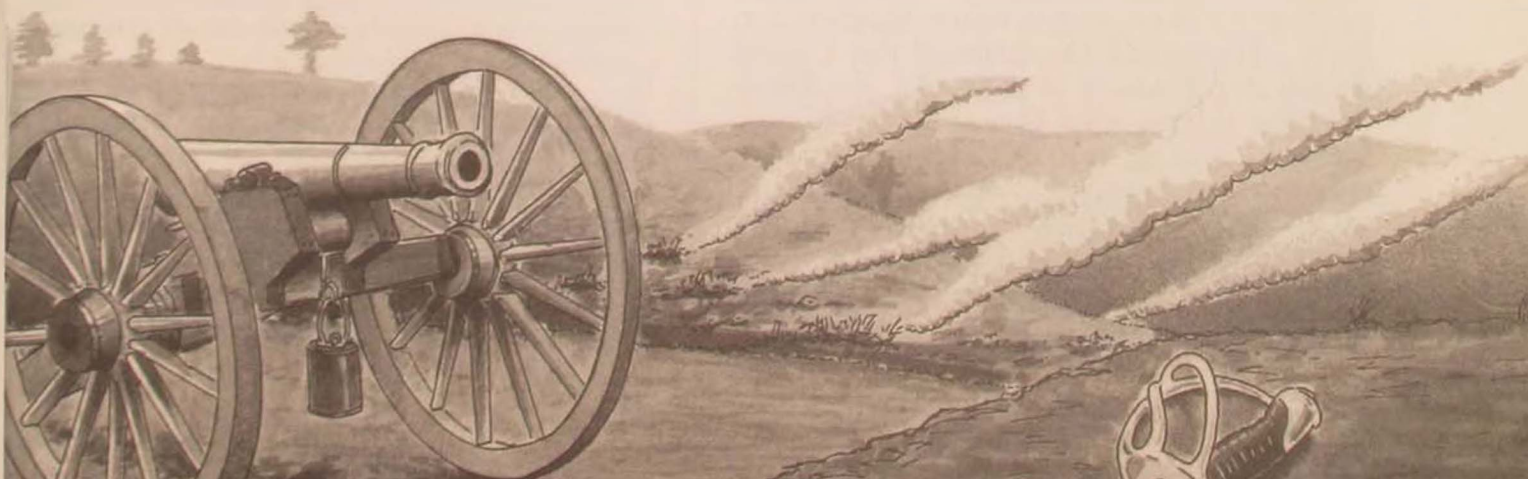
## AND THE NEED FOR DOCTRINAL CHANGE

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**C**ONTRARY to the underlying assumptions found in much of the US military's current doctrine, air power dominated the conduct of Operation Desert Storm. As a result, perhaps the most important lesson the US military could learn from Desert Storm is that it needs to change its doctrine to recognize the reality that air power can dominate modern conventional war (as opposed to revolutionary war and some military activities short of war like Operation Just Cause). Surface forces are still very important, but campaign success now depends on superiority in the air more than it does on surface superiority.<sup>1</sup>

Changing our doctrine to acknowledge that warfare can be dominated by air power is necessary because doctrine plays

a key role in guiding how our future military forces will be organized, trained, equipped, and employed. As the 1940 defeat of France showed, this guidance can spell the difference between victory and defeat.<sup>2</sup> Unfortunately, ensuring that doctrine provides the best guidance is an immensely challenging task. One reason is the difficulty we have in calculating accurately how various developments, such as low-observables, smart weapons, and night sensor technologies, will affect the future conduct of war.<sup>3</sup> An even greater obstacle could be the difficulty of persuading those satisfied with current guidance that it needs to be changed.<sup>4</sup> This is especially true now since our success in the Gulf war provides little incentive for making what are certain to be painful institutional changes. We should keep this second obstacle particularly in mind as we compare the conduct of Desert Storm to Air Force, Navy, Army, Marine Corps, and joint doctrine. This comparison should allow us to see where the guidance in our current doctrine differs from Desert Storm and thus where we need to make changes.





*During Desert Storm, Gen H. Norman Schwarzkopf achieved campaign objectives and kept down allied casualties by effectively utilizing ground forces to support the employment of air power.*

## Air Force Doctrine

Desert Storm validated much of the guidance found in Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*. For example, Air Force doctrine claims what Desert Storm demonstrated—that air power “can be the decisive force in warfare.”<sup>5</sup> Anticipating how air power was employed in Desert Storm, Air Force doctrine charges an air commander with developing “a broad plan for employing aerospace forces to undertake

strategic and tactical actions against the will and capabilities of an enemy.”<sup>6</sup> The strategic actions it recommends are the same as those taken by Gen Norman Schwarzkopf. They involve “the systematic application of force to a selected series of vital targets” that make up the enemy’s “key military, political, and economic power base.”<sup>7</sup> Accurately calculating the effectiveness that was achieved, Air Force doctrine states that “integrated strategic and tactical actions produce a cumulative effect on the enemy’s ability to wage war.”<sup>8</sup> The lack of Iraqi resistance to the coalition’s ground offensive provides still more evidence that Air Force doctrine is right when it states,

Regardless of an enemy’s will to fight on the field of battle, the stresses imposed by persistent and coordinated attacks and the lack of needed logistics and command guidance can make it physically and psychologically difficult, if not infeasible, to remain effective on the battlefield.<sup>9</sup>

The coherency and consistency General Schwarzkopf achieved when he used a joint air component commander to employ air power in Desert Storm also validates the emphasis Air Force doctrine puts on unity of command. Air Force doctrine calls for command arrangements that centralize control of all theater air power under a single air component commander, which it recognizes may not be an Air Force officer. To stress this point, Air Force doctrine quotes Gen William W. Momyer, USAF, Retired, who wrote that

for airpower to be employed for the greatest good of the combined forces in a theater of war, there must be a command structure to control the assigned airpower coherently and consistently and to ensure that the airpower is not frittered away by dividing it among army and navy commands.<sup>10</sup>

Our experience in the Gulf war revealed that another important strength of Air Force doctrine is the priority it assigns to gaining control of the air. According to Air Force doctrine, air superiority should be the first consideration when employing aerospace forces.<sup>11</sup> Air superiority is essen-

tial to success in modern conventional warfare because it prevents the enemy's air force from interfering effectively with the ability of friendly air forces to conduct strategic attacks, air interdiction, surveillance and reconnaissance, airlift, close air support, and other important air operations. Friendly control of the air not only makes these air operations more effective, which in turn greatly enhances the effectiveness of surface forces, but also can enhance the effectiveness of surface forces by preventing detection and interference with their employment by the enemy's air force. In addition, control of the air denies these same advantages to the enemy.

The Gulf war revealed that the silence of Air Force doctrine on the exercise of operational art is one area where change is needed.<sup>12</sup> Air Force doctrine's lack of guidance on the exercise of operational art may explain why some Air Force officers before the Gulf war seemed to believe that the sole purpose of theater air power was to support a ground commander's scheme of maneuver. As a result, these airmen did not realize that campaign objectives could be achieved more effectively by using surface forces to support an air component commander's scheme of employment.

During Desert Storm, General Schwarzkopf demonstrated that it was possible to achieve campaign objectives at an extraordinarily low cost in terms of friendly casualties when surface forces were used to support the employment of air power. He did this by using coalition ground and amphibious forces at the beginning of the campaign to "fix" Iraqi units into positions where air interdiction could inflict terrible destruction, as was achieved by "tank plinking," while simultaneously denying these units effective resupply. During this time, General Schwarzkopf also used surface forces to protect his air bases and disrupt Iraqi surface-based air defenses. After his air power had destroyed the ability of the Iraqi army to fight effectively, he used the maneuver of his surface forces during the ground offensive to seize Iraqi air bases as well as to force Iraqi units into the open where air power

could pursue them and inflict even greater destruction like that on the "Highway of Death."

Lack of guidance on operational art may be the reason for another deficiency of Air Force doctrine. It never mentions the impact air base availability and operability can have on the ability to conduct effective air operations in a campaign. Fortunately for the conduct of Desert Shield and Desert Storm, Saudi Arabia had made a large investment in basing infrastructure. As a result, the obstacles General Schwarzkopf faced were not of the same magnitude as those that hampered the employment of air power in World War II, Korea, and Southeast Asia.<sup>13</sup>

## Navy Doctrine

Comparing the conduct of Desert Storm to guidance provided in Navy doctrine could be a problem since the Navy, unlike the other services, does not publish formal doctrine except for that dealing with fleet tactics. However, the Navy's leadership did articulate a maritime strategy which, like the doctrines of the other services, is used as "a key element" in shaping programmatic decisions.<sup>14</sup> Thus, maritime strategy can be used to compare the Navy's view on the role of air power to the conduct of Desert Storm.

The focus of the Navy's strategy is on using offensive sea control to defeat Soviet maritime strength "in all of its dimensions, including base support."<sup>15</sup> Perhaps because of this focus on fighting the Soviet navy, the Navy's strategy needs significant change since it does not provide much guidance on how naval power, especially carrier-based air power, should be employed in a third-world contingency such as Desert Storm. For example, while it does address the importance of "antiair warfare" in protecting the fleet by countering "the Soviets' missile-launching platforms," maritime strategy makes no mention of the importance of gaining and maintaining control of the air over the land. Nor does it explain how carrier-

based air power should be employed to achieve and maintain control of the air.<sup>16</sup> It also does not mention the importance of waging a strategic air campaign or explain how air interdiction can contribute to campaign success.

Maritime strategy's failure to provide guidance on the employment of carrier-based air power in theater campaigns may also be due to the problems presented by such air operations. These air operations tend to require aircraft that can deliver a fairly significant payload against targets located far from where a carrier can safely operate. Yet only 20 A-6E medium-attack aircraft in a conventional carrier wing of 86 aircraft possess such a capability.<sup>17</sup> The limited deep-attack capability of carrier-based air power helps explain why during the first two weeks of Desert Storm the Navy was reported to have provided only 3,500 sorties (12 percent) of the total 30,000 sorties.<sup>18</sup> Moreover, even this effort required six of the Navy's 14 deployable carriers, dependence on massive Air Force refueling support, and carriers positioned in waters that independent naval analysts had previously considered too dangerous for carrier operations.<sup>19</sup>

Gen George B. Crist, USMC, Retired, who served as commander of Central Command before General Schwarzkopf, called attention to limitations in the Navy's capability before Desert Storm. He noted that "the US Navy is well equipped with the hi-tech weaponry to wage combat against the Soviet Union; it is not so adequately prepared to deal with Third World contingencies, as the Persian Gulf experience [of 1987 and 1988] demonstrated." General Crist concluded that correcting the problem "will take a shift from the Admirals' fixation with forward-deployed carrier battle groups and the 'maritime strategy' to the more mundane missions of controlling sealanes, moving troops and providing naval gunfire and tactical air support to amphibious operations."<sup>20</sup>

Such a shift must include attention to command arrangements. Not surprisingly, in ignoring the role of carrier-based air power in third-world contingencies, mar-

itime strategy does not address the command arrangements needed to integrate the employment of carrier-based air power with land-based air power. However, before Desert Storm demonstrated the value of unity of command, the Navy's position that carrier-based air power should not be controlled by a functional air component commander had been expressed numerous times and had posed a serious problem in the conduct of air operations in both Korea and Southeast Asia.<sup>21</sup>

## Army Doctrine

Several commentators have already credited Army doctrine found in Field Manual (FM) 100-5, *Operations*, with being the key to Desert Storm's success.<sup>22</sup> Perhaps because it is called AirLand Battle doctrine, many of these same commentators also mistakenly believe that it is Air Force as well as Army doctrine. Yet, despite the opinion of these commentators and the "air" in its title, comparison of Army doctrine to the conduct of Desert Storm reveals that it failed to anticipate the dominant role played by air power. Given this failure, it should not be a surprise that Army doctrine also provides remarkably little guidance on how land operations could be conducted to complement the employment of air power.

To its credit, Army doctrine does recognize that "the control and use of the air will always affect operations; the effectiveness of air operations in fact can decide the outcome of campaigns and battles."<sup>23</sup> The problem is that Army doctrine provides little guidance on how land operations can help achieve and maintain control of the air. The lack of guidance is especially apparent in the doctrine's discussion of what it calls "deep operations."<sup>24</sup> Army doctrine makes no reference as to how such operations might contribute to gaining control of the air, perhaps by seizing air bases or areas suitable for air bases, which is how Gen Douglas MacArthur employed land forces in his extremely successful campaigns in the



XVIII AIRBORNE CORPS PHOTO

*Although air base availability and operability has a critical impact on the air campaign, it is not addressed in Air Force doctrine. Fortunately, Saudi Arabia had established an extensive basing infrastructure that accommodated allied flight operations during Desert Storm. Above, F-15s from the 1st Tactical Fighter Wing, Langley AFB, Virginia, prepare for another Desert Storm mission at an air base in Saudi Arabia.*

Pacific.<sup>25</sup> Nor is there any mention of conducting deep operations to disrupt an enemy's surface-based air defenses, as Gen Ariel Sharon did when his tanks crossed the Suez during the 1973 war and Army AH-64s and special operations forces did during Desert Storm when they attacked Iraqi radar sites.<sup>26</sup>

Of course, achieving air superiority is only a means to the desired end—permit-

ting both air and surface forces to operate more effectively, while denying these advantages to the enemy. Thus, once air superiority is achieved, campaign success depends on how a commander exploits control of the air. General Schwarzkopf's conduct of Desert Storm shows that one of the best ways to exploit control of the air is through strategic air operations. Yet Army doctrine makes no mention that such operations can make a significant contribution to the success of land operations.

Air interdiction is another way to exploit control of the air. Army doctrine does note that interdiction performed by what it calls "air fires" is one of the activities typically conducted as part of deep opera-

tions.<sup>27</sup> It also states that arms and services complement each other by posing a dilemma for the enemy. The problem is that Army doctrine seems to see air interdiction only as a means to "support maneuver on the ground."<sup>28</sup> In contrast, Desert Storm revealed that the deployment of coalition ground forces served to "support" coalition air forces by fixing Iraqi forces in a position where air interdiction could inflict such devastating destruction that many Iraqi soldiers welcomed the coalition's ground offensive so they would have the opportunity to surrender and escape death from the air.

Perhaps one of the reasons the Army's doctrine fails to see the full potential of air power can be found in its use of history.

AirLand Battle doctrine uses Gen Ulysses S. Grant's Vicksburg campaign during the Civil War, rather than campaigns that employed air power such as those conducted by General MacArthur in the Pacific during World War II, to illustrate the fundamentals of the offensive.<sup>29</sup> Given the "air" in its title, this is somewhat akin to a book on the conduct of modern football containing only discussion and diagrams for running plays.

*The Navy does not publish a formal doctrine except for that dealing with fleet tactics. Its "Maritime Strategy," a similar document to the other services' doctrine, does not provide adequate guidance on how carrier-based air power should be used in a third-world contingency such as Desert Storm.*

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## Marine Corps Doctrine

Since the Marine Corps possesses both air and ground elements, some might assume that Marine Corps doctrine would provide effective guidance on how air and ground forces should be employed together in a campaign. However, comparing Fleet Marine Forces Manual (FMFM) 1-1, *Campaigning*, which "establishes the authoritative doctrinal basis for military campaigning in the Marine Corps," to General Schwarzkopf's conduct of Desert Storm shows that this would be a bad assumption. Like AirLand Battle doctrine, Marine Corps doctrine does make some extremely good points about operational art.<sup>30</sup> Yet it is similar to Army doctrine in requiring change because it almost totally ignores how air power has dramatically changed the conduct of war.

Evidence of the Marines' neglect of the dominant role air power can play is found in the fact that, like the Army, the Marines use Civil War campaigns fought before the invention of aircraft changed the conduct of war to illustrate their doctrine.<sup>31</sup> Surprisingly, when Marine Corps doctrine does refer to more modern campaigns, it does not discuss the Solomons campaign of World War II in any detail.<sup>32</sup> At Guadalcanal and throughout the war in the Pacific, at the operational as opposed to the tactical level of war, Marine ground elements "supported" the air elements by seizing and holding air bases—in this case, Henderson Field. Henderson Field was the key to US success in this extremely important campaign because it extended the range of land-based Marine, Navy, and Thirteenth Air Force aircraft so they could achieve air domination over the Solomon islands, and in doing so, break the back of Japanese air and surface forces. It will probably astonish marines who fought in World War II that instead of using as examples campaigns in the Pacific—where the Marine Corps played such an important role—Marine Corps doctrine generally refers to campaigns from the European theater, such as Gen Dwight D. Eisenhower's design for the reconquest of Europe.<sup>33</sup>

Moreover, in none of these examples, including Eisenhower's, is there a single mention of air power's critical role.

To its credit, Marine Corps doctrine does address strategic actions and their impact on the conduct of a campaign.<sup>34</sup> However, its examples include only one mention of air power, the 1986 raid against Libya. As with the Solomons, this doctrine fails to mention the crucial contribution the Marine Corps made to strategic actions in World War II by seizing the Mariana islands. The Marianas were critical to the war in the Pacific because they provided the Twentieth Air Force with air bases for its B-29s that made it possible to conduct a strategic air offensive against Japan. This strategic air offensive was so successful that a costly amphibious assault on Japan was not necessary to end the war.<sup>35</sup>

Another deficiency is that organization arrangements receive only indirect attention in Marine Corps campaigning doctrine. After making reference to how his organic aviation allows a Marine air-ground task force (MAGTF) commander to project power well in advance of close combat, this doctrine states, "A MAGTF commander must be prepared to articulate the most effective operational employment of his MAGTF in a joint or combined campaign."<sup>36</sup> It then notes that "if he cannot, he will in effect depend on the other services to understand fully the capabilities of the MAGTF and employ it correctly, an assumption which is likely to prove unwarranted."<sup>37</sup> This statement supports the long-held Marine Corps position against giving an air component commander—especially a non-Marine, as was the case in Desert Storm—control over the MAGTF's air element.

It is obvious that the doctrines of the US Navy, Army, and Marine Corps, unlike Air Force doctrine, did not anticipate air power's domination in the conduct of Desert Storm. As has been pointed out, these three doctrines fail to recognize the monumental contribution strategic air attacks can make towards success on the battlefield, a contribution that was especially apparent in Desert Storm. It is also obvious

that these doctrines do not put the same emphasis on the importance of gaining and maintaining control of the air as does Air Force doctrine.

The low priority many soldiers and marines seem to assign to achieving control of the air helps explain the humor they saw in a cartoon that appeared in the 1980s. This cartoon showed Soviet generals watching their tanks parade through a conquered Paris and asking, "By the way, who *did* win the air superiority battle in the end?"<sup>38</sup> Quite likely one reason for the popularity of this cartoon is the fact that American ground forces have not experienced serious air attacks for almost half a century. But there is another reason for the lack of understanding exhibited by some soldiers and marines regarding the critical linkage between air superiority and the successful employment of friendly air and land forces. It is the failure by those officers responsible for Army and Marine Corps doctrine to learn from the experience of others, such as the Iraqis, who have been on the receiving end of intense air attacks.

Those who do not understand the dominant role air power can play in modern war could learn much from a study of Desert Storm, although abundant evidence was available much earlier. Field Marshal Erwin Rommel, who first experienced the effects of Allied air power in North Africa, made the observation that "a balance of power in the air would have made the *old rules of warfare* [emphasis added] valid again.... Anyone who has to fight, even with the most modern weapons, against an enemy in complete command of the air, fights like a savage against modern European troops, under the same handicaps and with the same chances of success."<sup>39</sup>

Unfortunately for Rommel, he was unable to convince fellow soldiers like Field Marshal Karl Rudolf Gerd von Rundstedt and Gen Geyr von Schweppenburg, who had not had similar experience, of the debilitating effect Allied command of the air would have on their ability to defeat an Allied invasion of Europe.<sup>40</sup> Later, while recovering from wounds received in Nor-

mandy during an air attack, Rommel reflected that "ultimately it was shown that no compromise of any kind can make up for total enemy air and artillery superiority."<sup>41</sup>

Rommel was not alone in concluding that success was unlikely without control of the air. Writing about his experience commanding the XIV Panzer Corps in Italy, Gen Frido von Senger und Etterlin noted,

The enemy's mastery of the air space immediately behind the front under attack was a major source of worry to the defender, for it prevented all daylight movements, especially the bringing up of reserves. We were accustomed to making all necessary movements by night, but in the event of a real breakthrough this was not good enough. In a battle of movement a commander who can make the tactically essential moves only by night resembles a chess player who for three of his opponent's moves has the right to only one.<sup>42</sup>

Perhaps the opinion of Rommel, von Senger, and other foes regarding the importance of controlling the air receives too little emphasis by soldiers and marines responsible for doctrine because they perceive such comments as attempts to deflect blame for being defeated. Another reason, however, could be a perception that recognizing the tremendous role air forces have had in past successes would somehow cheapen the contribution made by ground forces. Worse, they may fear such recognition would relegate the Army and Marine Corps to an unimportant role in future warfare. This fear could not be further from the truth since Desert Storm revealed how essential ground and amphibious forces can be to air power's effectiveness.

Whatever the reason, failure to recognize the full role air power must play in the conduct of war remains a serious shortcoming of the Army and Marine Corps doctrines. Airmen in these two services remain under the domination of the surface elements who see support running in but one direction, with air providing direct support to ground maneuver or amphibious units. Moreover, the Army and



Marine Corps both put great emphasis on the contribution air power makes through close air support. Yet, while absolutely critical in some situations, close air support is usually the most ineffective way to employ air power in a campaign. Unlike a strategic air offensive and air interdiction, close air support puts at risk only those enemy forces that are in close proximity to friendly ground forces. If air power is employed primarily in close air support, the enemy would have a greater opportunity to use operational level maneuver to seize the initiative. Still another disadvantage with close air support is that it imposes added communications requirements and can force airmen to employ

*The Army's doctrine fails to recognize the full potential of air power. To illustrate the fundamentals of the offensive, AirLand Battle doctrine examines the Vicksburg campaign of the Civil War rather than campaigns that utilized air power. Below, soldiers participate in a training exercise in Saudi Arabia during Desert Shield.*

what are often less effective tactics and munitions in order to reduce the risk of fratricide.

## Joint Doctrine

Given that the four services provide the officers who make up the joint staff, it should not be a surprise that joint doctrine is no better than Navy, Army, and Marine Corps doctrine when it comes to recognizing how air power can dominate the conduct of war. For example, the latest draft of Joint Pub 0-1, "Basic National Defense Doctrine," that was circulated for comments, states that campaigns may be composed of a variety of types of operations but then fails to mention the contribution that can be made by a conventional strategic air offensive. Nor does this doctrine mention the requirement to gain control of the air, a key feature of all successful mod-

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NAVY PHOTO, PHC VOLUMES

ern military campaigns, except for insurgencies, up to and including Desert Storm.<sup>43</sup>

Compounding its error of not recognizing that air power can dominate warfare, this draft seems designed to ensure that an Air Force officer will never be in charge of future campaigns like Desert Storm. This possibility begins with the draft's guidance that "the dominant warfare or functional orientation of the force as a whole for continuing day to day execution of the strategic mission should determine the Service affiliation of the combatant commander."<sup>44</sup> The draft then divides the world into maritime, continental, and space "zones."<sup>45</sup> Such a division makes little sense unless these zones are to identify the "dominant" form of warfare. If so, the term *dominant warfare* is likely to be interpreted as meaning that only surface services should provide commanders for unified commands with continental or maritime responsibilities, while the Air Force would be limited to providing commanders for

*The synergies that resulted from his employment of air power gave General Schwarzkopf overwhelming advantages by the time he launched his ground offensive. Above, Army units advance during the "Hail Mary" maneuver and, right, the infamous "Highway of Death" littered with Iraqi vehicles.*

commands with functional or space zone responsibilities. Given the increased doctrinal and budgetary powers possessed by the chairman of the Joint Chiefs of Staff and the combatant commanders under the Goldwater-Nichols Act of 1986, such an arrangement could cause the future US military to reflect the current perspective of Navy, Army, Marine Corps, and joint doctrine that air power only supports surface forces, not the opposite possibility that was demonstrated by Desert Storm.

The keystone joint operations doctrine, Joint Pub 3-0, *Doctrine for Unified and Joint Operations*, recently distributed as a test publication, is yet another example of joint doctrine's lack of guidance on the key role air power must play. This publication

is supposed to set forth doctrine to govern operations by commands such as Central Command. Yet, if General Schwarzkopf had looked at it when preparing his campaign plan, he would not have found any guidance on specific methods, concepts, and principles on how the air and surface elements that make up joint forces should operate together.

Looking at Joint Pub 3-0's list of joint operations categories, General Schwarzkopf would not have found conventional strategic air offensive or offensive counterair operations, let alone guidance indicating that control of the air is essential to effective military operations for both air and surface forces.<sup>46</sup> Nor would he have found guidance that such control is best achieved through coordinated offensive operations in which enemy air bases, air defenses, and command and control facilities are the focus of synchronized attacks by fixed- and rotary-wing air forces, spe-

cial operations forces, and long-range missile systems. Finally, he would have found little guidance on the best organization for integrating the air power provided by the four services into a single, coherent air campaign. All he would have found was the statement that "CINCs establish command relationships and assign authority to subordinates based on the operational situation, the complexity of the missions, and the degree of control needed to ensure that strategic intent is satisfied."<sup>47</sup>

If General Schwarzkopf had looked at the more focused JCS Pub 26, *Joint Doctrine for Theater Counterair Operations (from Overseas Land Areas)*, he would still have found insufficient guidance. For example, instead of a strong statement that control of the air is essential to success, this doctrine only says, "When there is an enemy air power offensive threat to friendly surface operations, the requirement for friendly counterair actions must

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be a major consideration in the joint planning for those operations."<sup>48</sup> This rather vague "guidance" is followed by what the Iraqi military would see as a tremendous understatement: "Limiting the enemy's use of its air power provides increased potential for friendly force success."<sup>49</sup>

The guidance provided in joint counterair doctrine on command arrangements is even more flawed, although it begins well when it states that "the joint force commander will normally designate a joint force air component commander."<sup>50</sup> Unfortunately, the doctrine contains no explanation of why such an arrangement is "normally" best. Instead, it proceeds to create ambiguity by limiting the responsibilities and authority of the joint force air component commander (JFACC), while simultaneously acknowledging that "nothing shall infringe on the authority of the Theater or Joint Force Commander [in his ability] to ensure unity of effort in the accomplishment of his overall mission."<sup>51</sup>

Fortunately, despite joint doctrine's lack of guidance, General Schwarzkopf decided to appoint a JFACC to be responsible for developing a coherent plan for employing coalition air power that was not limited to counterair operations. He then approved the plan in the form of a single air tasking order that integrated the employment of Air Force, Army, Navy, Marine Corps, and allied air power. Finally, he delegated to his JFACC the authority to execute this plan, which allowed his air forces to win control of the air and made it possible to conduct a strategic air offensive and air interdiction operation in a way that produced a powerful synergy.

The synergies that resulted from his employment of air power gave General Schwarzkopf overwhelming advantages by the time he launched his ground offensive. The Iraqi army had been severely weakened physically by intense, almost continuous air attacks that had demonstrated that aircraft can be extremely effective tank killers. The Iraqi army had also been greatly weakened psychologically by the knowledge that it had almost no ability to

resist the coalition's devastating air attacks, an effect compounded by the warnings the coalition often gave Iraqi units before attacking. Thanks to his airborne warning and control system (AWACS) and joint surveillance target attack radar system (J-STARS), General Schwarzkopf possessed unprecedented near-real-time information on air and surface operations of both coalition and Iraqi forces. Plus he was able to deny the enemy similar information, which was the key to the coalition's successful shift of forces to the left flank resulting in the envelopment of the bulk of the Iraqi army.

Control of the air allowed General Schwarzkopf to use the electromagnetic spectrum to communicate quickly with his forces, whereas the Iraqi military was often reduced to using couriers. Observation made possible by control of the air greatly enhanced the effectiveness of coalition artillery, while simultaneously rendering Iraqi artillery largely ineffective. Finally, unlike the Iraqis who had almost no supplies of any kind because of the coalition's air interdiction, General Schwarzkopf was able to support his advancing maneuver forces with bumper-to-bumper convoys of trucks.

In conclusion, comparing US military doctrine to General Schwarzkopf's conduct of Desert Storm reveals how fortunate we were that Air Force doctrine fully recognized air power's ability to dominate the conduct of modern war. Thanks to Air Force doctrine, General Schwarzkopf possessed aerospace forces that made it possible for him to achieve his objectives at a very low cost in terms of friendly lives. By the same token, this comparison reveals that we are fortunate Desert Storm gave us the opportunity to learn so cheaply that much of the US military's current doctrine, which tends to see air power primarily as support for the employment of surface forces, needs to be changed to recognize that air power can play a dominant role. Under these doctrinal changes, US military forces would be organized, trained, and equipped to fight conven-

tional campaigns in which surface forces are employed to enhance the effectiveness of US air power while minimizing the risk of friendly casualties.<sup>52</sup> What has not yet been revealed is whether our relatively low losses in Desert Storm provided sufficient incentive to persuade those respon-

sible for doctrine that there is a need for change. If not, the question might be, What losses will it take for the US military to recognize the degree to which air power has, to paraphrase Rommel, made the old rules of warfare invalid? □

#### Notes

1. Air power's dominance results from its ability to enhance a commander's exercise of operational art in an environment characterized by fog, friction, and chance. The chance a commander will wage a successful campaign is increased by air power's ability to minimize his own fog and friction while simultaneously magnifying the enemy's. See the author's "Operational Art: An Airman's Perspective" (Presentation to the Military Operations Research Society's Mini-Symposium on Operational Art and Analysis, Fort McNair, Washington, D.C., 6-9 March 1990).

2. For an excellent discussion of the importance of doctrine to Germany's success in May 1940, see Robert Allan Doughty, *The Seeds of Disaster: The Development of French Army Doctrine, 1919-1939* (Hamden, Conn.: Archon Books, 1985).

3. The historian Michael Howard compares the problem of verifying military calculations made in peacetime as being like a sailor navigating by dead reckoning, noting that

you have left the terra firma of the last war and are extrapolating from the experiences of that war. The greater the distance from the last war, the greater become the chances of error in this extrapolation. Occasionally there is a break in the clouds; a small-scale conflict occurs somewhere and gives you a "fix" by showing whether certain weapons and techniques are effective or not; but it is always a doubtful fix. ("Military Science in an Age of Peace," *Royal United Services Institute [RUSI]*, March 1974, 4)

4. The magnitude of the problem involved in making major institutional changes due to the challenge of new weapon systems is illustrated by the case of the horse cavalry. According to Edward L. Katzenbach,

The military history of the past half-century is studded with institutions which have managed to dodge the challenge of the obvious. The Coast Artillery continued until the middle of World War II, at least in the United States. Other such institutional anomalies will spring to mind. But the most curious of all was the horse cavalry, which maintained a capacity for survival that borders on the miraculous. . . . When today's weapons are already out of date and there is therefore a daily need for reassessing our military institutions' response to them, the strange and wonderful survival of the horse cavalry may amount to something more than a curiously alarming anachronism. (Edward L. Katzenbach, Jr., "The Horse Cavalry in the Twentieth Century: A Study in Policy Response," in *American Defense Policy*, ed. John E. Endicott and Roy W. Stafford, Jr., 4th ed. [Baltimore: Johns Hopkins University Press, 1977], 360-61, originally published in *Public Policy* 7 [1958]: 120-49)

5. Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, 16 March 1984, 1-3.

6. *Ibid.*, 2-11.

7. *Ibid.*, 3-2.

8. *Ibid.*, 2-13.

9. *Ibid.*, 2-13 and 2-14.

10. *Ibid.*, 4-2. See also 2-8, 2-20, and 4-4.

11. *Ibid.*, 2-11.

12. The final draft of the revised AFM 1-1 that was recently circulated for comments within the Air Force puts great emphasis on the exercise of operational art.

13. See the author's "Operational Art and Aircraft Runway Requirements," *Airpower Journal* 2, no. 3 (Fall 1988): 57-63.

14. Adm James D. Watkins, "The Maritime Strategy," supplement to US Naval Institute *Proceedings*, January 1986, 4.

15. *Ibid.*, 11.

16. *Ibid.*, 12.

17. John D. Morrocco, "Revolution in Jeopardy," *US Naval Institute Proceedings* 116, no. 6 (June 1990): 59.

18. Jeffrey Record, "AF's Future Bright after Stellar Gulf Showing," *Air Force Times*, 11 March 1991, 36.

19. Proposed budget cuts could reduce the number of deployable carriers from 14 to 12. Morrocco, 57. Independent naval analysts questioned moving carriers into the Persian Gulf where the ships would be vulnerable to mines and Iraqi Exocets and where the narrow shallow water and the presence of oil rigs and shipping limited maneuverability. Rowan Scarborough, "Carrier to Sail within Attack Distance of Iraq," *Washington Times*, 27 September 1990, 8; and Melissa Healy, "Gamble Seen in U.S. Carrier's Entry into Narrow Gulf," *Los Angeles Times*, 28 September 1990, 6.

20. Gen George B. Crist, USMC, Retired, "A U.S. Military Strategy for a Changing World," *Strategic Review* 18, no. 1 (Winter 1990): 19.

21. See Gen William W. Momyer, USAF, Retired, *Air Power in Three Wars* (Washington, D.C.: Government Printing Office, January 1978), 51-59, 88-99, 107-8.

22. For example, see Stephen S. Rosenfeld, "Military Doctrine Today," *Washington Post*, 22 March 1991, A25. He mentions learning from retired Army colonel Harry Summers that war fighting was rediscovered after Vietnam and that it generated "the Army's and Air Force's Airland battle doctrine." From retired Army colonel Trevor Dupuy he learned that "[General Schwarzkopf] and his staff applied a doctrine which the U.S. Army and Air Force adopted about 10 years ago: the AirLand Battle Doctrine."

23. Field Manual (FM) 100-5, *Operations*, 5 May 1986, 4.

24. *Ibid.*, 19-20, 37-39.

25. For example, see George C. Kenney, *General Kenney Reports: A Personal History of the Pacific War* (New York: Duell, Sloan and Pearce, 1949; Washington, D.C.: Office of Air Force History, 1987), 91, 111. Soon after arriving in theater, General Kenney convinced General MacArthur of the need to use ground forces to seize the Dobodura plain just west of Buna for an air base. Such a base was needed to make Kenney's aircraft more effective by extending their range and payload since they would not have to cross the Owen Stanley mountains and penetrate the thunderstorms that often formed over this mountain range.

26. M. J. Armitage and R. A. Mason, *Air Power in the*

*Nuclear Age* (Urbana, Ill.: University of Illinois Press, 1983), 134.

27. FM 100-5, 20.

28. *Ibid.*, 25.

29. *Ibid.*, 91-94.

30. Fleet Marine Forces Manual (FMFM) 1-1, Campaigning, 25 January 1990.

31. *Ibid.*, 21-23, 66.

32. *Ibid.*, 24.

33. *Ibid.*, 42-43, 49.

34. *Ibid.*, 27.

35. Maj Gen Haywood S. Hansell, Jr., USAF, Retired, *Strategic Air War against Japan* (Maxwell AFB, Ala.: Airpower Research Institute, 1980), 30-35, 90-93.

36. FMFM 1-1, 29.

37. *Ibid.*

38. Prepared statement of David C. Isby, historian and analyst, BDM, in House, *Roles and Missions of Close Air Support: Hearing before the Investigations Subcommittee of the Committee on Armed Services*, 27 September 1990, 101st Cong., 2d sess., 1991, 16.

39. Erwin Rommel, *The Rommel Papers*, ed. B. H. Liddell Hart, trans. Paul Findlay (New York: Harcourt, Brace and Company, 1953), 285.

40. *Ibid.*, 468-71, 508-9.

41. *Ibid.*, 511.

42. Frido von Senger und Etterlin, *Neither Fear Nor Hope* (New York: E. P. Dutton, 1964), 244.

43. Joint Pub 0-1, "Basic National Defense Doctrine" (draft), undated, V-16 through V-23. Since this draft was circulated for comments a new "proposed final pub" has been written but not circulated for comments. This proposed final pub still fails to provide useful guidance on the vital role aerospace power must play in a campaign. Evidence of the problem can be seen in that the publication divides the world into maritime and continental theaters, a division that lost its value when aerospace power changed the conduct of war. Under the maritime theater, the final publication states campaigns may be composed of nine types of operations, but it does not list counterair operations as a separate type of operation, as it does with amphibious and airborne operations. Instead, the publication includes "establishing and maintaining local superiority (including air) in an area of naval operations." The joint or single-service land-based air operation category does list "anti-air warfare," but also includes in this category surface sea surveillance, antisurface

ship warfare, antisubmarine warfare, aerial mine laying, and aerial refueling. Joint airland operations is still another of the publication's categories. Control of the air receives only passing attention when the publication states that joint airland operations are those that "seize or defend major land areas together with associated airspace necessary for the prosecution of the theater campaign." Under continental theaters this publication does list joint counterair operations, but only as one of three subsets of joint airland operations, which is one of eight types of operations in this theater. Its list of operations also includes amphibious, airborne, riverine, and "joint or single-Service strike, interdiction, electronic warfare, special, reconnaissance and surveillance operations." The publication's placement of these different types of aerospace operations in a single category at the same time that it includes riverine and amphibious as categories distinct from naval operations provides further evidence that this pub fails to provide appropriate guidance on the key role aerospace power plays in modern war. Proposed final pub, Joint Pub 0-1, 7 May 1991, IV-7 to IV-11.

44. *Ibid.*, V-7; III-40.

45. *Ibid.*, III-3.

46. Joint Pub 3-0 (test pub), *Doctrine for Unified and Joint Operations*, January 1990, III-12.

47. *Ibid.*, III-5.

48. JCS Pub 26, *Joint Doctrine for Theater Counterair Operations (from Overseas Land Areas)*, 1 April 1986, III-2.

49. *Ibid.*

50. *Ibid.*, III-4.

51. *Ibid.*, III-4 and III-5.

52. Our tremendous superiority in aerospace technologies and the public's lack of tolerance for high casualties are two realities that should guide the employment of US military power. If they do, commanders will conduct campaigns in a manner that avoids putting our surface forces into situations where the full effectiveness of US aerospace power cannot be realized or where the enemy can inflict high casualties. In such campaigns commanders would first employ their surface forces to help aerospace forces achieve control of the aerospace environment. Once they achieve this control, commanders would then employ their surface forces to exploit the advantages control provides, perhaps by moving into easily defended positions that are chosen for their ability to force the enemy commanders to expose their forces to destruction by our aerospace forces.