The preceding chapters have sketched an approach to power projection operations that offers the promise of defeating armored invasions even in highly stressing scenarios where only modest defensive forces are available in the theater at the outset of the campaign. This chapter discusses the key components of the new approach and which of them may be at risk of receiving inadequate funding.

The following capabilities are vital in gaining rapid dominance over enemy operations quickly and achieving an effective, early halt:

1. **Rapid deployment and employment.** In addition to maintaining a modestly sized but potent force in the theater on a routine basis, the United States requires assets to ensure that forces essential to the halt campaign can arrive in the theater within days and conduct high tempo operations. Strategic airlift constitutes the backbone of this early deployment capability. It should be supplemented by adequate stocks of prepositioned materiel, particularly high-quality munitions sufficient to sustain operations until either the halt is achieved or materiel begins to arrive by sea.¹ Aerial refueling aircraft will be needed in large numbers to assist in the deployment and employment of combat and support aircraft and to increase the capacity and utilization rate of the airlifters.

¹Materiel should be prepositioned at multiple protected sites to minimize the risk of losing it in a preemptive attack. Intratheater airlift and ground transportation can distribute materiel to units.
2. **Enhanced capabilities to defeat weapons of mass destruction.** U.S. leaders and allies must have confidence that U.S. forces can be committed to future conflicts with acceptable costs and risks. A multipronged approach will be essential to provide the high levels of effectiveness needed not only to deter but also to prevent the use of chemical, biological, and nuclear weapons against U.S. allies and forces. This calls for capabilities to locate, identify, and destroy WMD stockpiles and their delivery vehicles before they are launched; improved, multilayered active defenses against ballistic and cruise missiles; timely and accurate capabilities for launch warning and attack assessment; and a range of passive protection measures. Capabilities to bring effective firepower to bear from longer ranges will also be required.

3. **Ensuring early freedom to operate.** All forces in the theater must be free from the threat of enemy air attack, and air forces must be free to observe and to attack enemy targets. Rapidly seizing the initiative in the air requires a dominant fighter—one that can enforce combat against enemy fighters and bombers and enjoy a highly favorable exchange ratio. Gaining freedom of operation over enemy forces and territory also demands effective capabilities to suppress and destroy surface-based air defenses, especially the most-capable radar-guided surface-to-air missiles (SAMs).

4. **Accurate and dominant knowledge of the battlefield.** Allied forces can be most effective only when they know with confidence the location and disposition of enemy forces and can deny comparable knowledge to the adversary. This requires a range of sensors and platforms to acquire data about the enemy, assessment capabilities to turn these data into information, and command and control centers to use this information to direct the activities of friendly forces.

5. **Lethal firepower systems in sufficient numbers.** We have already seen the tremendous leverage provided by advanced antiarmor munitions: They can increase by tenfold or more the effectiveness of aircraft assigned to destroy enemy armor. In the opening phase of a conflict, when sorties are limited and time is of the essence, it is essential that sufficient numbers of such munitions be available.

The importance of many of these capabilities can be illustrated by examining the effects of a delay in the commencement of large-scale
air attacks on an enemy invasion force. In our base case, such attacks began on Days 5 and 6 of the war when F-15Es and then B-1Bs began their operations. If U.S. commanders were compelled to delay the employment of these aircraft for two more days for whatever reason—delays in achieving an adequate degree of air superiority, threats to deployment bases, or insufficient airlift to deploy supporting assets—the effect on the outcome would be significant. Figure 5.1 shows our estimate of the result, assuming an "heroic" enemy. Compared with the base case, in which enemy forces penetrated as far as 260 kilometers, we see a penetration of 350 kilometers. Eventually, the joint force pushes back the leading edge and kills roughly the same number of armored vehicles, but penetration distance is, in our estimation, quite sensitive to delays in the onset of heavy air attacks.

Not surprisingly, both penetration distance and lethality are highly dependent on the number and quality of the antiarmor munitions.
available to the defenders. In Figure 5.2, we show the result when only 4000 Skeet dispensing weapons are available to the halt force, as opposed to the 10,500 employed in the base case. This result suggests that a highly determined adversary could capture much more ground if future U.S. air forces were compelled to fall back on older types of antiarmor munitions.

Some clear implications emerge from these results about the types of capabilities required to ensure that future U.S. forces have robust capabilities to halt a combined-arms offensive. Funding for programs to provide some of these capabilities, such as modern and capable airlift and enhanced ballistic missile defenses, does not appear to be in jeopardy. Other areas, discussed below, merit greater attention and, in some cases, greater resources. Because of the lead times associated with developing and fielding new equipment and because of the longevity of new platforms, the following points should be con-
sidered in the context of enemy capabilities that will emerge over the next ten years or more.

**DEFEATING ENEMY AIRCRAFT**

It is essential that U.S. and allied forces, both in place and deploying into the theater, be protected from enemy air attacks early in the conflict. At the same time, U.S. commanders will want to eliminate enemy threats to friendly offensive air operations as quickly as possible. As potential adversaries acquire more-capable fighter aircraft and, importantly, longer-range air-to-air missiles, it will become more difficult for a small expeditionary force to defend friendly airspace effectively and to secure air superiority quickly.

By 2005, a number of regional powers are projected to have fielded fourth-generation fighter-interceptors of the Su-27 Flanker class. The more wealthy among these powers, such as China, may eventually deploy hundreds of these advanced aircraft. Armed with the medium-range AA-12 or similar air-to-air missile, this type of aircraft poses a potent threat to the best U.S. air-to-air fighters. In detailed assessments of air-to-air combat using the Tac Brawler model, Su-27s armed with AA-12s achieved kill potentials of approximately .25 against F-15Cs armed with Advanced Medium Range Air-to-Air Missiles (AMRAAMs). Thus, a flight of six Su-27s might expect to destroy between one and two F-15s in a single sortie—a far higher level of lethality than U.S. fighters have ever encountered. This translates to an exchange ratio of between 3:1 and 6:1 for the F-15Cs against Su-27 Flanker aircraft armed with AA-12s. This rather poor exchange ratio, coupled with the F-15’s inability to operate freely over enemy territory covered by radar-guided SAMs, means that up to two weeks might be required to attrit substantially the enemy’s force of combat aircraft. And U.S. losses would be high: In the opening days of conflict, U.S. forces might lose as many fighter-interceptors as they deploy to the theater each day. Hence, while the F-15C with AMRAAM retains substantial lethality against

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2In other words, for every F-15C that is lost in air-to-air combat, between three and six Su-27s are downed. See R. D. Shaver, E. R. Harshberger, and N. W. Crawford, Modernizing Airpower Projection Capabilities: Future Needs and Options, RAND, IP-126, 1993.
Su-27 Flanker-class aircraft, a small U.S. force of current-generation fighter-interceptors would not be able to prosecute an aggressive campaign against the enemy’s air force in the face of these losses. Meanwhile, joint forces would find their deployment ports and airfields under attack while being constrained in their efforts to attack advancing enemy ground forces.

By modernizing its fleet of fighter-interceptors, the U.S. Air Force can ensure that joint forces can quickly gain the freedom to operate even in the face of enemy modernization and stressing, short-warning conflicts. Because of the modernized F-22’s ability to engage enemy aircraft before being detected by them, the Su-27’s kill potential against the F-22 drops to less than .05, and few friendly aircraft are lost in air-to-air engagements. In fact, the F-22 armed with AMRAAM can achieve exchange ratios upwards of 20:1 against Su-27s. The F-22’s high levels of lethality and survivability, coupled with the fact that the F-22 can operate effectively in the vicinity of enemy SAMs, means that a force equipped with aircraft of this nature can achieve a robust air defense posture and air superiority within a few days. Keeping in mind the sensitivity of campaign outcomes to fairly small changes in the time required to enable heavy antiarmor attacks, the value of highly capable air-to-air fighters becomes manifest.

It is worth noting here that judgments about the value of modernizing the U.S. fighter-interceptor fleet, like other modernization programs, should be informed by dynamic assessments of joint capabilities in the context of stressing but plausible future scenarios. A direct comparison of the capabilities of the F-15C versus the Su-27 is of little relevance outside of such a context.

SUPPRESSING SURFACE-TO-AIR DEFENSES

For similar reasons, it is important that DoD continue to enhance capabilities to suppress and destroy the most modern SAM systems. When employed to best effect, modern SAMs such as the SA-10 can provide in-depth protection to key rear area assets, as well as moving coverage of advancing ground forces. The SA-10 and similar systems pose new challenges to defense suppression efforts. Their phased-array radars can be difficult to locate with precision, because they can detect and track aircraft quickly, using adaptive radar wave-
GAINING AND EXPLOITING INFORMATION

It is the nature of power-projection operations that the number of U.S. and allied forces available at the outset of a conflict will be modest in relation to the size of the attacking force. Hence, to be effective in damaging and halting a large-scale armored offensive, expeditionary forces must be highly efficient. A brute force approach to the defense—covering the battlefield with platforms and weapons—is infeasible and, for a host of reasons, undesirable in any case.

Thus, there will be a premium on systems that can locate the main concentrations of enemy maneuver forces, determine the direction and velocity of their movement, and pass this information on to control centers in a timely fashion. The overall objective is to develop operational concepts for targeting moving ground forces that are similar in timeliness and flexibility to current concepts for engaging airborne air forces. Like most air defense sorties, ground attackers would not be launched against specific targets but, rather, would be provided as assets to controllers who, armed with up-to-date information on the location and disposition of enemy ground forces, would assign targets to the attack sorties and provide them with information to assist in the engagement.
Implicit in this approach is the need to distinguish military units, especially armored formations, from clusters of nonmilitary and other unarmored vehicles. To be truly robust in the face of potential countermeasures, such discrimination will probably require multiple types of sensors, such as moving target indicator (MTI) and synthetic aperture (SAR) radars, electro-optical sensors, and passive signals intelligence (SIGINT) collectors. Battlefield surveillance sensors, assessment capabilities, and control centers themselves will need to be rapidly deployable or, in some cases, “virtually” deployable. One way to ensure rapid availability of certain capabilities is to set up staffs in one or two central locations to which theater forces “reach back” for support. Given robust, real-time communication links of sufficient capacity, data from theater-based sensors can be sent to these staffs and processed there, with information then sent back to users in the theater.

In light of these requirements, it is difficult to understand the rationale behind DoD’s decision, announced as part of the Quadrennial Defense Review, to reduce from 19 to 13 the number of JSTARS surveillance and battle management aircraft to be fielded. Eight to ten of these aircraft will need to be deployed forward to maintain two continuous orbits in an overseas theater, and there is no immediate substitute system that offers the full range of capabilities provided by this system. Whatever path is chosen, DoD clearly will need to expand its wide-area surveillance capabilities, along with the assessment and control functions needed to make best use of the data provided by these sensors.

**RAPIDLY DESTROYING ARMOR**

We have seen that the ability of a given force to halt an enemy invasion depends upon modern antiarmor munitions. Sortie effectiveness can be increased by factors of ten or more when newer weapons are substituted for older, unguided weapons. The question then arises: How many of these advanced antiarmor weapons are sufficient to halt two nearly simultaneous invasions?

Figure 5.3 compares the number of antiarmor weapons used by joint forces in three variants of our basic scenario—each of which resulted in a rapid halt of the invasion. The left bar shows the antiarmor weapons used in the halt phase of a scenario featuring the “heroic”
adversary, where each unit presses the attack at a high rate of speed until more than 70 percent of its armored vehicles have been damaged or destroyed. In this case, U.S. forces required nearly 10,500 WCMD and JSOW weapons dispensing smart, antiarmor bomblets (along with a number of ATACMS missiles and helicopter-delivered Hellfire munitions) to halt the attacker by Day 10.

The other two bars in Figure 5.3 show area antiarmor weapons expended in cases involving our less-heroic opponent, whose forces advance more slowly and are rendered ineffective when 50 percent of their vehicles are damaged or destroyed. If one is satisfied that damaging 50 percent of the armored vehicles to an “A-kill” level or better is sufficient, around 3200 area antiarmor munitions would be called for. Alternatively, if one strove for a more-demanding damage criterion of 50 percent M-, F-, or K-kills, some 5700 such weapons would be needed.

Using the middle case as a benchmark, we conclude that DoD should plan to procure a mix of antiarmor weapons, including not fewer
than approximately 15,000 smart, air-delivered area antiarmor weapons to be able to defeat armored offensives in two major theater wars and still have reserve stocks for subsequent phases of these or other operations. This inventory goal is more than twice what the Air Force, Navy and Marine Corps are currently planning to procure by 2005.3 Remarkably, in DoD assessments of U.S. force structure set in this time frame, many Navy, and Marine Corps sorties allocated to the attack of armored formations are shown to be delivering the Mk-20 Rockeye—a 1960s era unguided cluster weapon of low effectiveness. These must be regarded as, essentially, wasted sorties.

It will be important for the United States to preposition the bulk of these stocks of advanced munitions overseas so that scarce inter-theater airlift assets, which are scarce, are not needed to move the munitions in the opening days of the conflict.4

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3These weapons figures assume a weapon similar in capability to the WCMD-delivered or JSOW-delivered sensor fuzed weapon examined here. There are many options for area antiarmor munitions, including the Brilliant Antitank Weapon (BAT) and the developmental Low-Cost Anti Armor Submunition (LOCAAS). By all accounts, these weapons will be at least as effective as SFW and may be less costly. Whatever the individual weapons chosen, it is clear that U.S. capabilities and budgets must be increased in this area.

4In our baseline scenario, 1400 WCMD/Skeet weapons are needed to attack 140 kilometers of armored column every day. To deliver just these weapons from the United States to a theater as distant as the Persian Gulf would require approximately 30 C-141B equivalent sorties per day, or around one-third of the total daily airlift effort.