Aerospace Force Enhancement

Airpower was first envisioned by military leaders as a tool to enhance the performance of surface forces. Military commanders saw the flimsy flying machines built by the Wright brothers and others primarily as tools for observation—a means to see over the next hill, to watch enemy movements, and to assist in the adjustment of artillery fire. This role had already been explored with static observation balloons in the Napoleonic Wars, the American Civil War, and the Spanish-American War. It is not surprising, therefore, that the first American military aviators and aircraft became part of the Army Signal Corps in August 1907.

The role of airpower rapidly expanded during World War I as many new combat and support missions were pioneered. Since the Great War, the role of airpower has expanded into almost every area of military activity. More than an equal partner with land and sea forces, airpower (and now aerospace power) not only wages war in its own domain but also provides capabilities that enhance all forms of military power.

Although aerospace forces perform many crucial enhancing functions,[1] five of these functions are uniquely important to the success of aerospace and surface forces: airlift, air refueling, spacelift, electronic combat, and surveillance and reconnaissance (the original task of airpower). Each has become indispensable in modern warfare.

Airlift

Aerospace power revolutionized warfare by providing the means to concentrate great combat power rapidly at any spot on the globe. In the post-World War II era, it quickly became obvious that no place on earth was so remote that airmen could not quickly deliver their firepower. Distances previously crossed in days, weeks, or even months could be traversed in minutes or hours. Airlift continued the airpower revolution by providing the capability to deliver more than just firepower. Airlift provided the means to transport surface forces and their equipment to those same remote locations with nearly equal speed, and it provided the sustenance required for staying power.

Airlift provides global reach for military forces, a capability of particular importance given the worldwide commitments and interests of the United States. Without airlift, the United States would be hard-pressed to respond to far-flung crisis situations. Viewed in this light, effective airlift becomes the backbone of deterrence, at least at the nonnuclear level.

The United States is a nearly insular power, surrounded by normally pacific states and broad oceans. With the exception of strategic attack upon the United States itself, military challenges to American interests will most likely occur in distant overseas locations. To deter or meet those threats militarily, two options are available. The first is to deploy forward forces and their supporting equipment, a policy long followed in both Europe and Northeast Asia as well as in certain other locations. To say the least, such forward basing is expensive. Further, forces so deployed must be reinforced and reprovisioned rapidly if hostilities do, in fact, ensue. The second choice is to deploy forces from a central reserve to the point of conflict in times of crisis. Because American combat forces cannot be prepositioned everywhere vital interests might be at risk, US military strategy increasingly relies on this second option. The combination of options means that the United States must have sufficient airlift to deploy forces quickly and to sustain rapid-reaction, expeditionary, and forward-deployed forces if it is to deter or defeat hostile activities wherever American interests are at stake.[2]

Strategic airlift provides the capability to employ and deploy forces and to reinforce and reprovision those forces almost anywhere on the globe. This capability is limited by the weight and volume of the forces and the distance they are to be transported. Due to these limitations, sea lift must play the major role in deploying heavy forces and in sustaining large forces. Nevertheless, strategic airlift is vital because it allows the United States, to paraphrase the words of the Confederate general Nathan Bedford Forrest, to get there first with the most forces. Accordingly, adequate strategic airlift must be viewed as a cornerstone of US national security at the strategic level and as a crucial capability for operational-level commanders who must use military forces in a particular theater of operations. There are two basic forms of strategic airlift. Strategic employment is used to insert combat forces directly into a theater or a hostile situation, as in Operation Urgent Fury. Such employment requires support from suppression forces as well as control of the aerospace environment. Strategic deployment or redeployment, in contrast, requires no suppression support.

Theater commanders must also have adequate theater airlift to prosecute their campaign plans. Theater airlift (also known as intratheater or tactical airlift) provides the capability to move and sustain in-theater forces with great speed, unhindered by topography. Theater airlift creates maneuver speed that may provide surface forces a decisive advantage by allowing them to bypass enemy strongholds and to attack vulnerable rear areas. It can also sustain forces cut off from other methods of reinforcement and supply.[3]

Depending on the nature of the contingency, both strategic and theater airlift may be hard pressed to meet the myriad competing demands placed on them. At any given time, there will be a limited number of aircraft available to support operations to, from, and within a particular theater. Additional constraints may exist on the carrying capacities of these aircraft and on the ability of aerial ports and other elements of the logistics infrastructure to support operational requirements.

The air component commander must determine how available airlift assets can best serve the campaign objectives of the theater commander and the component forces. He must then recommend to the combatant commander clear priorities for the use of theater airlift capabilities. Centralized, yet flexible, direction of airlift support is critical, given the logistical magnitude of modern theater combined-arms operations such as Operation Desert Storm and the Desert Shield buildup that preceded it.[4]

Airmen face formidable obstacles in designing and structuring appropriate strategic and theater airlift capabilities. The most pervasive problem is the requirement to strike the appropriate balance between airlift and other types of aerospace forces. Experience has demonstrated that shortchanging airlift forces can lead to serious consequences.[5]

Another major problem in designing airlift forces is the need to strike an appropriate balance between capacity and flexibility. Capacity is the measure of how much can be lifted, how far, and how fast. More specifically, how big should a transport be (larger aircraft are far more efficient in moving a given load than the increased number of smaller aircraft required to carry the same load), and how many of these transports are enough? Such static measures of capacity as "ton-miles per day" may yield precise answers to these questions in terms of efficiency, but not necessarily correct answers in terms of effectiveness in specific instances.

Static measures of capacity must be balanced against the less well-defined issues of flexibility. Where and what are the threats to American national interests, and how likely might simultaneous contingencies be? How many, what kind, and what capacity are the airfields available for use at probable destinations? What attrition rate is expected, and how long might the attrition be expected to continue? The answers to these questions (and a good many others as well) directly affect the issues of airlift capacity and the structure of the required airlift force.

Finally, the airlift force must be designed jointly. Airlift supports and enhances the capabilities of surface and aerospace forces. Forces that may need airlift support must be designed to fit on transports and, at the same time, transports must be designed and sized to lift the forces expected to require such support. Especially in the case of surface force support, these requirements mandate joint planning and close coordination in everything from peacetime procurement to wartime operations.

Air Refueling

Air refueling capability ensures that the unique flexibility of airpower (concentration of power quickly at any point on the globe against any facet of an enemy's power) is a reality rather than an abstract concept. Air refueling has its direct antecedents in naval coaling stations. Coal-fired ships of the late nineteenth and early twentieth centuries required a network of coaling stations (or access to those stations) if navies were to have global reach. The advent of oil-fired ships and underway refueling capabilities lessened the requirement for shore-based refueling stations. In the air, analogous developments took place as frequent fuel stops on long flights were slowly eliminated by production of longer-range aircraft, provision of auxiliary fuel tanks ("drop" tanks on many combat aircraft), and development of underway refueling capabilities in the form of air refueling.

Air refueling makes possible intercontinental strategic airlift and strategic attack operations without the use of forward air bases. Any air refuelable aircraft can increase its payload (whether cargo or munitions), without sacrificing range, by trading fuel load for payload and using air refueling capabilities. Even short-range fighter aircraft can respond nonstop to worldwide contingencies. Adequate air refueling capability is of central importance to global exploitation of airpower's flexibility.[6]

Adequate air refueling capability is no less important in shorter-range theater operations. Strike aircraft can extend their combat radius, lengthen their loiter time, carry heavier payloads in lieu of fuel, and still return to their operating bases with comfortable fuel reserves. In these senses, air refueling capability is a powerful force multiplier for theater commanders.[7]

Airmen face essentially the same problems in designing and structuring the air refueling force as they face in designing and structuring the airlift force. Balancing tankers against other types of aircraft is the most basic question. The capacity and flexibility issue remains important and is directly related to the number and types of aircraft that must be refueled. Joint planning is of paramount importance because tankers are used to refuel everything from helicopters to intercontinental bombers, all with different operating envelopes. Further, off- and on-loading systems must be matched both in terms of procedures and equipment.[8]

Spacelift

Space is the new "high ground" in military operations, a natural extension of the air. Regardless of the sometimes acrimonious debate over the military use of space, three undeniable facts must drive our view of space operations. First, space operations offer enormous military advantages to air and surface forces and, inversely, the inability to conduct space operations can pose significant problems for those forces. Second, important military assets have operated in space almost from the beginning of the space age. Space has never been a "demilitarized zone" for any significant period of time. It is no accident that even the earliest cosmonauts and astronauts were military officers. Third, American military forces have come to rely on space-based systems for instantaneous worldwide communications, constant surveillance and early warning, accurate weather forecasting, and precise navigation. Failure of these systems (for whatever reason) would seriously degrade US operating capabilities and provide an opponent who retained such capabilities an enormous advantage.[9]

At this writing, military operations in space are analogous to early air operations in World War I. In that earlier time, even unarmed aircraft offered such great advantages that actions had to be taken to deny those advantages to the enemy and to protect one's own advantages in the air. The air quickly became a major arena for direct combat operations. It follows from all of the aforementioned that under some circumstances and against some opponents, space may become a combat arena in which operations will have the objective of denying the use of space assets to the opponent while preserving one's own use of space.

The absolutely minimal military space operations requirement is to be able to replace, in a timely manner, critical space systems that become inoperative, whether by accident or through enemy action. Timeliness is the key concept and requires spacelift capabilities responsive to time-urgent situations. The clear implications of this requirement are that we cannot afford to rely on launch systems that need weeks or months to prepare for launch and that "spare" satellite systems must be readily available for emplacement in orbit. Additional requirements, admittedly conceptual for the US forces at this time, include the capability to deny the use of space assets to potential enemies and the ability to defend (actively or passively) friendly space assets.[10]

Electronic Combat

Electronic combat is a sine qua non of modern warfare, particularly for airmen. A modern aerospace force is, in effect, an electronic force, dependent upon electromagnetic capabilities to command, control, guide, detect, target, and perform a myriad of other essential combat functions. The importance of the electromagnetic spectrum was driven home for airmen early in World War II when radar, still in its infancy, played a vital role in the successful British air defense system during the Battle of Britain.

Countermeasures also came to the fore during the so-called Battle of the Beams in which the electromagnetic beams used to guide German bombers on night missions over Great Britain were successfully "spoofed" by the British. Later, Allied bombers dropped clouds of radar-distorting metal foil to disrupt German air defense efforts.[11] Current generation air defense systems still rely heavily on electromagnetic means for target detection and acquisition, as well as for guidance and direction of antiaircraft and antimissile weapons.

Although vastly more potent than their predecessors in terms of range, speed, maneuverability, and armament, today's combat aircraft are proportionately more expensive and fewer in number. Evolving air defenses and offensive combat platforms using advanced electromagnetic weapon systems have significantly increased the risk of attrition to friendly forces of all types. This risk, if not countered, could threaten the ability of aerospace forces, in particular, to dominate the combat arena and carry the war to the enemy.[12] Consequently, electronic combat, properly integrated in time and space with other aerospace and surface warfare missions, is vital to the success of air and theater campaigns.[13]

The need to avoid, deceive, disrupt, and suppress enemy electromagnetic systems has, to a significant degree, driven aircraft design, routing, force packaging, targeting, and tactics.[14] As was the case during Desert Storm, the success of entire campaigns has hinged on the ability of aerospace forces to blind enemy air defense and surveillance systems, while capitalizing on the resulting opportunity to attack other vital military and infrastructure targets with a minimum of interference.[15]

As recent history so well illustrates, the ability to exploit the electronic spectrum multiplies the effectiveness of combat forces. Likewise, detecting, denying, analyzing, and hindering enemy use of the electromagnetic spectrum are essential conditions for the unconstrained use of aerospace power throughout a theater of operations. In addition, the synergism of electronic combat and other war-fighting functions can produce cumulatively disastrous effects on the enemy's overall war-making capability.[16]

Surveillance and Reconnaissance

This section brings us back to what was originally envisioned as the most valuable use for airpower, surveillance and reconnaissance. So important were these missions that in the early days of World War I, pilots were considered to be little more than technicians. The observer was the important part of a two-man reconnaissance (recce) crew.[17]

As the breadth of air missions increased, surveillance and reconnaissance often appeared to take a backseat to other missions, at least in terms of the attention devoted to them in force structuring and procurement. In past years, several recce aircraft (RF-101 and RF-4) that were airframes originally designed for other purposes were modified for the recce mission.[18] However, air and now space reconnaissance and surveillance systems have become the backbone of intelligence operations in both peace and war.

Examples abound in which aerospace surveillance and reconnaissance capabilities have been vital to the success of aerospace and surface operations and in which poor reconnaissance or surveillance led to disastrous failures. In World War I, aircraft played a key role in spotting the split between two German armies approaching Paris and paved the way for the Battle of the Marne, which stemmed the German tide in 1914. Guided by signals intelligence in June 1942, air reconnaissance found Adm Isoroku Yamamoto's aircraft carriers to set the stage for the decisive Battle of Midway. Pre- and poststrike photoreconnaissance missions guided the strategic bombing efforts against both Germany and Japan. The failure of air reconnaissance to find well over 100,000 Chinese troops contributed to the near disastrous defeat and retreat of United Nations forces in Korea in late 1950. This example shows how the terrain and type of enemy force can combine to limit the contribution air reconnaissance makes in providing reliable information. In contrast, air reconnaissance missions provided clear evidence that Soviet missiles were in Cuba, precipitating the Cuban missile crisis.[19] The imperative for effective surveillance of the modern battlefield was well illustrated during Operation Desert Storm, in which the Joint Surveillance Target Attack Radar System helped pinpoint numerous targets for allied air attack.[20] In short, aerospace surveillance and reconnaissance missions have become an indispensable part of deterrence and military operations from the tactical to the strategic level.

Without effective surveillance of enemy forces and supporting infrastructures, and the ability to obtain focused intelligence through follow-up reconnaissance, modern military forces are far less capable and far more vulnerable. Civilian decision makers and military commanders depend on timely and accurate information provided by surveillance and reconnaissance systems to help provide what Carl von Clausewitz termed the "quick recognition of truth" not otherwise obvious. Sufficient numbers of these assets must be available, and their use must be given a high priority in both crisis management and campaign planning. Without the ability to "see over the next hill," the effective use of military power becomes nearly impossible to plan or execute.[21]

Conclusion

Force enhancement of land, naval, and aerospace forces is a vital role played by aerospace forces. It has been, and almost certainly will continue to be, a key to military success. Aerospace forces can perform a great many force enhancement missions. Only a few of the most fundamental have been discussed here. Indeed, in certain kinds of warfare (most notably, insurgencies), the various force enhancement missions may be the primary contribution of aerospace power to the overall campaign.

Notes

1. Among the other force enhancement functions that may be performed by aerospace forces are weather services, rescue and recovery, intelligence, navigational aids, and communication services.

2. The ability to airlift forces almost anywhere quickly and to sustain those forces is particularly important as the centers of possible conflict shift increasingly to remote third world regions. It would be all but impossible to deploy forward sufficient forces to every area in which American vital interests might be threatened for at least three reasons. First, fiscal constraints simply would not allow such deployments. Second, even without fiscal constraints, there may well not be enough manpower and materiel resources available to provide adequate forces, posing the risk of attempting to be strong everywhere and in fact being weak everywhere. Third, serious challenges to American interests will, in all likelihood, occur only where adequate US forces are not readily available. Minor hostile powers rarely seek to challenge superpowers directly with military force. *Discriminate Deterrence*, Report of the Commission on Integrated Long-Term Strategy (Washington, D.C.: Government Printing Office, 1988), 19–28.

3. Examples of these capabilities abound. Air transport of troops was at times a key element of the German blitzkrieg technique to achieve surprise or to build up inserted forces faster than the enemy could assemble forces to deal with them. This was particularly evident in the assaults on Norway and the Low Countries. Bypassing enemy positions and attacking to the rear through the use of airlift were well demonstrated in the German aerial assault on Crete, the insertion of Allied airborne troops behind the beaches at Normandy before D day in 1944, and the Market-Garden operation conducted by Field Marshal Bernard Law Montgomery as he attempted a quick thrust across the Rhine and into Germany in the fall of 1944. The most recent well-known American example of aerial reinforcement and supply of isolated surface forces occurred during the 1968 siege of Khe Sanh in the war in Southeast Asia. For an excellent short history of American theater airlift, see Lt Col Charles E. Miller, *Airlift Doctrine* (Maxwell AFB, Ala.: Air University Press, 1988), 79–154, 194–202, 311–17. Also see Group Captain K. Chapman, *Military Air Transport Operations* (London: Brassey's Defence Publishers, 1989).

4. Before and during US and coalition operations in Iraq and Kuwait, strategic airlift moved more than 482,000 passengers and 513,000 tons of cargo into theater, the equivalent of moving Oklahoma City (people, vehicles, food, and household goods) to Saudi Arabia. In theater, approximately 145 C-130s moved units and equipment to forward positions and flew resupply and medical evacuation missions,

as well as airland and airdrop missions. By the end of Operation Desert Storm, tactical airlift had moved over 209,000 people and 300,000 tons of cargo to and from operating locations critical to the eventual success of the campaign. Air Force white paper, *Air Force Performance in Desert Storm* (Washington, D.C.: Department of the Air Force, April 1991), 9–10. Also see John W. Leland, "Operation Desert Shield," *Air Force Journal of Logistics* 15, no. 2 (Spring 1991): 25–26; and James Kitfield, "Dash to the Desert II: The Race By Air," *Government Executive* 22, no. 11 (November 1990): 18–22.

5. In a multivolume analysis of German airpower written for the US Air Force by Luftwaffe general officers immediately following World War II, the Germans lamented the fact that airlift had taken a distant second place in the development of the Luftwaffe force structure. The shortfall in airlift became most apparent on their Eastern front, most notably (but far from exclusively) at Stalingrad. An excellent condensation of the German multivolume analysis has been done by Harold Faber, ed., *Luftwaffe: A History* (New York: Quadrangle/New York Times Book Co., 1977), especially 163–67.

6. The importance of air refueling capability to strategic offensive operations is well known because the original tanker force concept was structured around the strategic bomber force. The importance in other areas is less well known. For example, the lift/payload/range problem came to the fore in US resupply of the Israeli armed forces during the 1973 Yom Kippur War. That experience made it clear that even such strategic airlift aircraft as the C-141 needed the capability to receive fuel in flight (and have since been so modified). Miller, 340–43.

7. Air refueling quickly became an integral part of air operations in the Vietnam War, allowing fighter-bombers to extend their actual combat maneuvering time in the target area, as well as augmenting many other air operations. Charles K. Hopkins, *SAC Tanker Operations in the Southeast Asia War* (Offutt AFB, Nebr.: Office of the Historian, Headquarters Strategic Air Command, 1979).

8. For a brief overview of aerial refueling and the requirement for common equipment and procedures, see Marck R. Cobb, *Aerial Refueling: The Need for a Multipoint, Dual-System Capability*, CADRE Paper 87-3 (Maxwell AFB, Ala.: Air University Press, 1987).

9. James C. Cannon and Robert E. Maskell, "Military Satellite Communications," *Army Communicator* 14, no. 3 (Summer 1989): 40–41; Christian Bernard, "Military Intelligence and Space," *Defense & Armament Heracles International*, October 1988, 49–56; and Caspar W. Weinberger, *The Soviet Space Challenge* (Washington, D.C.: Department of Defense, 1987), iv.

10. Donald C. Latham, "A Prescription for America's Galaxy of Problems in Space," *Armed Forces Journal International*, September 1987, 42–50; Duncan Lunan, "Fighting for the High Ground," *Defense & Foreign Affairs*, March 1989,

8–12; and Jim Hartz, "Can Shuttle Fill the Air Force Bill?" *Air Force Magazine*, June 1981, 68–73.

11. The story of the air war in Europe during World War II is in large part the story of the struggle for technological advantage and the race to either exploit or counter technical developments. The so-called Battle of the Beams illustrated the ebb and flow of electronic measures and countermeasures early in the German air offensive against Great Britain. Forced to rely on night area bombing after suffering heavy losses in daylight bombing raids, the Luftwaffe developed radio navigation aids that were accurate within about one square mile (the X-Garaet and Knickebein systems). In essence, German bombers rode an electronic beam to their targets. The British quickly developed means to jam or distort (bend) the beams, thereby destroying their value (one primitive but effective jamming method used radiated waves from hospital diathermy sets). When the Allied bombing offensive of the Continent began, the Allies in turn sought ways to improve bombing accuracy at night and through heavy overcast (Gee, Oboe, H2S, H2X, AN/APQ-13, LORAN, etc.). They also sought to overcome German defenses through the use of chaff to distort German radar, a technique code-named Window. The Germans countered by developing a new longer-wave radar (SN2) which was not affected by Window. These are only a few examples of the electronic measure/countermeasure struggle. Alfred Price, *Instruments of Darkness: The History of Electronic Warfare* (New York: Charles Scribner's Sons, 1977), 119–30; Williamson Murray, *Strategy for Defeat: The Luftwaffe, 1933–1945* (Maxwell AFB, Ala.: Air University Press, January 1983), 166–79, 210–14; Thomas Parrish, ed., *Encyclopedia of World War II* (New York: Simon and Schuster, 1978), 428–29; Lee Kennett, *A History of Strategic Bombing* (New York: Charles Scribner's Sons, 1982), 117–62; and Leonard Mosley, *Battle of Britain* (Alexandria, Va.: Time-Life Books, 1977), 142–43.

12. Modern air defense has been characterized by the development of layered air defenses with large numbers of sophisticated ground-to-air and air-to-air systems networked by rapid and efficient command, control, and communications systems. In the absence of effective electromagnetic counters, airpower can come off a poor second to such integrated defense systems in terms of net operational losses versus net gains. Theodore Deitchman, *Military Power and the Advance of Technology* (Boulder, Colo.: Westview Press, 1983), 52. Also see Maj Gen George B. Harrison, "The Electronics of Attrition," *Air Force Magazine* 74, no. 1 (January 1991): 68–71.

13. The Israelis were so surprised by and vulnerable to Arab surface-to-air missiles (SAM) that the United States had to provide, on an emergency basis, appropriate jamming pods for Israeli aircraft during the 1973 Yom Kippur War. Kenneth P. Werrell, *Archie, Flak, AAA, and SAM: A Short Operational History of Ground-Based Air Defense* (Maxwell AFB, Ala.: Air University Press, December 1988), 139–44; Air Vice-Marshal R. A. Mason, ed., *War in the Third Dimension:*

Essays in Contemporary Air Power (London: Brassey's Defence Publishers, 1986), 191; and J. E. Johnson, *The Story of Air Fighting* (London: Hutchinson & Co., 1985), particularly chap. 28.

14. For example: low-observable (stealth) technology used in aircraft design to make aircraft "invisible" to defensive radars; extremely low-level routing to and from heavily defended target areas to avoid radar detection (before the advent of surface-to-air missiles capable of reaching high altitudes, high-altitude routing was used for protection against ground-based antiaircraft artillery); force "packages" often include not only strike aircraft and escort protection but also electronic warfare aircraft to jam enemy radar defenses and specialized Wild Weasel aircraft armed with antiradiation missiles to destroy surface-to-air missile guidance radars; and ground-based defenses (including but not limited to surface-to-air missile sites) have become priority targets in many campaign plans to achieve air superiority, so much so that a new counterair function was spawned, suppression of enemy air defenses (SEAD).

15. Preliminary reports of Desert Storm air operations indicate how decisive electronic combat was in initially impairing (and ultimately destroying) the Iraqi ability to detect and react to allied air attack throughout the theater of operations. The use of the F-117A stealth fighter to neutralize Iraqi early-warning radars, closely followed by Wild Weasel suppression of enemy SAM and antiaircraft artillery (AAA) sites, along with stand-off and escort jamming of acquisition radars and command, control, and communications networks, effectively paralyzed Iraqi air defense capabilities and paved the way for the rapid attainment of air supremacy. James W. Canan, "The Electronic Storm," *Air Force Magazine* 74, no. 6 (June 1991): 26–31. Effective signals intelligence prior to the conflict greatly assisted initial electronic suppression operations. Bruce D. Nordwall, "Electronic Warfare Played Greater Role in Desert Storm Than Any Conflict," *Aviation Week & Space Technology* 134, no. 16 (22 April 1991): 68–69.

16. See Air Commodore J. P. R. Browne, *Electronic Air Warfare* (London: Brassey's Defence Publishers, 1989).

17. James L. Stokesbury, *A Short History of Airpower* (New York: William Morrow and Co., 1986), 27; see also Johnson, chap. 1.

18. This is particularly true of tactical reconnaissance aircraft, and thus the "R" designator on many fighter and fighter-bomber aircraft modified for recce work (RF-101, RF-4, etc.). This is not to say that these aircraft were poor recce airframes, but rather to indicate that recce has often taken a backseat to other missions.

19. Most of these incidents are well known, are widely understood, and are documented in a large number of scholarly and popular works. However, the failure of air reconnaissance in Korea may be less well known for two reasons. First, it represented a failure rather than a success and thus is a subject often avoided for parochial reasons. Second, the Korean conflict has been the so-called forgotten war

in American memory. Those unfamiliar with the failure of recce in late 1950, its causes, and the consequences of that failure should refer to Robert Frank Futrell, *The United States Air Force in Korea, 1950–1953*, rev. ed. (Washington, D.C.: Office of Air Force History, 1983), 228–30.

20. In conjunction with manned air reconnaissance, this accurate and continuous view of the battlefield greatly enabled allied air and ground commanders to plan and implement successful fire and maneuver operations, while frustrating Iraqi attempts to counter both air and, later, ground operations. Air Force white paper, 12. Also see Peter Grier, "Joint STARS Does Its Stuff," *Air Force Magazine* 74, no. 6 (June 1991): 38–42; and Bruce A. Smith, "Pentagon Weighs Key Reconnaissance Issues Highlighted by Gulf War," *Aviation Week & Space Technology* 134, no. 16 (22 April 1991): 78–79.

21. The importance of and capabilities related to surveillance and reconnaissance are discussed in Air Vice-Marshal R. A. Mason, *Air Power: An Overview of Roles* (London: Brassey's Defence Publishers, 1987), 77–88; and Group Captain G. J. Oxlee, *Air Reconnaissance* (London: Brassey's Defence Publishers, 1989).