
FRICION AND OPERATIONAL PROBLEMS

Although NATO's use of air power in Allied Force must, in the end, be adjudged a success, some troubling questions arose well before the air war's favorable outcome over a number of unexpected and disconcerting problems encountered along the way. Some of those problems, most notably in the area of what air planners came to call "flex" targeting of elusive VJ troops on the move in Kosovo, were arguably as much a predictable result of prior strategy choices as a reflection of any inherent deficiencies in the air weapon itself.¹ Of more serious concern were identified shortcomings that indicated needed fixes in the realm of tactics, techniques and procedures, and, in some cases, equipment. Beyond the problem of locating, identifying, and engaging dispersed and hidden light infantry targets, the shortcomings arousing the greatest consternation included assessed deficiencies in SEAD, excessively lengthy information and intelligence cycle time, inadvertent civilian casualties, and some serious deficiencies in alliance interoperability. Also of special concern were the many problems spotlighted by the U.S. Army's plagued deployment of its AH-64 Apache helicopters to Albania and the full extent of U.S. global military overcommitment that the Allied Force experience brought to light.

¹The "flex" targeting effort entailed the launching of combat aircraft without specific assigned target locations and coordinates, although tasked to seek out various classes of targets, either through free search or upon being directed to a specific area of known or suspected enemy activity by the CAOC or an airborne forward air controller.

FRUSTRATIONS WITH THE SEAD EFFORT

In contrast to the far more satisfying SEAD experience in Desert Storm, the initial effort to suppress Serb air defenses in Allied Force did not go nearly as well as expected. The avowed going-in objective of the SEAD operation was to neutralize as many of Serbia's SAMs and AAA sites as possible, particularly its estimated 16 SA-3 LOW BLOW and 25 SA-6 STRAIGHT FLUSH fire control radars. Another early goal was to take out or suppress long-range surveillance radars that could provide timely threat warning to MANPADS operators carrying shoulder-fired infrared SAMs like the SA-7.

The Serbs, however, kept their SAMs defensively dispersed and operating in an emission control (EMCON) mode, prompting concern that they were attempting to draw NATO aircraft down to lower altitudes where they could be more easily engaged. Before the initial strikes, there were reports of a large-scale dispersal of SA-3 and SA-6 batteries from nearly all of the regular known garrisons. The understandable reluctance of enemy SAM operators to emit and thus render themselves cooperative targets made them much harder to find and attack, forcing allied aircrews to remain constantly alert to the radar-guided SAM threat throughout the air war.² It further had the effect of denying some high-risk targets for a time, increasing force package size, and increasing overall SEAD sortie requirements.

Moreover, unlike in the more permissive Desert Storm operating environment, airspace availability limitations in the war zone typically made for high predictability on the part of attacking NATO aircraft, and collateral damage avoidance considerations frequently prevented the use of the most tactically advantageous attack headings. The resulting efforts to neutralize the Serb IADS were, according to retired U.S. Navy Admiral Leighton Smith, the commander of NATO forces in Bosnia from 1994 to 1996, "like digging out potatoes one at a time."³ The commander of USAFE, General Jumper, later added that the CAOC could never get NATO political clearance to attack the most troublesome early warning radars in Montenegro,

²Dana Priest, "NATO Unlikely to Alter Strategy," *Washington Post*, March 26, 1999.

³Dana Priest, "NATO Pilots Set to Confront Potent Foe," *Washington Post*, March 24, 1999.

which meant that the Serbs knew when attacks were coming most of the time.⁴ In other cases, the cumbersome command and control arrangements and the need for prior CAOC approval before fleeting pop-up IADS targets detected by Rivet Joint or other allied sensors could be attacked resulted in many lost opportunities and few hard kills of enemy SAM sites.

Operation Allied Force drew principally on 48 USAF F-16CJs and 30 Navy and Marine Corps EA-6B Prowlers, along with Navy F/A-18s and German and Italian electronic-combat role (ECR) Tornados, to conduct the suppression portion of allied counter-SAM operations. Land-based Marine EA-6Bs were tied directly to attacking strike packages and typically provided ECM support for missions conducted by U.S. aircraft. Navy Prowlers aboard the USS *Theodore Roosevelt* supported carrier-launched F-14 and F/A-18 raids and strike operations by allied fighters. The carrier-based Prowlers each carried two AGM-88 high-speed antiradiation missiles (HARMs). Those operating out of Aviano, in contrast, almost never carried even a single HARM, preferring instead to load an extra fuel tank because of their longer route to target. This compromise was often compensated for by teaming the EA-6B with HARM-shooting F-16CJs or Luftwaffe Tornado ECR variants.⁵

The USAF's EC-130 Compass Call electronic warfare aircraft was used to intercept and jam enemy voice communications, thereby allowing the EA-6Bs to concentrate exclusively on jamming enemy early warning radars. The success of the latter efforts could be validated by the RC-135 Rivet Joint ELINT aircraft, which orbited at a safe distance from the combat area. The biggest problem with the EA-6B was its relatively slow flying speed, which prevented it from keeping up with ingressing strike aircraft and diminished its jamming effectiveness as a result. On occasion, the jamming of early warning radars forced Serb SAM operators to activate their fire-control radars, which in turn rendered them susceptible to being

⁴General John Jumper, USAF, "Oral Histories Accomplished in Conjunction with Operation Allied Force/Noble Anvil."

⁵Robert Wall, "Sustained Carrier Raids Demonstrate New Strike Tactics," *Aviation Week and Space Technology*, May 10, 1999, p. 37.

attacked by a HARM. Accordingly, enemy activation of SAM fire-control radars was limited so as to increase their survivability.⁶

SEAD operations conducted by F-16CJs almost invariably entailed four-ship formations. The spacing of the formations ensured that the first two aircraft in the flight were always looking at a threat area from one side and the other two were monitoring it from the opposite side. That enabled the aircraft's HARM Targeting System (HTS), which only provided a 180-degree field of view in the forward sector, to maintain 100-percent sensor coverage of a target area whenever allied strike aircraft were attempting to bomb specific aim points within it. According to one squadron commander, the F-16CJs would arrive in the target area ahead of the strikers and would build up the threat picture before the strikers got close, so that the latter could adjust their ingress routes accordingly. In so doing, the F-16CJs would provide both the electronic order of battle and the air-to-air threat picture as necessary. The squadron commander added that enemy SAM operators got better at exploiting their systems at about the same rate that the F-16CJ pilots did, resulting in a continuous "cat and mouse game" that made classic SAM kills "hard to come by."⁷

As noted in Chapter Three, only a few SAMs were reported to have been launched against attacking NATO aircraft the first night. The second night, fewer than 10 SA-6s were fired, with none scoring a hit. Later during Allied Force, enemy SAMs were frequently fired in large numbers, with dozens launched in salvo fashion on some nights but only a few launched on others. Although these ballistic launches constituted more a harassment factor than any serious challenge to NATO operations, numerous cases were reported of allied pilots being forced to jettison their fuel tanks, dispense chaff, and maneuver violently to evade enemy SAMs that were confirmed to be guiding.⁸

⁶Robert Wall, "Airspace Control Challenges Allies," *Aviation Week and Space Technology*, April 26, 1999, p. 30.

⁷Tim Ripley, "Viper Weasels," *World Air Power Journal*, Winter 1999/2000, p. 102. The standard F-16CJ weapons loadout was two AGM-88 HARMs and four AIM-120 advanced medium-range air-to-air missiles (AMRAAMs).

⁸Richard J. Newman, "In the Skies over Serbia," *U.S. News and World Report*, May 24, 1999, p. 24. It bears noting here that 10 or more pilots operating in a target area might report an observed SAM shot as ballistic, while the one pilot on whose helmet the

Indeed, the SAM threat to NATO's aircrews was far more pronounced and harrowing than media coverage typically depicted, and aggressive jinking and countermaneuvering against airborne SAMs was frequently necessary whenever the Serbs sought to engage NATO aircraft. The Supreme Allied Commander in Europe, U.S. Army General Wesley Clark, later reported that there had been numerous instances of near-misses involving enemy SAM launches against NATO aircraft, and General Jumper added that a simple look at cockpit display videotapes would show that "those duels were not trivial."⁹ From the very start of NATO's air attacks, Serb air defenders also sought to sucker NATO aircrews down to lower altitudes so they could be brought within the lethal envelopes of widely proliferated MANPADS and AAA systems. A common Serb tactic was to fire on the last aircraft in a departing strike formation, perhaps on the presumption that those aircraft would be unprotected by other fighters, flown by less experienced pilots, and low on fuel, with a consequent limited latitude to countermaneuver.

The persistence of a credible SAM threat throughout the air war meant that NATO had to dedicate a larger-than-usual number of strike sorties to the SEAD mission to ensure reasonable freedom to operate in enemy airspace. In turn, fewer sorties were available for NATO mission planners to allocate against enemy military and infrastructure targets—although the limited number of approved targets at any one time tended to minimize the practical effects of that consequence. Moreover, the Block 50 F-16CJ, which lacked the ability to carry the LANTIRN targeting pod, was never used for night precision bombing because it could not self-designate targets.

One of the biggest problems to confront attacking NATO aircrews on defense-suppression missions was target location. Because of

missile was figuratively guiding would be actively reacting to it. Shortly thereafter, 10 pilots would recover to widely dispersed home bases and report nonthreatening ballistic launches, while only one would return with the evidence of a guided shot. This drove a perception among Allied Force leaders that "most" of the SAM shots observed were ballistic. Once all the pertinent information was fused and duplicate reporting was factored out, however, it turned out that a substantial number of SAM launches (perhaps as many as a third) were guided. Comments on an earlier draft by Hq USAFE/IN, May 18, 2001.

⁹Cited in "Ground Troops Lauded," *European Stars and Stripes*, August 6, 1999, and "Jumper on Air Power," *Air Force Magazine*, July 2000, p. 41.

Kosovo's mountainous terrain, the moving target indicator (MTI) and SAR aboard the E-8 Joint STARS could not detect objects of interest in interspersed valleys that were masked from view at oblique look angles, although sensors carried by the higher-flying U-2 often compensated for this shortfall.¹⁰ The cover provided to enemy air defense assets by the interspersed mountains and valleys was a severe complicating factor. Similarly, efforts to attack the internetworked communications links of the Yugoslav IADS were hampered by the latter's extensive network of underground command sites, buried land lines, and mobile communications centers. Using what was called fused radar input, which allowed the acquisition and tracking of NATO aircraft from the north and the subsequent feeding of the resulting surveillance data to air defense radars in the south, this internetworking enabled the southern sector operations center to cue defensive weapons (including shoulder-fired man-portable SAMs and AAA positions) at other locations in the country where there was no active radar nearby. That may have accounted, at least in part, for why the F-16CJ and EA-6B were often ineffective as SAM killers, since both employed the HARM to home in on enemy radars that normally operated in close proximity to SAM batteries.¹¹

In all, well over half of the HARM shots taken by allied SEAD aircrews were preemptive targeting, or so-called PET, shots, with a substantial number of these occurring in the immediate Belgrade area.¹² Many HARM shots, however, were reactive rather than preplanned, made in response to transitory radar emissions as they were detected.¹³

Yugoslavia's poorly developed road network outside urban areas may also have worked to the benefit of NATO attackers on more than a few occasions because enemy SAM operators depended on road

¹⁰Further mitigating this constraint, the limited surveillance range of Joint STARS caused by interposed ridge lines restricted E-8 operations primarily with regard to Kosovo, which harbored only a limited SAM threat (only one of the 5 SA-6 regiments and no SA-2s or SA-3s). Most of the enemy IADS targets were assessed to lie outside Kosovo. Moreover, the U-2 and Rivet Joint typically performed well and did not suffer the same problems that sometimes plagued the E-8. Comments on an earlier draft by Hq USAFE/IN, May 18, 2001.

¹¹Wall, "Airspace Control Challenges Allies."

¹²Brigadier General Randy Gelwix, USAF, "Oral Histories Accomplished in Conjunction with Operation Allied Force/Noble Anvil."

¹³Wall, "Airspace Control Challenges Allies," p. 30.

transportation for mobility and towed AAA tended to bog down when driven off prepared surfaces and into open terrain. NATO pilots therefore studiously avoided flying down roads and crossed them when necessary at 90-degree angles to minimize their exposure time. By remaining at least 5 km from the nearest road, they often were able to negate the AAA threat, albeit at the cost of making it harder to spot moving military vehicles.

Whenever available intelligence permitted, the preferred offensive tactic entailed so-called DEAD (destruction of enemy air defense) attacks aimed at achieving hard kills against enemy SAM sites using the Block 40 F-16CG and F-15E carrying LGBs, cluster bomb units (CBUs), and the powered AGM-130, rather than merely suppressing SAM radar activity with the F-16CJ and HARM.¹⁴ For attempted DEAD attacks, F-16CGs and F-15Es would loiter near tankers orbiting over the Adriatic to be on call to roll in on any pop-up SAM threats that might suddenly materialize.¹⁵ The unpowered AGM-154 Joint Standoff Weapon (JSOW), a “near-precision” glide weapon featuring inertial and GPS guidance and used by Navy F/A-18s, was also effective on at least a few occasions against enemy acquisition and tracking radars using its combined-effects submunitions.¹⁶

One problem with such DEAD attempts was that the data cycle time had to be short enough for the attackers to catch the emitting radars before they moved on to new locations. One informed report observed that supporting F-16CJs were relatively ineffective in the reactive SEAD mode because the time required for them to detect an impending launch and get a timely HARM shot off to protect a striker

¹⁴The AGM-130 could be fired from a standoff range of up to 30 nautical miles. It featured GPS guidance, enhanced by terminal homing via man in the loop through live video feed data-linked to the attacking aircraft from the guiding weapon.

¹⁵The Block 50/52 F-16CJs used for defense suppression were equipped to carry the AGM-65 Maverick missile, but they did not employ that munition in Allied Force because the pilots, given their predominant focus on making the most of the AGM-88 HARM, had not sufficiently trained for its use.

¹⁶Gelwix, “Oral Histories.” JSOW was employed only infrequently during Allied Force. Many of the targets assigned to the Navy were inappropriate for attack by the AGM-154’s cluster-bomb variant because of collateral damage concerns and the lengthy timelines associated with attacks against mobile targets and with the munition’s lack of a precise impact timeline. William M. Arkin, “Fleet Praises JSOW, Lists Potential Improvements,” *Defense Daily*, April 26, 2000.

invariably exceeded the flyout time of the SAM aimed at the targeted aircraft. As a result, whenever attacking fighters found themselves engaged by a SAM, they were pretty much on their own in defeating it. That suggested to at least some participating aircrews the value of having a few HARMs uploaded on selected aircraft in every strike package so that strikers could protect themselves as necessary without having to depend in every case on F-16CJ or EA-6B support.¹⁷

The commander of the Marine EA-6B detachment at Aviano commented that there was no single-solution tactic that allied SEAD assets could employ to negate enemy systems. "If we try to jam an emitter in the south," he said, "there may be a northern one that can relay the information through a communications link and land line. They are fighting on their own turf and know where to hide."¹⁸ The detachment commander added that Serb SAM operators would periodically emit with their radars for 20 seconds, then shut down the radars to avoid swallowing a HARM.

In all, more than 800 SAMs were reported to have been fired at NATO aircraft, both manned and unmanned, over the course of the 78-day air war, including 477 SA-6s and 124 confirmed man-portable infrared missiles (see Figure 6.1 for a depiction of reported enemy SAM launches by type).¹⁹ A majority of the fixed SAMs were fired without any radar guidance. Yet despite that expenditure of assets, only two NATO aircraft, an F-117 and an F-16, were shot down by enemy fire, although another F-117 sustained light damage from a nearby SA-3 detonation and two A-10s were hit by enemy AAA fire but not downed.²⁰ There also were two reported cases of short-range infrared (IR)-guided missiles hitting A-10s, one of which apparently struck the bottom of the aircraft, defused itself, and bounced off

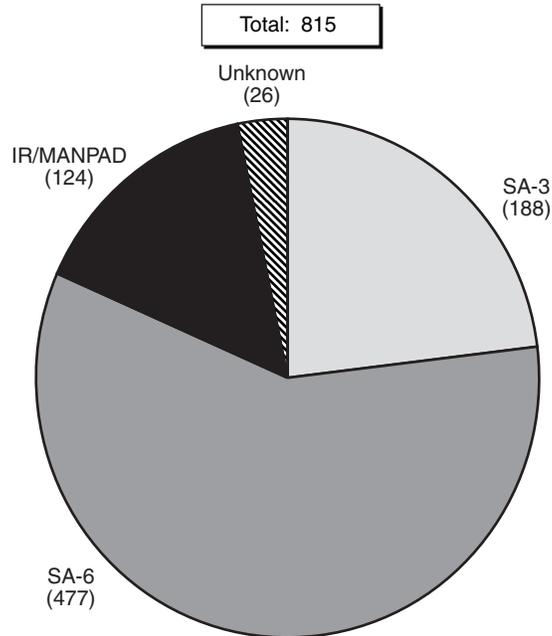
¹⁷Lieutenant Colonel Philip C. Tissue, USMC, "21 Minutes to Belgrade," *Proceedings*, U.S. Naval Institute, September 1999, p. 40.

¹⁸Michael R. Gordon, "NATO to Hit Serbs from 2 More Sides," *New York Times*, May 11, 1999.

¹⁹"AWOS Fact Sheet," Hq USAFE/SA, December 17, 1999. See also William M. Arkin, "Top Air Force Leaders to Get Briefed on Serbia Air War Report," *Defense Daily*, June 13, 2000, p. 1.

²⁰David A. Fulghum, "Kosovo Report to Boost New JSF Jamming Role," *Aviation Week and Space Technology*, August 30, 1999, p. 22.

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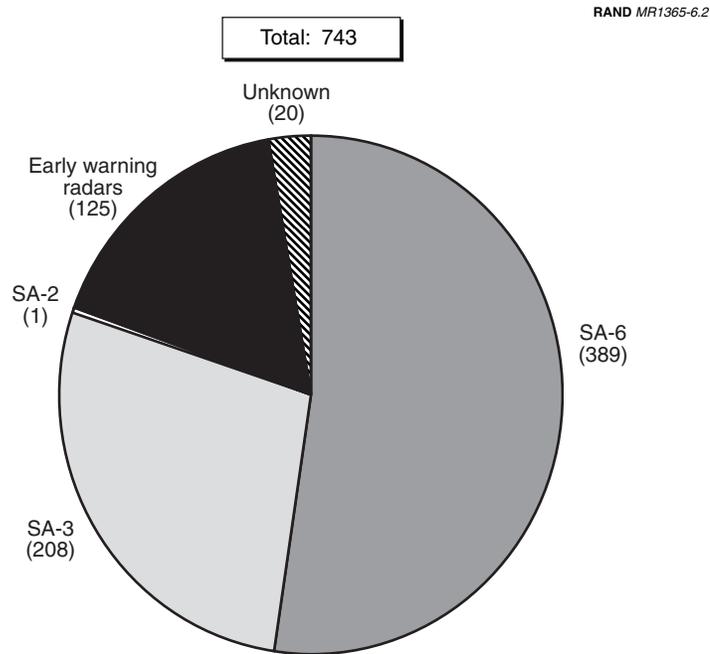
SOURCE: AWOS Fact Sheet.

Figure 6.1—Enemy SAM Launches Reported

harmlessly.²¹ At least 743 HARMs were fired by U.S. and NATO aircraft against the radars supporting these enemy SAMs (Figure 6.2 provides a detailed breakout of HARM expenditure by target type).²² Yet enough of the Serb IADS remained intact to require NATO fighters to operate above the 15,000-ft hard deck for most of the air effort. The main reason for this requirement was the persistent AAA and MANPADS threat. Although the older SA-7 could be effectively

²¹“Washington Outlook,” *Aviation Week and Space Technology*, September 20, 1999, p. 25.

²²“AWOS Fact Sheet,” Hq USAFE/SA, December 17, 1999.



SOURCE: AWOS Fact Sheet.

Figure 6.2—HARM Expenditures by Target Type

countered by flares if it was seen in time, the SA-9/13, SA-14, SA-16, and SA-18 presented a more formidable threat.

In the end, as noted above, only two aircraft (both American) were brought down by enemy SAM fire, thanks to allied reliance on electronic jamming, the use of towed decoys, and countertactics to negate enemy surface-to-air defenses.²³ However, NATO never fully succeeded in neutralizing the Serb IADS, and NATO aircraft operating over Serbia and Kosovo were always within the engagement envelopes of enemy SA-3 and SA-6 missiles—envelopes that extended

²³In all, 1,479 ALE-50 towed decoys were expended by U.S. aircraft during Allied Force.

to as high as 50,000 ft. Because of that persistent threat, mission planners were forced to place such high-value ISR platforms as the U-2 and Joint STARS in less-than-ideal orbits to keep them outside the lethal reach of enemy SAMs. Even during the operation's final week, NATO spokesmen conceded that only three of Serbia's approximately 25 known mobile SA-6 batteries had been confirmed destroyed.²⁴

In all events, by remaining dispersed and mobile, and activating their radars only selectively, the Serb IADS operators yielded the short-term tactical initiative in order to present a longer-term operational and strategic challenge to allied air operations. The downside of that inactivity for NATO was that opportunities to employ the classic Wild Weasel tactic of attacking enemy SAM radars with HARMs while SAMs were guiding on airborne targets were "few and far between."²⁵ The Allied Force air commander, USAF Lieutenant General Michael Short, later indicated that his aircrews were ready for a wall-to-wall SAM threat like that encountered over Iraq during Desert Storm, but that "it just never materialized. And then it began to dawn on us that . . . they were going to try to survive as opposed to being willing to die to shoot down an airplane."²⁶ In fact, the survival tactics employed by Serb IADS operators were first developed and applied by their Iraqi counterparts in the no-fly zones of Iraq that have been steadily policed by Operations Northern and Southern Watch ever since the allied coalition showed its capability against active SAM radars during the Gulf war. That should not have come as any great surprise to NATO planners, and it is reasonable to expect more of the same as potential future adversaries continue to monitor U.S. SEAD capabilities and operating procedures and to adapt their countertactics accordingly.

²⁴Comments on an earlier draft by Hq USAFE/IN, May 18, 2001.

²⁵Tim Ripley, "'Serbs Running Out of SAMs,' Says USA," *Jane's Defense Weekly*, June 2, 1999.

²⁶Interview with Lieutenant General Michael Short, USAF, PBS *Frontline*, "War in Europe," February 22, 2000. Serb IADS operators may have been able to trade short-term effectiveness for longer-term survivability because allied aircraft were typically unable to find and successfully attack VJ fielded forces and other mobile ground targets. Had they been able to do so and to kill VJ troops in large numbers, the VJ's leadership would have insisted on a more aggressive air defense effort. That would have enabled NATO to kill more SAMs, but at the probable cost of more friendly aircraft lost. I am indebted to my RAND colleague John Stillion for this insight.

The dearth of enemy radar-guided SAM activity may also have been explainable, at least in part, by reports that the Air Force's Air Combat Command had been conducting information operations by inserting viruses and deceptive communications into the enemy's computer system and microwave net.²⁷ Although it is unlikely that U.S. information operators were able to insert malicious code into enemy SAM radars themselves, General Jumper later confirmed that Operation Allied Force had seen the first use of offensive computer warfare as a precision weapon in connection with broader U.S. information operations against enemy defenses. As he put it, "we did more information warfare in this conflict than we have ever done before, and we proved the potential of it." Jumper added that although information operations remained a highly classified and compartmented subject about which little could be said, the Kosovo experience suggested that "instead of sitting and talking about great big large pods that bash electrons, we should be talking about microchips that manipulate electrons and get into the heart and soul of systems like the SA-10 or the SA-12 and tell it that it is a refrigerator and not a radar."²⁸ Such pioneering attempts at offensive cyberwarfare pointed toward the feasibility of taking down SAM and other defense systems in ways that would not require putting a strike package or a HARM missile on critical nodes to neutralize them.

During Desert Storm, by means of computer penetration, high-speed decrypting algorithms, and taps on land lines passing through friendly countries, the United States was reportedly able to intercept and monitor Iraqi email and digitized messages but engaged in no manipulation of enemy computers. During Allied Force, however, information operators were said to have succeeded in putting false targets into the enemy's air defense computers to match what enemy controllers were predisposed to believe. Such activities also reportedly occasioned the classic operator-versus-intelligence conundrum from time to time, in which intelligence collectors sought to preserve enemy threat systems that were providing them with streams of in-

²⁷David A. Fulghum, "Serb Threat Subsides, but U.S. Still Worries," *Aviation Week and Space Technology*, April 12, 1999, p. 24.

²⁸"Jumper on Air Power," p. 43.

formation while operators sought to attack them and render them useless in order to protect allied aircrews.²⁹

Fortunately for NATO, the Serb IADS did not include the latest-generation SAM equipment currently available on the international arms market. There were early unsubstantiated reports, repeatedly denied by the Russian Ministry of Foreign Affairs, that several weeks before the start of the bombing effort, Russia had provided Yugoslavia with elements of between six and ten S-300PM (NATO code-name SA-10) long-range SAM systems, which had been delivered without their 36D6 Clam Shell low-altitude acquisition radars.³⁰ Had those reports been valid, even the suspected presence of SA-10 and SA-12 SAMs in the enemy IADS inventory would have made life far more challenging for attacking NATO aircrews. Milosevic reportedly pressed the Russians hard for such equipment repeatedly, without success. Deputy Secretary of State Strobe Talbott later stated that the Yeltsin government had been put on the firmest notice by the Clinton administration that any provision of such cutting-edge defensive equipment to Yugoslavia would have had a “devastating” effect on Russian-American relations.³¹

All of this raised basic questions about the adequacy of U.S. SEAD tactics and suggested a need for better real-time intelligence on mobile enemy IADS assets and a means of getting that information to pilots quickly enough for them to act on it, as well as for greater standoff attack capability.³² The downings of both the F-117 and F-16 were attributed to breakdowns in procedures aimed at detecting

²⁹David A. Fulghum, “Yugoslavia Successfully Attacked by Computers,” *Aviation Week and Space Technology*, August 23, 1999, pp. 31–34.

³⁰Zoran Kusovac, “Russian S-300 SAMs ‘In Serbia,’” *Jane’s Defense Weekly*, August 4, 1999.

³¹Michael Ignatieff, *Virtual War: Kosovo and Beyond*, New York, Henry Holt and Company, Inc., 2000, p. 109.

³²For example, the SA-10 and SA-12, now available on the international arms market for foreign military sale, are lethal out to a slant range of some 80 nautical miles, five times the killing reach of the earlier-generation SA-3 (David A. Fulghum, “Report Tallies Damage, Lists U.S. Weaknesses,” *Aviation Week and Space Technology*, February 14, 2000, p. 34). One SA-10/12 site in Belgrade and one in Pristina could have provided defensive coverage of all of Serbia and Kosovo, as well as threatened Compass Call and the ABCCC operating outside enemy airspace.

enemy IADS threats in a sufficiently timely manner and ensuring that pilots did not fly into lethal SAM envelopes unaware of them. Other factors cited in the two aircraft downings were faulty mission planning and an improper use of available technology (see below for more on the F-117 downing). Although far fewer aircraft were lost during Allied Force than had been expected, these instances pointed up some systemic problems in need of fixing. As one Air Force general observed, "there had to be about 10 things that didn't go right. But the central issue is an overall lack of preparedness for electronic warfare."³³

One of the first signs of this insidious trend cropped up as far back as August 1990, when half of the Air Force's ECM pods being readied for deployment to the Arabian peninsula for Desert Storm were found to have been in need of calibration or repair. Among numerous later sins of neglect with respect to electronic warfare (EW) were Air Force decisions to make operational readiness inspections (ORIs) and Green Flag EW training exercises less demanding, decisions that naturally resulted in an atrophying of the readiness inspection and reporting of EW units, along with a steady erosion of EW experience at the squadron level. "Now," said the Air Force general cited above, "they only practice reprogramming [of radar warning receivers] at the national level. Intelligence goes to the scientists and says the signal has changed. Then the scientists figure out the change for the [ECM] pod and that's it. Nobody ever burns a new bite down at the wing."³⁴

During the years since Desert Storm, the response time for SEAD challenges has become longer, not shorter, owing to an absence of adequate planning and to the disappearance of a talent pool of Air Force leaders skilled in EW. One senior Air Force Gulf War veteran complained that "we used to have an XOE [operational electronic

³³David A. Fulghum, "NATO Unprepared for Electronic Combat," *Aviation Week and Space Technology*, May 10, 1999, p. 35. A thorough and detailed account of the many problems and concerns identified and highlighted with respect to the USAF's current SEAD and electronic warfare repertoire is contained in the summary report of an Air Force-commissioned study by RAND's Natalie Crawford and seven senior retired Air Force general-officer electronic warfare experts, "USAF EW Management Process Study," briefing charts, October 1, 1999.

³⁴Fulghum, "NATO Unprepared for Electronic Combat," p. 35.

warfare] branch in the Air Staff. That doesn't exist any more. We used to reprogram [ECM] pods within the wings. They don't really do that any more." During a subsequent colloquium on the air war and its implications, former Air Force chief of staff General Michael Dugan attributed these problems to the Air Force's having dropped the ball badly in 1990, when it failed to "replace a couple of senior officers in the acquisition and operations community who [oversaw] the contribution of electronic combat to warfighting output. The natural consequence was for this resource to go away."³⁵

A particular concern prompted by the less-than-reassuring SEAD experience in Allied Force was the need for better capabilities for accommodating noncooperative enemy air defenses and, more specifically, countering the enemy tactic whereby Serb SAM operators resorted to passive electro-optical rather than active radar tracking. That tactic prompted Major General Dennis Haines, Air Combat Command's director of combat weapons systems, to spotlight the need for capabilities other than relying on radar emissions to detect SAM batteries, as well as to locate and fix on enemy SAM sites more rapidly when they emitted only briefly.³⁶ Looking farther downstream, one might also suggest that in the long run, the answer is not to continue getting better at SEAD but rather to move to improved low-observability capabilities and to the use of UCAVs (unmanned combat air vehicles), with a view toward rendering SEAD increasingly unnecessary.

Such concerns have occasioned a growing sense among SEAD specialists that the management of EW should be taken out of the domain of information operations, where it was pigeonholed for convenience after the retirement of the EF-111 and F-4G, and returned to its proper home at the USAF Air Warfare Center at Nellis AFB, Nevada. As one senior officer complained in this respect, electronic combat after Desert Storm found itself "buried in with information operations and information attack. What got lost was the critical issue that EW is a component of combat aircraft survivability."³⁷ One

³⁵"Washington Outlook," *Aviation Week and Space Technology*, August 23, 1999, p. 27.

³⁶Robert Wall, "SEAD Concerns Raised in Kosovo," *Aviation Week and Space Technology*, June 26, 1999, p. 75.

³⁷"Washington Outlook," *Aviation Week and Space Technology*, June 7, 1999, p. 23.

side result of this neglect of the EW mission by the Air Force was that maintenance technicians could no longer reprogram quickly (that is, in 24 hours or less) ECM pods and radar warning receivers to counter newly detected enemy threats. That problem first arose in 1998, when several planned U-2 penetrations into hostile airspace had to be canceled at the last minute because USAF radar warning systems could not recognize some IADS signals emanating from Iraq and Bosnia.

Yet another problem highlighted by the IADS challenge presented in Allied Force was the disconcertingly small number of F-16CJs and EA-6Bs available to perform the SEAD mission. Aircraft and aircrews were both stretched extremely thin, even with the modest help provided by German and Italian Tornado ECR variants. This shortage of SEAD assets prompted a proposal for backfitting the HARM targeting system carried by the F-16CJ onto older F-16s and F-15Es. Another fix suggested for the shortfall in SEAD capability was to begin supplementing existing capabilities and tactics, which rely on the small-warhead HARM, with PGMs and attack tactics aimed at achieving hard kills against IADS targets for the duration of a campaign, essentially a very different approach. Most telling of all, the uneven results of the SEAD experience in Allied Force induced Air Combat Command to seek an increase in its planned acquisition of new F-16CJs from 30 to 100.³⁸

THE F-117 SHOOTDOWN

It did not take long for the problems connected with the air war's SEAD effort to register their first toll. On the fourth night of air operations, in the first combat loss ever of a stealth aircraft, an F-117 was downed at approximately 8:45 p.m. over hilly terrain near Budanovici, about 28 miles northwest of Belgrade, by an apparent barrage of SA-3s. Fortunately, the pilot ejected safely and, against formidable odds, was recovered before dawn the next day by a

³⁸"Washington Outlook," *Aviation Week and Space Technology*, May 24, 1999, p. 27.

combat search and rescue team using MH-53 Pave Low and MH-60 Pave Hawk helicopters, and directed by a flight of A-10s.³⁹

There was a flurry of speculation afterward as to how such an unexpected event might have taken place. Experts at Lockheed Martin Corporation, the aircraft's manufacturer, reported that unlike earlier instances of F-117 combat operations, the missions flown over Yugoslavia had required the aircraft to operate in ways that may have compromised its stealth characteristics. By way of example, they noted that even a standard banking maneuver can increase the aircraft's radar cross-section (RCS) by a factor of 100 or more—and such turns were unavoidable in the constricted airspace within which the F-117s were forced to fly.⁴⁰ Another unconfirmed report suggested that the RC-135 Rivet Joint aircraft monitoring enemy SAM activity may have been unable to locate the SA-3 battery that was thought to have downed the F-117 and may additionally have failed to relay to the appropriate command and control authorities timely indications of enemy SAM activity. Lending credence to that interpretation, the commander of Air Combat Command, General Richard Hawley, commented that “when you have a lot of unlocated threats, you are at risk even in a stealth airplane.”⁴¹

Although the Air Force has remained understandably silent as to what confluence of events it believes occasioned the F-117's downing, press reports claimed that Air Force assessors had concluded, after conducting a formal postmortem, that a lucky combination of low-technology tactics, rapid learning, and astute improvisation had

³⁹Although some criticism was voiced afterward as to how CSAR had been shown to be “broken” because of problems that cropped up during the rescue operation (apparently, one of the helicopters was forced to disengage, refuel, and penetrate enemy airspace a second time before it could find and finally retrieve the downed pilot), genuine acts of heroism were displayed during the mission. It ended up a brilliant success and had the welcome effect of turning a propaganda coup for Milosevic almost instantly into a propaganda coup for NATO. On the criticism expressed, see Rowan Scarborough, “Air Force Search and Rescue Operations Called ‘Broken,’” *Washington Times*, September 13, 1999.

⁴⁰James Peltz and Jeff Leeds, “Stealth Fighter's Crash Reveals a Design's Limits,” *Los Angeles Times*, March 30, 1999.

⁴¹“Washington Outlook,” *Aviation Week and Space Technology*, May 3, 1999, p. 21. Asked whether the aircraft's loss was caused by a failure to observe proper lessons from earlier experience, Hawley added: “That's an operational issue that is very warm.”

converged in one fleeting instant to enable an SA-3 not operating in its normal, radar-guided mode to down the aircraft. Enemy spotters in Italy doubtless reported the aircraft's takeoff from Aviano, and IADS operators in Serbia, as well as perhaps in Bosnia and along the Montenegrin coast, could have assembled from scattered radars enough glimpses of its position en route to its target to cue a SAM battery near Belgrade to fire at the appropriate moment. The aircraft had already dropped one laser-guided bomb near Belgrade, offering the now-alerted air defenders yet another clue. (The Air Force is said to have ruled out theories hinging on a stuck weapons bay door, a descent to below 15,000 ft, or a hit by AAA.)⁴²

At least three procedural errors were alleged to have contributed to the downing.⁴³ The first was the reported inability of ELINT collectors to track the changing location of the three or four offending SAM batteries. Three low-frequency Serb radars that at least theoretically could have detected the F-117's presence were reportedly not neutralized because U.S. strike aircraft had earlier bombed the wrong aim points within the radar complexes. Also, F-16CJs carrying HARMs and operating in adjacent airspace could have deterred the SA-3 battery from emitting, but those aircraft had been recalled before the F-117 shutdown.

The second alleged procedural error entailed an EA-6B support jammer that was said to have been operating not only too far away from the F-117 (80 to 100 miles) to have been of much protective value, but also out of proper alignment with the offending threat radars, resulting in inefficient jamming.

Last was the reported fact that F-117s operating out of Aviano had previously flown along more or less the same transit routes for four nights in a row because of a SACEUR ban on overflight of Bosnia to

⁴²Eric Schmitt, "Shrewd Serb Tactics Downed Stealth Jet, U.S. Inquiry Shows," *New York Times*, April 11, 1999. In subsequent testimony before the Senate Armed Services Committee, Secretary of the Air Force F. Whitten Peters did confirm that the aircraft had been downed by enemy SAMs. See Vince Crawley, "Air Force Secretary Advocates C-130, Predators," *Defense Week*, July 26, 1999, p. 2.

⁴³See David A. Fulghum and William B. Scott, "Pentagon Gets Lock on F-117 Shootdown," *Aviation Week and Space Technology*, April 19, 1999, pp. 28-30, and Paul Beaver, "Mystery Still Shrouds Downing of F-117A Fighter," *Jane's Defense Weekly*, September 1, 1999.

avoid jeopardizing the Dayton accords. That would have made their approach pattern into Yugoslav airspace predictable. Knowing from which direction the F-117s would be coming, Serb air defenders could have employed low-frequency radars for the best chance of getting a snap look at the aircraft. Former F-117 pilots and several industry experts acknowledged that the aircraft is detectable by such radars when viewed from the side or from directly below. U.S. officials also suggested that the Serbs may have been able to get brief nightly radar hits while the aircraft's weapons bay doors were fleetingly open.

Heated arguments arose in Washington and elsewhere in the immediate aftermath of the shootdown over whether USEUCOM had erred in not aggressively having sought to destroy the wreckage of the downed F-117 in order to keep its valuable stealth technology out of unfriendly hands and eliminate its propaganda value, which the Serbs bent every effort to exploit.⁴⁴ Said a former commander of Tactical Air Command, General John M. Loh: "I'm surprised we didn't bomb it, because the standing procedure has always been that when you lose something of real or perceived value—in this case real technology, stealth—you destroy it."⁴⁵ The case for at least trying to deny the enemy the wreckage was bolstered by Paul Kaminski, the Pentagon's former acquisition chief and the Air Force's first F-117 program manager during the 1970s. Kaminski noted that although the F-117 had been operational for 15 years, "there are things in that airplane, while they may not be leading technologies today in the United States, are certainly ahead of what some potential adversaries have." Kaminski added that the main concern was not that any exploitation of the F-117's low-observable technology would enable an enemy to put the F-117 at greater risk, but rather that it could help him eventually develop his own stealth technology in due course.⁴⁶ Reports indicated that military officials had at first considered attempting to destroy the wreckage but opted in the end not to follow

⁴⁴To bolster their case, some noted that when an F-117 had crashed earlier at an air show near Baltimore in 1998, the Air Force had thoroughly sanitized the area and hauled off the wreckage to prevent its most sensitive features from being compromised.

⁴⁵Vago Muradian, "Stealth Compromised by Not Destroying F-117 Wreckage," *Defense Daily*, April 2, 1999.

⁴⁶*Ibid.*

through with the attempt because they could not have located it quickly enough to attack it before it was surrounded by civilians and the media.⁴⁷ Those issues aside, whatever the precise explanation for the downing, it meant not merely the loss of a key U.S. combat aircraft but the dimming of the F-117's former aura of invincibility, which for years had been of incalculable psychological value to the United States.

PROBLEMS WITH FLEXIBLE TARGETING

Yet another disappointment in the air war's performance centered on what turned out to be NATO's almost completely ineffective efforts to attack mobile VJ forces in the KEZ. By the end of the third week, despite determined attempts by allied aircrews over the preceding week, NATO analysts were unable to confirm the destruction of a single VJ tank or military vehicle, owing to the success of enemy ground units at dispersing and concealing their armor. That disappointment underscored the limits of conducting air operations against dispersed and hidden enemy troops in conditions in which weather, terrain, and tactics all favored the enemy and where no friendly ground combat presence was on hand to compel those forces to concentrate and expose themselves. Had Serb commanders any reason to fear a NATO ground invasion, they would have had little alternative but to position their tanks to cut off roads and other avenues of attack, thus making their forces more easily targetable by NATO air power. Instead, having dispersed and hidden their tanks and armored personnel carriers (APCs), Serb army and paramilitary units were free to go in with just 20 or more troops in a single vehicle to terrorize a village in connection with their ethnic cleansing campaign.

⁴⁷On April 2, the Yugoslav government announced its intention to hand over pieces of the downed F-117 to Russian authorities. Robert Hewson, "Operation Allied Force: The First 30 Days," *World Air Power Journal*, Fall 1999, p. 18. For the record, it should be noted that USAF F-15Es were immediately put on alert to destroy the wreckage with AGM-130s after the F-117 downing was confirmed, but by the time the wreckage location could be positively determined, CNN was on the scene and collateral damage issues precluded the attack. Comments on an earlier draft by Hq USAF/XOXS, July 9, 2001.

Indeed, the opportunity to get at fielded enemy ground units with air power alone had been essentially lost by NATO even before Operation Allied Force commenced. As General Jumper later recalled, during the Rambouillet talks in early March 1999, “we watched 40,000 Serbian troops mass north of Kosovo, we watched them infiltrate down into Kosovo, we watched heavy armor come down into there, all under the umbrella of the peace conference, and we weren’t able to react.”⁴⁸ Once those forces had completed their massing on March 15 and had begun a substantial incursion into Kosovo, any chance for allied air power to be significantly effective against them promptly disappeared. Once safely dispersed, VJ units simply turned off the engines of their tanks and other vehicles to save fuel, hid their vehicles in barns, churches, forests, and populated areas, hunkered down, and hoped to wait the air effort out. By the end of April, General Clark frankly conceded that after six weeks of bombing, there were more VJ, MUP, and Serb paramilitary forces in Kosovo than there had been when Allied Force began. That attested powerfully to the latter’s near-total ineffectiveness, at least up to that point, in halting the Serbian ethnic cleansing rampage throughout Kosovo.

Once the targeting of enemy troops in Kosovo became a SACEUR priority at the start of the third week, Yugoslavia was divided into four large search sectors. The two USAF E-8 Joint STARS aircraft that had been committed to supporting the air effort were tasked with searching for ground targets in the KEZ and with providing near-real time intelligence and targeting information to the CAOC in Vicenza and to the EC-130 ABCCC. Depending on the possibility of collateral damage, Joint STARS was sometimes cleared to communicate directly to airborne FACs and to direct NATO strikes against fleeting targets of opportunity, with the goal of getting target information and coordinates to orbiting strike aircraft within minutes.⁴⁹

⁴⁸General John Jumper, USAF, “Oral Histories Accomplished in Conjunction with Operation Allied Force/Noble Anvil.”

⁴⁹Robert Wall, “Joint STARS Changes Operational Scheme,” *Aviation Week and Space Technology*, May 3, 1999, pp. 25–27.

Before long, three broad approaches to what came to be called “flex” targeting emerged for prompt employment against mobile VJ and MUP forces operating in Kosovo and against pop-up IADS assets deployed in Serbia. In the first, called “alert flex” targeting, combat aircraft were apportioned from the very outset as designated “flex” sorties in the ATO and reserved for launch on short notice against any pop-up targets that might be detected and identified within the ATO cycle. Initially, such designated aircraft were kept on ground alert. Later in the operation, they were placed on airborne tanker alert, which reduced their response times by as much as two hours.

The second approach entailed redirecting aircraft already en route to preplanned fixed targets. Strikers would be diverted either to alternate high-value fixed targets in Serbia or to recently detected mobile targets in Serbia or Kosovo. Because of the large number of NATO fighters already preapportioned and available on call for use as alert flex assets, however, such en route diversions occurred only rarely. All three heavy bombers (the B-52s, B-1s, and B-2s) were also diverted to new targets on occasion, requiring real-time changes in their preplanned ingress routes.

The third category of flexible targeting involved dedicated sorties launched into holding orbits for on-call attacks against detected mobile VJ forces in Kosovo after the KEZ was declared on Day 20 of the air effort. This approach, which evolved progressively over time, entailed the use of F-16s, A-10s, or Tornados serving as airborne forward air controllers. Their FAC-qualified pilots would search for ground targets in predesignated kill boxes, attempt a visual identification of any suspected target candidates, and assess the potential for collateral damage after determining that the target candidates were valid. Depending on the prevailing rules of engagement, the FAC pilots would first request ABCCC or CAOC approval to attack the target and then, upon being cleared to release weapons, would drop their munitions on the approved target while directing their wingmen to drop on adjacent targets. In the event that multiple targets were detected and approved, additional strike aircraft would be called in if they were close at hand. Because NATO had no fielded ground forces in the combat zone, the FACs could not request ground assistance and were on their own in locating and identifying mobile targets.

As noted earlier, a major problem that inhibited the effectiveness of Joint STARS in support of these missions was Kosovo's mountainous terrain, which required the aircraft to fly unusually close to enemy territory so its sensor operators could look into valleys and minimize the enemy's opportunities to take advantage of terrain masking. Even then, the high ridgelines often made it impossible for Joint STARS crews, from their standoff orbits, to peer into some valleys where VJ forces were thought to have been concentrated. Joint STARS also had only a limited ability to detect and monitor ground targets in dense woods and built-up areas. Because of these constraints, NATO had little by way of wide-area airborne surveillance and cueing of the sort that had made coalition operations against enemy ground forces so effective in Desert Storm. That deficiency placed a doubly high premium on hitting enemy ground-force targets as they moved into open areas and were visually detected by airborne FACs. It also, in effect, ceded the tactical initiative to VJ forces, since the latter could decide when and where to reposition themselves. The net result was a need for large numbers of combat aircraft continuously orbiting over the KEZ but producing little tactical return, compounded—indeed, largely caused—by the absence of a NATO ground threat to force enemy troops into more predictable patterns of behavior.⁵⁰

The performance of Joint STARS against dispersed and hidden enemy forces was less than satisfactory not only because of the constraints described above, but also because of an unfortunate failure by air operations managers to make the most of the aircraft's inherent capabilities for supporting counterland operations. That failure partly reflected a continuing slowness on the part of the U.S. Air Force to develop and institutionalize a detailed appreciation for how land forces operate and, in turn, to acquire the conceptual where-withal that is essential for making air power more effective in defeating those forces. Surprisingly little progress was registered by the Air Force over the nine years since Desert Storm in developing a concept of operations for using Joint STARS in a surveillance and control team that also includes AWACS, Rivet Joint, airborne FACs, and UAVs, all working as a synergistic collective against elusive enemy ground forces.

⁵⁰I am indebted to my colleague John Stillion for developing these points.

As one telling testament to this failure, the inclusion of Joint STARS in the air war's equipment roster had been requested by the Army, not by the Air Force.⁵¹ Because of the predominant USAF focus on attacking fixed infrastructure targets, few in the Air Force fully appreciated the E-8's capability for providing wide-area, all-weather standoff coverage of the KEZ and its resultant ability to provide USEUCOM's and NATO's operational-level commanders with real-time situation awareness regarding the status and activity of VJ forces. It took days for Joint STARS even to be included in the ATO. Once there, the aircraft was typically thought of as a surveillance platform operating in the service of the intelligence community, rather than as a strike support asset working to provide direct and immediate assistance to NATO aircrews conducting flexible targeting missions. With the right teaming, connectivity, and practice, the use of Joint STARS to cue UAVs might have reduced, if not eliminated, the "searching-through-a-soda straw" problem, lessened UAV exposure to hostile fire, and helped maintain tactical surprise for NATO aircrews engaged in the search for VJ targets of opportunity. No measures of that sort, however, were attempted until quite late in Allied Force.

Yet another complicating influence on the air effort's attempts against dispersed and hidden enemy forces stemmed from the command and control arrangements that had been hastily cobbled together at the operational and tactical levels once it became clear that NATO was committed to an air war for the long haul. Although the CAOC eventually worked out a means of using real-time imagery to detect fielded VJ forces in the KEZ and to "flex" allied air assets to attack those newly developed targets in an orderly fashion, those doing the "flex" decisionmaking during the first half of Allied Force did so with no apportionment or targeting guidance whatever. As one expert observer noted, "if the detected target was militarily significant, it was struck, regardless of [General Short's] priorities or intentions. There was no link to an assessment mechanism, so that once a target was struck, there was no way to link it to what unit it had been associated with, so no effective degradation was re-

⁵¹Personal communication to the author from Price Bingham, Northrop Grumman Corporation, Melbourne, Florida, December 20, 1999.

corded.”⁵² As a result, combat aircraft were sometimes diverted from scheduled ATO targets of clear operational significance to attack “flex” targets of highly dubious tactical, let alone operational or strategic, worth. Moreover, owing to the absence of any feedback mechanism, aircraft were often committed against targets that had already been successfully struck, forcing the CAOC either to re-role aircraft on short notice or else to expose aircrews needlessly to enemy IADS threats a second time. For most of the air war, roughly half of General Short’s available surface-attack sorties were committed against targets in the KEZ. Of those, a significant percentage were “flexed” in this haphazard manner.⁵³

Weather was still another complicating factor in the effort against dispersed VJ forces. From the 15,000-ft altitude floor above which NATO aircrews typically operated, the cloud cover over Kosovo was greater than 50 percent for more than 78 percent of the air war’s duration. That allowed unimpeded strike operations on only 24 of the air war’s 78 days. The impact of these conditions on the flexible targeting effort was considerable. In all, 3,766 planned sorties, including 1,029 designated close air support sorties, had to be canceled because of weather.

Even on clear days, another factor preventing the kill box system from being as effective as it might otherwise have been was the tight rules-of-engagement regime that had been imposed after the Djakovica incident (see below), in which more than 60 ethnic Albanian refugees were reportedly killed in an attack by USAF F-16s against what was thought to have been a VJ troop convoy. These restrictions had a far greater inhibiting influence on the effectiveness of NATO’s flexible targeting efforts than the oft-cited 15,000-ft altitude floor which NATO’s aircrews had been directed to observe. Unless an object of interest was clearly determined to be a valid military target, such as a VJ tank operating in the open, pilots had to get clearance for any attack from the CAOC, with General Short himself often

⁵²Lieutenant Colonel L. T. Wight, USAF, “What a Tangled Web We Wove: An After-Action Assessment of Operation Allied Force’s Command and Control Structure and Processes,” unpublished paper, no date, p. 12. Colonel Wight was a member of the C-5 Strategy Cell at the CAOC.

⁵³Ibid.

making the decision after checking second sources like real-time UAV video feed. Because of the delays created by these and similar hurdles, orbiting NATO aircraft often ran low on fuel before being cleared to drop their weapons and accordingly were forced to leave the area in search of a tanker.⁵⁴

Last, and perhaps as decisive as any single other factor, VJ forces aggressively avoided making themselves easy targets for NATO air attacks. Indeed, digging in and hunkering down for defensive attrition warfare had lain at the heart of Yugoslav operational doctrine ever since the days of partisan operations against the Wehrmacht in World War II. Whenever General Clark would say, "You've got to get them in their assembly areas," the reply typically was: "These guys aren't assembling!"⁵⁵ RAF Harrier GR. Mk 7 pilots operating in kill boxes over Kosovo reported that "there was nothing moving around at all during the daytime," adding that when Clark "got up and said knocking out five tanks was a good day for NATO, he [was] telling it straight. On some days we couldn't find any tanks."⁵⁶ Even with the aid of binoculars, the ground below often seemed devoid of life to NATO aircrews orbiting overhead at 15,000 ft. This was the predictable result of trying to engage an enemy who had no need to shoot, move, or expose his position, thanks to the absence of a credible NATO ground threat.

To be sure, there were some notable bright spots in NATO's air effort against VJ forces in Kosovo. To cite one example, in those rare instances in which enemy armor and other targets exposed themselves to attack from the air, the upgraded AGM-65G2 Maverick air-to-ground missile generally performed very effectively. The effectiveness rate for older Mavericks was lower, but still reportedly higher than 90 percent.⁵⁷ Also, both U-2 imagery and pictures provided by the Navy's F-14 equipped with TARPS (Tactical Air Reconnaissance

⁵⁴Tim Ripley, "Harriers over the Kosovo 'Kill Boxes,'" *World Air Power Journal*, Winter 1999/2000, p. 100.

⁵⁵Brigadier General Randy Gelwix, USAF, "Oral Histories Accomplished in Conjunction with Operation Allied Force/Noble Anvil."

⁵⁶Ripley, "Harriers over the Kosovo 'Kill Boxes.'"

⁵⁷Robert Wall, "Maverick Fix Tested in Kosovo," *Aviation Week and Space Technology*, September 6, 1999, pp. 88–89.

Pod System) later proved useful to the CAOC in what the Cohen-Shelton after-action report to Congress called “several” instances involving the rapid retargeting of NATO aircraft to new targets.⁵⁸

To cite another notable example, the two Marine F/A-18D squadrons that deployed to the former Warsaw Pact airfield at Taszar, Hungary, late in the air war played an active part in the effort against enemy forces in the KEZ.⁵⁹ For the first time on a large scale in combat, the F/A-18D aircrews, along with NATO pilots flying other combat aircraft types, made heavy use of night-vision goggles with compatible internal and external lighting modifications, thus enabling multi-aircraft formations and simultaneous night bomb deliveries.⁶⁰ Some F/A-18Ds also carried the internally mounted Advanced Tactical Aerial Reconnaissance System (ATARS). Still in operational evaluation as Allied Force began, the system provided digital, multispectral target images with its SAR and medium-altitude electro-optical (EO) imagery as a backup to pictures from other ISR sources, with a real-time connection to ground receiver stations. It figured prominently in both targeting and BDA activities.⁶¹

In a typical night F/A-18D flexible targeting mission (which might last as long as six hours, with four inflight refuelings), the C-130 ABCCC would pass to orbiting Marine fighters the grid coordinates of a VJ artillery position detected by the TPQ-36 and TPQ-37 counter-battery radars attached to the U.S. Army’s Task Force Hawk in Albania. An airborne FAC in an OA-10 would then illuminate the target

⁵⁸Secretary of Defense William S. Cohen and Chairman of the Joint Chiefs of Staff General Henry H. Shelton, *Kosovo/Operation Allied Force After-Action Report*, Washington, D.C., Department of Defense, Report to Congress, January 31, 2000, p. 58.

⁵⁹The airfield itself offered an 8,200-ft runway and a tactical air navigation (TACAN) system enabling the aircraft to fly instrument approaches, but it lacked a ready communications link to the CAOC in Vicenza and also needed more fuel trucks, as well as runway arresting gear in the event of wet runways and aircraft emergencies. The latter were shipped in and quickly became a welcome presence because high-gross-weight landings in heavy rain proved to be routine.

⁶⁰As one downside aspect worth noting in this respect, numerous aircrews later indicated that night-vision goggles often provided them with *too* much information because they were capable of picking up infrared events as far as 100 miles away.

⁶¹For further details, see Margaret Bone, “Kodak Moments in Kosovo,” *The Hook*, Spring 2000, pp. 29–31.

location with flares and call in a two-plane section of F/A-18Ds to be available on short notice to attack it. In so doing, the OA-10 FAC, in effect, performed reconnaissance by fire. When shot at in return, the FAC would determine the source of fire to be hostile, and the F/A-18Ds would then be cleared to drop 500-lb Mk 82 bombs on it, which would generally stop the artillery fire for the rest of the night.⁶² It was said that the greatest frustration for *all* NATO aircrews flying combat missions was to be orbiting over the KEZ night after night, for as long as six hours interspersed with multiple inflight refuelings, only to be called in at long last by an airborne FAC and cleared to attack a reported VJ tank that was no longer there.⁶³

Owing in large part to such operations, at least those that produced recognizable combat results, NATO's effort to engage dispersed and hidden enemy forces in the KEZ was not a complete waste of time and assets. For one thing, VJ commanders knew all too well that as the weather began steadily improving with the onset of summer, any effort on their part to conduct large-scale operations against either the KLA or civilian ethnic Albanians would put them at extremely high risk of being attacked. Moreover, General Short reported in late May that the newly focused attacks against the VJ's 3rd Army in Kosovo were beginning to register discernible effects. He went on to predict that "if we do this for two more months, we will either kill this army in Kosovo or send it on the run."⁶⁴

Taken as a whole, however, NATO's effort to attack enemy ground units in the KEZ was essentially a failure, the full extent of which became apparent only after the air war was over. To the very end, Short doubted that focusing exclusively, or even primarily, on elusive VJ forces in Kosovo would be enough to swing the desired outcome. He also placed little stock in claims emanating from NATO headquarters that the VJ was being progressively weakened by the air attacks. On that latter point, he observed that the only things that mattered were

⁶²Tissue, "21 Minutes to Belgrade," pp. 38–40.

⁶³Conversation with Major General P. J. M. Godderij, deputy commander in chief, Royal Netherlands Air Force, Scheveningen, the Netherlands, June 7, 2000.

⁶⁴William Drozdiak, "Air War Commander Says Kosovo Victory Near," *Washington Post*, May 24, 1999.

that army's ability to move and its willingness to fight, and that both of those remained decidedly intact.⁶⁵

In the first detailed official rundown of the air war's accomplishments as Allied Force approached its midpoint, the limited effects of NATO's bombing attempts against enemy forces in Kosovo were underscored by the frank admission that the VJ still retained 80 to 90 percent of its tanks.⁶⁶ Later, on May 19, NATO spokesman Major General Walter Jertz claimed more optimistically that one-third of all VJ tanks and artillery in Kosovo had been destroyed.⁶⁷ As the bombing effort drew to a close, NATO was similarly claiming that it had taken out more than one-quarter of the VJ's tanks and APCs deployed in Kosovo. Britain's chief of the defense staff, General Sir Charles Guthrie, further reported that more than 30 percent of the VJ's artillery and mortar pieces had been destroyed by NATO attackers.⁶⁸

In its final tally as Operation Allied Force ended, the U.S. Defense Department settled on 700 out of 1,500 tanks, APCs, and artillery pieces destroyed altogether in Kosovo.⁶⁹ More specifically, General Shelton announced in an early postwar briefing that NATO attacks had destroyed "around 120 tanks, about 220 armored personnel carriers, and up to 450 artillery and mortar pieces." However, nothing like a matching number of hulks was found by allied inspectors after Allied Force ended. During their withdrawal, VJ troops took hundreds of tanks, artillery pieces, and APCs out of Kosovo. They also seemed spirited and defiant rather than beaten.⁷⁰ The VJ's com-

⁶⁵William M. Arkin, "Limited Warfare in Kosovo Not Working," *Seattle Times*, May 22, 1999.

⁶⁶Paul Richter, "Milosevic War Machine Has a Lot of Fight Left," *Los Angeles Times*, April 29, 1999.

⁶⁷Robert Hewson, "Allied Force, Part II: Overwhelming Air Power," *World Air Power Journal*, Winter 1999/2000, p. 113.

⁶⁸Michael Evans, "Serb Army Talks of Peace as Armor Takes a Pounding," *London Times*, June 2, 1999.

⁶⁹Rowan Scarborough, "Pentagon Intends to Issue Final Count of Serbian Losses," *Washington Times*, July 9, 1999.

⁷⁰Over the course of the 11-day Serb withdrawal, NATO observers counted 220 tanks, 300 APCs, and 308 artillery pieces being loaded onto trucks and transporters, along with hundreds of other vehicles and assorted military equipment. Steven Lee Myers, "Damage to Serb Military Less Than Expected," *New York Times*, June 28, 1999.

mander in chief, General Dragoljub Ojdanic, claimed after the war that only 524 Yugoslav soldiers had been killed, in marked contrast to NATO's estimate of thousands.⁷¹

After the dust settled in early June, a preliminary NATO postmortem concluded that the air war had had almost no effect on VJ operations in Kosovo. In an after-action briefing to senior Pentagon officials, the commander of Joint Task Force Noble Anvil, Admiral James Ellis, confirmed that NATO air operations were effective against VJ armor only after the KLA launched its offensive, forcing defending VJ troops to uncover and mass their armor and mechanized forces.⁷² NATO initially claimed after the air war ended that it had disabled 150 of the estimated 400 VJ tanks in Kosovo. General Clark later scaled back that number to 110, after having determined that many tanks assumed to have been destroyed had, in fact, been decoys that the VJ had skillfully fielded in large numbers.⁷³

Not only did the Serbs make successful use of tank decoys made out of tetra-pak milk carton material, they also positioned wood-burning stoves with their chimneys angled to make them look like artillery pieces. In some cases, water receptacles were found in the decoys, cleverly placed there to heat up under the sun to help replicate the infrared signature of a vehicle or hot artillery tube.⁷⁴ One source spoke of cockpit display videotapes showing targets with every appearance of being tanks collapsing instantly upon being hit. In addition, the Serbs made heavy and frequently effective use of smoke generators to protect targets against LGBs. After the air war ended,

⁷¹"Yugoslav Army Lost 524 Soldiers, Top General Says," *International Herald Tribune*, July 22, 1999.

⁷²Briefing by Admiral James O. Ellis, USN, commander in chief, U.S. Naval Forces, Europe, and commander, Allied Forces Southern Europe and Joint Task Force Noble Anvil, no date given.

⁷³Joseph Fitchett, "NATO Misjudged Bombing Damage," *International Herald Tribune*, June 23, 1999. General Jumper dismissed criticisms from some that expensive U.S. precision munitions had been wasted on decoys. Declaring that U.S. forces had had "plenty of bombs for decoys," he noted that what appeared to be legitimate targets were immediately attacked so that aircrews would not loiter over target areas trying to distinguish real targets from decoys and exposing themselves needlessly to enemy fire. *Aviation Week and Space Technology*, September 20, 1999, p. 25.

⁷⁴Paul Richter, "U.S. Study of War on Yugoslavia Aimed at Boosting Performance," *Los Angeles Times*, July 10, 1999.

site-survey teams that went in on the ground in Kosovo and interviewed witnesses discovered that VJ forces had buried many of their missile launchers, covered fuel trucks with rugs, and disguised tanks as haystacks and armored vehicles as trees.

The subsequent, and putatively definitive, after-action report on Allied Force submitted to Congress by Secretary Cohen and General Shelton in the summer of 1999 claimed valid strikes on 93 enemy tanks, 153 APCs, 339 other military vehicles, and 389 artillery and mortar pieces.⁷⁵ Those downwardly revised estimates came on the heels of the findings by a munitions effectiveness assessment (MEA) team of 67 operators and intelligence experts, made up mostly of USAF officers, who went into Kosovo at Clark's behest to comb the country, both by helicopter and on foot, in an on-site survey of all actual DMPIs attacked. The team's specific mission was to perform an assessment of attacks undertaken against mobile targets in the Presevo Valley region of Kosovo by cross-referencing on-scene observations and conversations with witnesses on the ground against available cockpit display videotapes, imagery intelligence, signals intelligence, human intelligence, and interviews with airborne FACs who had been operating near the target area at the time of the attacks.⁷⁶

The team's initial conclusion from that assessment was that "only a handful" of enemy tanks, APCs, and artillery pieces could be determined to have been catastrophically damaged by air attacks.⁷⁷ Although the team succeeded in investigating some 60 percent of NATO's claimed hits on mobile targets in the KEZ, it confirmed only 14 tanks, 18 APCs, and 20 artillery pieces as destroyed for sure. A later assessment conducted by USAFE's office of studies and analy-

⁷⁵Cohen and Shelton, *After-Action Report*, pp. 84–85.

⁷⁶As the team's concept of operations clearly stipulated, the mission objective was to "determine Allied Force munition effectiveness by selective examination of fixed and mobile target sets within Kosovo [and to] evaluate and record physical and functional target damage and precise weapons impact locations and characteristics, with emphasis on precision and near-precision air-dropped munitions." The concept of operations further stipulated that validation of NATO's air campaign, target set, BDA, and rationale for specific target selection were "beyond the scope of this survey." Documentation provided to the author by Hq USAFE/SA, May 2, 2001.

⁷⁷Tim Butcher and Patrick Bishop, "NATO Admits Air Campaign Failed," *London Daily Telegraph*, July 22, 1999.

sis, using the team's findings as one important input, reported 93 tanks and 153 APCs as having been struck altogether, the same numbers noted above that were cited later by Secretary Cohen and General Shelton. Many of those claimed hits, however, were validated by only a single source of evidence, such as a cockpit display videotape or an infrared event detected by DSP satellites.⁷⁸ In the later aftermath of Allied Force, on-site surveys of bomb damage effects by KFOR observers and other inspectors further confirmed that NATO's attacks against VJ forces had accomplished far less than had initially been assumed, notably including at Mount Pastrik.⁷⁹

These seeming discrepancies led some air war critics to charge that NATO and the U.S. Defense Department were engaging in a blatant cover-up of allied air power's poor performance against VJ forces in Kosovo to avoid being embarrassed by the paltry numbers the inspection team had produced. That criticism turned out, however, to have been overblown for two reasons. First, the cover-up charge was misdirected, in that it was based entirely on a leaked draft report by USAFE's inspection team that went to Kosovo earlier in the summer of 1999. That draft report, dated August 3, 1999, and titled "Operation Allied Force: Munitions Effectiveness Assessment, Vol. II: Mobile Targets," documented information collected in Kosovo and elsewhere by the MEA working group tasked with looking into mobile enemy targets. That effort was undertaken not to account for successful strikes, but rather to determine what equipment remained at the attacked sites. The freshest of the attacked sites visited was four weeks old, and some were only visited for the first time three months after the attacks.

All told, the USAFE team came across 14 tank carcasses and the hulks of 12 self-propelled artillery vehicles, which could have looked like tanks from the air and been reported as such in post-strike pilot mission reports. That added up to 26 confirmable "tanks" suffering sufficiently catastrophic damage from NATO air attacks to be written off and abandoned by departing VJ forces. Cross-referencing pilot reports with corroborating evidence from other sources, the USAFE

⁷⁸John Barry, "The Kosovo Cover-Up," *Newsweek*, May 15, 2000, p. 23.

⁷⁹Richard J. Newman, "The Bombs That Failed in Kosovo," *U.S. News and World Report*, September 20, 1999.

studies and analysis staff later documented presumed successful strikes on 93 tanks, 153 APCs, and 389 artillery pieces. It further documented another 60 instances of attacks on tanks that were believed to have been successful but that could not be validated because of the stringent criteria it had been given by SACEUR. As explained in SACEUR's subsequent strike assessment briefing at NATO headquarters, 26 tanks could be categorized as "confirmed catastrophic kills," based on physical information actually gathered on the ground in Kosovo. The remainder of the 93 reported tank kills were categorized as "assessed strikes," which meant, in effect, that there were indications suggesting that a weapon may have hit a valid target.⁸⁰

Air warfare professionals, notably including the USAF chief of staff, General Michael Ryan, have readily acknowledged since the end of Allied Force that the problems encountered by the operation's flexible targeting effort outlined above reflected real challenges for the effective application of air power posed by such impediments as trees, mountains, poor weather, and an enemy ground force permit-

⁸⁰Stephen P. Aubin, "Newsweek and the 14 Tanks," *Air Force Magazine*, July 2000, pp. 59–61. As USAFE's director of studies and analysis, Brigadier General John Corley, who directed that assessment, explained afterward during a Pentagon press briefing, "if a pilot claimed that he had attacked a tank at a given [location], we would go to that location and . . . begin to survey that exact site. If what we had was . . . multiple sources to confirm what had been claimed, then we would put that into a successful strike category. Let me give you an example. If we went to one of those desired mean points of impact and we found a bomb crater and we found shrapnel and oil down in the bottom of that bomb crater, then we would take a digitized photo of that crater and we would note that there would be earth scarring, as if some very heavy piece of equipment had been dragged from that bomb crater out to a road. Then we would compare that with both before and after imagery. You might have, for example, a [satellite] image showing a tank in a tree line. You may go and take a look at the cockpit video which shows that tank at that exact set of coordinates with a munition impacting it. . . . You may then go back and discover a piece of U-2 film afterward showing a damaged tank. You may then find out that an airborne forward air controller who had flown specifically over this area day in and day out would report that approximately two to three days later, whatever had been there was now gone from that location. We further wound up with some information whereby we saw bomb-damaged and destroyed equipment loaded on board flatbed trucks being taken out of Kosovo, headed back north into Serbia. So as you begin to look at all those sources of information, those multiple layers worth . . . in concert, and if we had multiple pieces of evidentiary information, we would confirm a successful strike. And that was the difference between the 26 and the 93. If we could not confirm with multiple sources, we did not claim a successful strike." News briefing, Office of the Assistant Secretary of Defense (Public Affairs), the Pentagon, Washington, D.C., May 8, 2000.

ted the luxury of dispersing and hiding rather than concentrating to maneuver to accomplish its mission.⁸¹ The Cohen-Shelton report to Congress frankly admitted that the problems encountered with flexible targeting of VJ forces in Kosovo pointed up continued shortfalls in the nation's ability to meet "the difficult challenge of rapidly targeting enemy forces and systems that can move and hide frequently."⁸² On that discomfiting point, U.S. and NATO defense officials had nothing whatever to hide and covered nothing up.

Second, and perhaps more important, although it was clearly essential for NATO to maintain constant pressure on VJ and MUP forces deployed in Kosovo and to bend every reasonable effort to suppress their freedom to operate at will against the ethnic Albanians, the majority of the combat sorties that SACEUR insisted be devoted to finding and attacking enemy forces in the KEZ arguably entailed a waste of munitions and other valuable assets. That perspective was pithily expressed by the vice chairman of the Joint Chiefs of Staff, USAF General Joseph Ralston, who later went on to replace Clark as SACEUR: "The tank, which was an irrelevant item in the context of ethnic cleansing, became the symbol for Serb ground forces. How many tanks did you kill today? All of a sudden, this became the measure of merit that had nothing to do with reality."⁸³ When General Jumper, on being pressed later by reporters for an honest account of how many tanks NATO had actually destroyed, replied simply "enough," he was telling the truth. The marginality of the tank issue to what really mattered in Allied Force was perhaps most convincingly explained by Brigadier General Daniel Leaf, commander of the 31st Air Expeditionary Wing at Aviano, when he declared in the immediate wake of the cease-fire that "counting tanks is irrelevant. The fact is they withdrew, and while they took tanks with them, they returned to a country whose military infrastructure has been ruined.

⁸¹Indeed, in its interim report on the Kosovo air effort, the USAF expressly conceded that "shortfalls remain . . . in the USAF's ability to locate and attack moving armor and other ground forces in poor weather. The Air Force needs to continue to develop and improve its ability to do this." *The Air War Over Serbia: Aerospace Power in Operation Allied Force*, Washington, D.C., Hq United States Air Force, April 1, 2000, p. 53.

⁸²Cohen and Shelton, *After-Action Report*, p. 56.

⁸³Dana Priest, "Tension Grew with Divide in Strategy," *Washington Post*, September 21, 1999.

They're not going to be doing anything with those forces for a long time."⁸⁴

True enough, a demonstrable record of effective performance by the attacks against VJ tanks may well have been regarded at the time as being of crucial importance toward vindicating SACEUR's stress on attacks against dispersed and hidden enemy forces in Kosovo. Yet viewed in hindsight, the number of tanks taken out in the air war was, and remains, an issue of only scant pertinence to the operation's ultimate outcome. Not only that, getting into the tank-counting business in the first place made for a largely self-inflicted wound by the Department of Defense, SACEUR, and NATO. In the end, all the to-ing and fro-ing over how many enemy tanks were taken out by NATO was mainly of academic interest, since air operations in the KEZ were, by all indications, not a determining factor affecting Milosevic's ultimate decision to capitulate.⁸⁵ The KLA had been eliminated entirely as a tactical consideration by superior VJ strength. Moreover, notwithstanding more than two months of continual NATO bombing, the VJ lost few personnel to hostile fire, retained its command and control and resupply apparatus throughout the air effort, and continued to conduct ethnic cleansing forays until the last day of the air war, even though it did put itself at risk whenever its units exposed themselves to attack from the air. At bottom, NATO's failure to perform better than it did against enemy ground units in the KEZ was as much a result of the strategy chosen by its leaders as

⁸⁴Ignatieff, *Virtual War*, p. 106.

⁸⁵This is not to suggest that one should draw any particular comfort from the apparent fact that NATO's failure to take out more than a token number of VJ tanks was largely irrelevant to the overall outcome of Allied Force. For one thing, had NATO been able to render the VJ's Kosovo corps ineffective during the air war's initial month, Milosevic may well have capitulated earlier, to the relief of both NATO and the Kosovar Albanians. Second, and more important, the mission of finding, identifying, and destroying dispersed and concealed enemy tanks is not going to go away, and the U.S. Air Force will likely be asked again in some future contingency to attack fielded enemy forces under comparably challenging circumstances. Civilians in senior leadership positions who recall the more optimistic early claims on behalf of the air war's accomplishments in this respect will naturally expect air power to perform effectively. Fortunately, despite charges from some that the Air Force sought to play down its difficulties in this regard in the early aftermath of Allied Force, its leadership has frankly owned up to those difficulties and has initiated measures aimed at improving its capability. I am grateful to my RAND colleague Bruce Pirnie for directing my attention to this point.

it was of any inherent deficiencies in the air weapon. By ruling out before the fact even a ground threat, let alone any serious prospect of an early ground invasion, the Clinton administration and NATO ensured that air power would be stressed to the fullest when it came to attempts to engage fielded enemy forces.

STRAY WEAPONS AND THE LOSS OF INNOCENTS

Pressures to avoid civilian casualties and unintended damage to nonmilitary structures were greater in Allied Force than in any previous campaign involving U.S. forces. Nevertheless, despite rules of engagement characterized by USAF Major General Charles Wald as being "as strict as I've seen in my 27 years in the military," there were more than 30 reported instances throughout the air war of unintended damage caused by errant NATO munitions or mistakes in targeting, including a dozen highly publicized incidents in which civilians were accidentally killed.⁸⁶ The first serious loss of civilian lives occurred on April 12, when an electro-optically guided AGM-130 released by an F-15E struck a targeted rail bridge over the Jusna Morava river in Kosovo on the Belgrade-Skopje line 300 km southeast of Belgrade just as a passenger train full of noncombatants, in a tragic moment of fateful timing, happened to be crossing it.⁸⁷ Belgrade later reported that more than 55 civilians had been killed in that incident. Two days later, in the worst case of collateral damage

⁸⁶Joel Havemann, "Convoy Deaths May Undermine Moral Authority," *Los Angeles Times*, April 15, 1999.

⁸⁷Indeed, the train entered the AGM-130's field of regard so close to the moment of weapon impact that the F-15E weapon systems officer (WSO) who was controlling the guiding weapon noted that he had not even seen it until the videotape of his cockpit display was played back during the subsequent mission debriefing. As a measure of the extent to which F-15E aircrews, like all others, were disciplined to honor the strictest collateral-damage avoidance rules, there were numerous instances in which the WSO dragged the selected impact point of a guiding AGM-130 off the designated aim point to an open area at the last moment because the target looked through the weapon's EO seeker head like a house or some other potential opportunity for collateral damage. In a similar illustration of such discipline, one videotape of an AGM-130 attack on an enemy fuel storage tank as the weapon neared impact showed the targeted tank to be empty while others around it were full. Nevertheless, despite the WSO's natural temptation, the guiding weapon was not slewed at the last moment toward a more lucrative target because the empty fuel tank happened to be the one to which the approved DMPI had been assigned. Conversation with USAF F-15E aircrews, 492nd Fighter Squadron, RAF Lakenheath, England, April 27, 2001.

to have occurred at any time throughout the operation, attacks against presumed enemy military vehicles at two sites in southwestern Kosovo near the town of Djakovica were said to have killed numerous ethnic Albanian refugees when USAF F-16 pilots mistook civilian vehicles for a convoy.⁸⁸

These and similar possible target identification errors resulted, in at least a few instances, from constraints imposed by the requirement that NATO aircrews remain above 15,000 ft to avoid the most lethal enemy infrared SAM and AAA threat envelopes, which made visual discrimination between military and civilian traffic difficult at best. Discriminate attacks against moving military vehicles amid a virtual sea of civilian refugees typically bordered on being an impossible mission when pilots orbiting at medium altitudes could not determine for sure whether a convoy consisted of military trucks, military vehicles carrying refugees, or civilian vehicles. General Wald, the deputy director of strategic planning on the Joint Staff and the commander at Aviano during Operation Deliberate Force in 1995, conceded that “the job is about as hard as it’s going to get for targeting.”⁸⁹

Another contributing factor was the occasional tendency of allied aircrews to maneuver their aircraft in such a way as to put clouds within the targeting pod’s field of view between the aircraft and the target, thus blocking the laser beam illuminating the target and depriving the weapon of guidance. On April 6, near the end of the second week, the first LGB went astray in that manner, hitting an apartment building in the small town of Aleksinac 100 miles southeast of Belgrade and reportedly killing at least seven civilians and injuring dozens more. The intended target had been an artillery brigade headquarters, but the bomb’s steering toward its desired mean point of impact was disrupted by clouds that deflected the laser beam after weapon release.

In the case of the Djakovica incident noted above, there were initial reports that Yugoslav aircraft had intentionally attacked the civilian

⁸⁸Rowan Scarborough, “As Strikes Mount, So Do Errors,” *Washington Times*, May 11, 1999.

⁸⁹Robert Wall, “NATO Shifts Tactics to Attack Ground Forces,” *Aviation Week and Space Technology*, April 12, 1999, p. 23.

tractors and wagons near Prizren. Those reports ultimately proved groundless, although Pentagon officials did confirm that the Yugoslav air force was still operating low-flying Galeb ground-attack jets and attack helicopters.⁹⁰ In all events, the alleged occurrence of an inadvertent bombing attack on noncombatant civilians took place at midday, despite the greatest operational discipline on the part of the involved USAF pilots. The F-16 strike force leader, who was operating as an airborne forward air controller (FAC-A), determined the initial convoy to be made up of uniformly sized, colored, and spaced military vehicles whose occupants seemed engaged in systematic house-burning. Extensive radio discussion then ensued between the FAC-A and the ABCCC stressing the need to avoid inadvertently harming any Kosovar refugees. The ABCCC, backstopped by an orbiting UAV, confirmed the convoy to be a valid military target and marshaled as many fighters against it as were available in the immediate target area.

During the course of the precision attacks with 500-lb GBU-12 LGBs that then ensued, it was reported as "possible" that some of the vehicles may have been civilian tractors, at which point the FAC-A immediately called all fighters off "high and dry" (clear of the target area with their armament switches deselected), and the ABCCC, in turn, requested reverification of the targets as hostile. At that point, nearby OA-10s were called in so that their pilots might reconnoiter the situation and provide such reverification with onboard nine-power space-stabilized binoculars. One OA-10 pilot reported observing definite military vehicles but also multicolored and possibly civilian vehicles, whereupon the FAC-A terminated all further attacks. Afterward, Serb news reports claimed that 80 civilians had been killed, although the persistent ambiguities were such that NATO only conceded that it "may have attacked" civilian vehicles. Some reports suggested that the civilians involved had been machine-gunned rather than bombed, and eyewitnesses on the ground reported the use of human shields in the convoys and nearby Serb mortar fire at the same time the convoy was being attacked by the F-16s. The commander of the 31st Air Expeditionary Wing whose F-16s were involved in the tragedy, Brigadier General Leaf, later told

⁹⁰Michael Dobbs and Karl Vick, "Air Strikes Kill Scores of Refugees," *Washington Post*, April 15, 1999.

reporters that the incident involved “a very complicated scenario, and we will never be able to establish all the details.” He further stated that he could not explain the bodies of the civilians that had been shown on Serbian television and conceded only, in light of the ambiguous evidence, that there “may have been” unintended civilian fatalities.⁹¹

The extraordinary media attention that was given to events like these attested to what can happen when incurring zero noncombatant casualties becomes not just the goal of strategy but also the expectation. Thanks to unrealistic efforts to treat the normal friction of war as avoidable human error, every occurrence of unintended collateral damage became overinflated as front-page news and treated as a blemish on air power’s presumed ability to be consistently precise. Indeed, the added constraints imposed on NATO aircrews as a result of such occasional tragic occurrences indicated the degree to which modern air power has become a victim of its own success. During the Gulf War, cockpit video images of LGBs homing with seemingly unerring accuracy down the air shafts of enemy bunkers were spell-binding to most observers. Yet because of that same seemingly unerring accuracy, such performance has since come to be expected by both political leaders and the public alike. Once zero collateral damage becomes accepted as a measure of strategy success, not only air power but *all* forms of force employment get set up to be judged by all but unreachably high standards. Inevitably, any collateral damage then caused during the course of a campaign becomes grist for domestic critics and the enemy’s propaganda mill. Anthony Cordesman rightly noted how characterizations of modern precision bombing as “surgical” overlook the fact that patients still die on the operating table from time to time.⁹² Nevertheless, a nontrivial number of proposed sorties in Operation Allied Force were either canceled outright or aborted at the last minute before any weapons were released because their targets (wryly characterized by some USAFE staffers as “morally hardened”) could not be positively identified or

⁹¹Videotaped press statement by Brigadier General Daniel Leaf, USAF, Brussels, Belgium, NATO Office of Information and Press, April 19, 1999.

⁹²Anthony H. Cordesman, “The Lessons and Non-Lessons of the Air and Missile War in Kosovo,” unpublished draft, Center for Strategic and International Studies, Washington, D.C., July 20, 1999.

because of the perceived risk of causing collateral damage. At best, that made for a necessarily constrained and therefore inescapably inefficient air operation compared to the standard set earlier in Desert Storm.

A bevy of criticism arose from some quarters after the bombing ended alleging that many of the 500 or more Yugoslav and Kosovar Albanian civilians who lost their lives to collateral damage incidents had died needlessly as a direct result of NATO attack aircraft having been kept above 15,000 ft in the interest of minimizing the likelihood of losing friendly lives. Critics further charged that operating at that altitude had somehow been risk-free, cowardly, and even immoral on the part of NATO's aircrews.⁹³ In league with other detractors of the way the air war was conducted, strategist Edward Luttwak, for example, characterized 15,000 ft as a "not-optimal" but "ultra-safe" altitude from which allied pilots might carry out "perfectly safe bombing."⁹⁴

In point of fact, 15,000–20,000 ft was precisely the "optimal" altitude block from which to conduct LGB attacks—not only to keep the attacking aircraft clear of short-range air defenses in the immediate target area but, more important, to give the LGB time to acquire the target and assume a stabilized glide. Contrary to the suggestions of critics, operating at medium altitude provides no protection whatever against radar-guided SAMs. It merely puts attacking aircraft outside the lethal envelope of "trash fire" threats (small arms, AAA, and infrared SAMs). These threats are impossible to detect in a timely way and offer little or no warning of imminent danger; as a result, they cannot be countered very effectively. Indeed, operating at medium altitude actually *increases* the risk of being engaged by un-negated enemy radar-guided SAMs because the aircraft can no longer take advantage of terrain-masking opportunities. The more important point, however, is that when medium-altitude attack tac-

⁹³Typical of such baseless charges was the reference by one pundit to the "low altitudes at which tactical attacks work," yet where "pilots risk getting killed" (William Pfaff, "After NATO's Lies About Kosovo, It's Time to Come Clean," *International Herald Tribune*, May 11, 2000) and the allegation by another that "avoiding risk to pilots multiplied the risk to civilians exponentially" (James Carroll, "The Truth About NATO's Air War," *Boston Globe*, June 20, 2000).

⁹⁴Edward N. Luttwak, "Give War a Chance," *Foreign Affairs*, July/August 1999, p. 40.

tics are employed, the timeline for target acquisition and weapons guidance is substantially longer, thus improving the chance of achieving a hit.

Even assuming the absence of undetectable “trash fire” threats, it is by no means a foregone conclusion that had allied aircrews routinely descended to lower altitudes in an effort to identify their targets more positively, the incidence of unintended collateral damage occurrences would have been that much lower. To begin with, VJ and MUP troops were highly accomplished at camouflage and hiding, and they made frequent use of the civilian populace as human shields. Moreover, in Kosovo, where most of the inadvertent civilian fatalities occurred, the mandated altitude floor was not invariably 15,000 ft as the critics implied. On the contrary, once operations against dispersed and hidden VJ forces in Kosovo began in earnest in mid-April, FACs were cleared down to 5,000 ft as necessary to make positive target identifications, and strike aircraft could descend to as low as 8,000 ft for a nonprecision dive-bomb delivery.

Even at those lower altitudes, however, positive identifications tended to be difficult, although in one case, as noted above, USAF OA-10 pilots using nine-power space-stabilized binoculars managed to observe civilians intermingled with a VJ truck convoy after one vehicle had already been hit, as a result of which the ongoing attack was instantly terminated.⁹⁵ As a rule, however, routinely going lower and accepting the increased risk of losing an aircraft in the hope of doing better target discrimination would not, in all likelihood, have produced the desired result. True enough, flying even as low as 100 ft above ground level might have enabled NATO pilots to distinguish civilian from military traffic in a few fleeting moments, if that traffic happened to lie almost directly underneath the aircraft’s flight path. Yet operating that close to the ground at normal fighter airspeeds (500 nautical miles per hour or more) in defended airspace would have offered zero perspective and zero precision-attack capability. It also would have increased the chance of NATO aircraft losses to enemy “trash fire” and just possibly brought about the overall failure

⁹⁵“NATO Jets May Have Erred in Convoy Attack, General Says,” *Aerospace Daily*, April 20, 1999, p. 102.

rather than success of Allied Force as a result. Moreover, hidden targets would still have remained hidden.

The point of the foregoing is that for the kinds of circumstances that repeatedly occasioned the accidental loss of civilian life in Allied Force, the United States, to say nothing of its NATO allies, has yet to develop fail-safe target discrimination capabilities and tactics for use either above *or* below 15,000 ft. As a result, it has had little choice but to rely on draconian rules of engagement (ROE), which are designed to hedge on the side of caution yet are anything but foolproof. In one case during Allied Force in which the ROE worked as intended, a USAF pilot was directed not to attack a confirmed SA-6 launcher because it was parked immediately adjacent to a civilian structure in a village. There were other reported instances in which precision munitions in the process of guiding were deliberately steered away from targets at the last minute to avoid harming civilians who had not been seen in the target area until after weapon release.⁹⁶ In the most egregious instance in which the ROE regime appears to have failed, however, namely, the tragedy involving the convoy along the Djakovica road in Kosovo, the FAC who was coordinating the attack had been given a positive identification by the ABCCC that was completely consistent with the prevailing ROE. Upon observing that the vehicles were uniformly colored and evenly spaced, the FAC declared the convoy to be a valid target. He had also been given ABCCC approval to clear the fighters under his control to drop at will after one F-16 orbiting overhead had drawn fire from one of the convoy's vehicles.⁹⁷

⁹⁶John A. Tirpak, "The State of Precision Engagement," *Air Force Magazine*, March 2000, p. 26.

⁹⁷It further bears stressing in this regard that most cases of unintended damage resulting in civilian deaths occurred inside targeted buildings, which were prespecified in the ATO and against which NATO aircrews were not free to exercise real-time discretion. Other such cases were occasioned by munitions failures such as faulty cluster-bomb fuses or laser target designators that were disrupted by smoke or clouds while a weapon was guiding. Neither had anything to do with weapon-release altitude. The only clear case of noncombatant fatalities that can be even indirectly ascribed to altitude was the April 14 Djakovica convoy incident, during which the attack was immediately called off once the target identification error was discovered.

The solution to such challenges lies not in more relaxed operating restrictions but rather in the development of better tactics, techniques, procedures, and equipment—perhaps beginning with a more aggressive and effective use of offboard platforms like UAVs to perform combat identification and to provide cueing for engaged shooters.⁹⁸ Unfortunately, the sensor-to-shooter links that have been refined to a high art over the years for the air-to-air arena, such as the E-3 AWACS and the joint tactical information distribution system (JTIDS) carried by some F-15s, remain far less developed for ground-attack operations when it comes to situation characterization and target identification.⁹⁹ In the absence of such capabilities, flying lower in Allied Force not only would not have solved the target identification problem, it would also have rendered weapons deliveries less accurate and, as a result, probably compounded the collateral damage problem rather than ameliorating it. As matters stood, although regrettable tragedies did occur because of occasional misdirected weapons, the munitions and tactics used by NATO in Operation Allied Force made the air effort a record-setter when it came to achieving its declared goals with a minimum of collateral damage for an operation of that magnitude. Indeed, given the high volume of ordnance that was expended over the course of the 78-day air war, it is most remarkable—even astonishing—that the incidence of unintended civilian fatalities was not higher.

⁹⁸Email from Lieutenant Colonel James Tubbs, AF/XPXQ, to Colonel James Callard, AF/XPXS, February 11, 2000. Lieutenant Colonel Tubbs was the operations officer of the 510th Fighter Squadron flying F-16CGs out of Aviano Air Base during Operation Allied Force.

⁹⁹Although, as in Desert Storm, AWACS generally provided a superb threat picture to allied pilots operating in hostile airspace, at least one specific instance of friction was reported by a USAF F-15C pilot who downed a Yugoslav MiG-29 during a day defensive counterair mission on March 26. The pilot complained that the supporting AWACS controller “did not have any inkling [that] someone was flying on the other side of the border, although he was real good at calling out every friendly *west* of us” (email communication to the author, June 4, 1999). The F-15 pilot further charged that the supporting AWACS was still unaware of the MiG-29’s presence even after initial moves had commenced. The intercepting pilot accordingly assessed the assumed threat aircraft to be hostile by origin, since there were no NATO offensive counterair missions airborne at the time. Only after the engagement was fully joined and the F-15 pilot had visually confirmed his target to be a MiG-29 did the AWACS controller finally report two possible hostile contacts in lead-trail formation.

THE CHINESE EMBASSY BOMBING

By far the most consequential instance of unintended bomb damage in Allied Force occurred on May 7, when three JDAMs intended for the headquarters of a Yugoslav arms agency were dropped instead with unerring accuracy by a B-2 on the Chinese embassy in Belgrade. That colossal blunder was reminiscent of the ill-fated attack on the Al Firdos bunker by an F-117 during Desert Storm, which accidentally killed more than a hundred Iraqi women and children who, unbeknown to U.S. target planners, had been sleeping inside in the false belief that it offered them shelter. The inadvertent bombing of the Chinese embassy, which killed four occupants who happened to be in the targeted portion and sent 26 more embassy staffers to the hospital, became the latest of more than a dozen strikes in Allied Force that had gone awry by that time. Not only did the bombing cause a huge international uproar, it dramatized yet again how seemingly “tactical” errors can have immensely disproportionate strategic consequences. Among other things, the event triggered a diplomatic crisis of the first order between Washington and Beijing, disrupted moves to negotiate an end to the Kosovo conflict, and prompted a politically directed halt to any further bombing of targets in Belgrade for two weeks thereafter.¹⁰⁰

At least two failures seem to have accounted for the inadvertent bombing. First, CIA officials who nominated the intended target wrongly deduced where it was located in Belgrade. Second, those same officials were unaware that the actual targeted building was the Chinese embassy, which had been moved there from another site four years before. During Desert Storm, target planners almost always had knowledge of all off-limits buildings in and around Baghdad, including foreign embassies, and they put red circles around those buildings on planning maps to ensure that they would not be inadvertently struck. Gulf War planners were also more proactive in updating the no-strike list, to include having U.S. officials contact

¹⁰⁰The error was also reminiscent of earlier damage to the French embassy in Tripoli, Libya, in 1986 during the joint U.S. Air Force–U.S. Navy Operation El Dorado Canyon against Libya's ruler, Moammar Khaddafi, caused when the bomb fragmentation pattern from a preceding F-111 forced the trailing pilot to shift course, inadvertently sending his bombs into the embassy. That, however, was an operational error occasioned by the heat of battle, not a planning error committed by target nominators.

foreign governments directly whenever there was any doubt about the location of their embassies.¹⁰¹ In this case, although the target development process most definitely included the creation and continual updating of a “no-strike” list of facilities, locations, and assorted other entities that was duly vetted throughout the intelligence community, U.S. officials admitted afterward that they had relied on an outdated map of Belgrade. Some laid the blame on a budget-cutting decision by the Clinton administration in 1996 to fold the CIA’s National Photographic Interpretation Center (NPIC) into the Defense Department’s National Imagery and Mapping Agency (NIMA), which had prompted many of NPIC’s most experienced analysts to quit in protest.

In the immediate aftermath of the blunder, Secretary Cohen said: “Clearly, faulty information led to a mistake in the initial targeting of this facility. In addition, the extensive process in place used to select and validate targets did not correct this original error.”¹⁰² Cohen added that the bombing had resulted not from a mechanical or human mistake but from “an institutional error.”¹⁰³ It was later determined that the error had occurred in considerable part because of the intense pressure that was being applied at the time by General Clark for planners to come up with 2,000 suggested targets in Yugoslavia, prompted by the scramble for targets that had commenced once the air war’s first few disappointing nights made it clear that Milosevic was not about to fold quickly as had originally been hoped. It was in this forced atmosphere of trying to find and justify 2,000 plausible targets at any cost that the CIA’s Counter-Proliferation Division, which had no particular expertise with respect either to Yugoslavia or to targeting, was led to submit the CIA’s first target nomination in Allied Force.

As it turned out, U.S. intelligence had the correct street address for the intended target, which was a Yugoslav weapons-producing agency called the Federal Directorate of Supply and Procurement.

¹⁰¹David A. Fulghum and Robert Wall, “Intel Mistakes Trigger Chinese Embassy Bombing,” *Aviation Week and Space Technology*, May 17, 1999, p. 55.

¹⁰²Eric Schmitt, “Aim, Not Arms, at the Root of Mistaken Strike on Embassy,” *New York Times*, May 10, 1999.

¹⁰³Paul Richter and Doyle McManus, “Pentagon to Tighten Targeting Procedures,” *Los Angeles Times*, May 11, 1999.

Yet when overhead imagery was examined to match up the address with the intended target, responsible individuals at CIA selected the wrong building. The actual target turned out to have been on the same street, only a block away to the south. The map used had been created in 1992 and updated in 1997. It did not, however, show the Chinese embassy at its current location, to which it had moved in 1996. No one in the planning loop had thought to check the match-up of the target address with its presumed location, because no one had any reason to believe that there might be a problem in the making. One midlevel CIA analyst who was familiar with the intended target reportedly "was concerned, raised some questions, and they did not get resolved." Doubts about the target's validity also were aired at the working level at USEUCOM, but those concerns were never passed up to more senior levels before the strike.¹⁰⁴ Afterward, in a classic case of closing the barn door after the horse had escaped, NATO officials cited a new "iron-clad requirement" that targets be reviewed by people who had first-hand knowledge of them.¹⁰⁵ Yet despite that belated measure, on the first day after NATO's bombing of Belgrade resumed two weeks later, attacking aircraft inadvertently damaged the residences of the Swedish, Spanish, and Norwegian ambassadors, the Libyan embassy, and a hospital in which four civilians were killed.¹⁰⁶

Perhaps predictably when viewed in hindsight, more than a few people around the world came to conclude in the early wake of the Chinese embassy bombing that notwithstanding the U.S. government's insistent claims to the contrary, the bombing had, in fact, been not only far from accidental, but planned with calculated intent from the very start. Much of the apparent strength of this conspiracy theory stemmed from the fact that the three JDAMs that were dropped by the B-2 had, all too conveniently, landed squarely on that part of the embassy that housed the office of the defense attaché and the embassy's intelligence cell, the latter of which was widely believed in

¹⁰⁴Vernon Loeb and Steven Mufson, "CIA Analyst Raised Alert on China's Embassy," *Washington Post*, June 24, 1999.

¹⁰⁵Eric Schmitt, "Pentagon Admits Its Maps of Belgrade Are Out of Date," *New York Times*, May 11, 1999, and Bradley Graham, "U.S. Analysts Misread, Relied on Outdated Maps," *Washington Post*, May 11, 1999.

¹⁰⁶Steven Pearlstein, "NATO Bomb Said to Hit Belgrade Hospital," *Washington Post*, May 21, 1999.

informed circles to be the single largest Chinese collection center in all of Europe.¹⁰⁷

One can readily understand how that curious coincidence might have helped energize Chinese allegations, which continue to this day, that the bombing of the embassy was intentional. Yet as much as one might wish to savor the thought that U.S. planners may have been just clever enough to contrive to take out a Chinese SIGINT site that was suspected of providing aid and comfort to the enemy while maintaining a reliable basis for plausible denial, it defies credibility to believe that those responsible for implementing Allied Force, at whatever level such putative machinations may have occurred, attacked the offending part of the embassy with premeditation. Although truth is indeed stranger than fiction on occasion, *no* coalition of democratic partners—least of all one led by an official Washington that, since Watergate, has become famously reputed for leaking like a sieve at even the slightest hint of high-level impropriety—could have pulled off such a stratagem without it being exposed. Ivo Daalder and Michael O’Hanlon perhaps best clinched this point when they wrote that the strongest proof of the groundlessness of the conspiracy theory was that “the attack’s predictable damage—not only to U.S.-PRC relations but even to NATO solidarity—was far too great to justify the military benefit of silencing any Chinese military or intelligence assistance to Serbia that could theoretically have been provided from that building.”¹⁰⁸

TASK FORCE HAWK

As noted earlier in Chapter Three, within days after Operation Allied Force commenced, General Clark asked the Army to deploy a contingent of its AH-64 Apache attack helicopters to the combat zone to provide a better close-in capability against enemy tanks and APCs than that offered by fixed-wing fighters, which remained restricted to operating at medium altitudes. Clark initially had hoped to deploy this force to Macedonia, where the roads and airfields were better

¹⁰⁷Steven Lee Myers, “Chinese Embassy Bombing: A Wide Net of Blame,” *New York Times*, April 17, 2000.

¹⁰⁸Ivo H. Daalder and Michael E. O’Hanlon, *Winning Ugly: NATO’s War to Save Kosovo*, Washington, D.C., The Brookings Institution, 2000, p. 147.

and the terrain less challenging. The Macedonian government, however, declined to grant permission because it was already swamped by the flood of Kosovar refugees, so Clark sought Albania instead as the best available alternative.¹⁰⁹ Within four hours, NATO had approved Clark's request. It took more than a week, however, for the U.S. and Albanian governments to endorse the deployment. That approval finally came on Day 12 of Allied Force. The U.S. Defense Department at first indicated that it would take up to 10 days to deploy the package. In the end, it took 17 days just to field the first battalion of Apaches, which arrived in Albania on April 21.

At first glance, the idea of using Apaches to reinforce NATO's fixed-wing aircraft seemed entirely appropriate, considering that the AH-64 had been acquired by the Army expressly to engage and destroy enemy armor. As Pentagon spokesman Kenneth Bacon put it in announcing the deployment, they would offer NATO "the type of tank-killing capability that the bad weather has denied us . . . the capability to get up close and personal to the [VJ] units in Kosovo."¹¹⁰ In a normal weapons load, the Apache mounts up to 16 Hellfire antitank missiles, 76 folding-fin antipersonnel rockets, and 1,200 rounds of 30mm armor-piercing ammunition. With that armament, it gained deserved distinction by destroying more than 500 Iraqi armored vehicles during Operation Desert Storm. In Desert Storm, the Apaches had deployed as an organic component of two fully fielded U.S. Army corps. But in this case, the Army was being asked by SACEUR to cobble together an ad hoc task force designed to operate essentially on its own, without the backstopping support of a fielded U.S. ground combat presence in the theater. The Army is not configured to undertake such ad-hoc deployments, and its units do not train for them. Instead, an Apache battalion normally deploys only as part of a larger Army division or corps, with all of the latter's organically attached elements.

¹⁰⁹Another reported problem with the Macedonia basing option was the fact that it would have been a violation of the Dayton accords to station any offensive forces within the territorial confines of the former Yugoslavia. Albania was thus the only realistic alternative.

¹¹⁰Bradley Graham and Dana Priest, "Allies to Begin Flying Refugees Abroad," *Washington Post*, April 5, 1999.

Accordingly, the Army was driven by its own standard operating procedures to supplement the two Apache battalions with an additional heavy contingent of ground forces, air defenses, military engineers, and headquarters overhead. As the core of this larger force complement, now designated Task Force (TF) Hawk, the Apaches were drawn from the Army's 11th Aviation Brigade stationed at Illesheim, Germany. The deployment package included, however, not only the two battalions of AH-64s, but also 26 UH-60L Blackhawk and CH-47D Chinook helicopters from the 12th Aviation Regiment at Wiesbaden, Germany. Additional assets whose deployment was deemed essential for supporting the Apaches included a light infantry company; a multiple-launch rocket system (MLRS) platoon with three MLRS vehicles; a high-mobility multipurpose wheeled vehicle (HMMWV, or "humvee") antitank company equipped with 38 armed utility vehicles; a military intelligence platoon; a military police platoon; and a combat service support team. The Army further determined a need for its Apaches to be accompanied by a mechanized infantry company equipped with 14 Bradley AFVs; an armor company with 15 M1A2 Abrams main battle tanks; a howitzer battery with eight 155mm artillery pieces; a construction engineer company; a short-range air defense battery with eight more Bradley AFVs armed with Stinger infrared SAMs; a smoke generator platoon; a brigade headquarters complement; and diverse other elements. In all, to backstop the deployment of 24 attack helicopters to Albania, TF Hawk ended up being accompanied by a support train of no fewer than 5,350 Army personnel.

To be sure, there was a legitimate force-protection rationale behind this accompanying train of equipment and personnel. Unlike the Marines, who deployed 24 F/A-18D fighters to Hungary only a few weeks thereafter and had them flying combat missions within days with nothing even approaching TF Hawk's overhead and support baggage, Army planners had to be concerned about the inherent risks of deploying a comparable number of Apaches on terrain that was not that of a NATO ally, that lacked any semblance of a friendly ground force presence, and that could easily have invited a VJ cross-

border attack in the absence of a U.S. ground force sufficient to render an attack an unacceptable gamble for VJ commanders.¹¹¹

As one might have expected with so much additional equipment and personnel, however, the Apache deployment soon encountered the predictable consequences of the Army's decision. It was at first estimated that 200 USAF C-17 transport sorties would be needed to airlift the assorted support elements with which the Apaches had been burdened. (The Tirana airport lacked the required taxiway and ramp specifications to accommodate the more capacious C-5.) In the end, it took more than 500 C-17 sorties, moving some 22,000 short tons in all, to transfer TF Hawk in its entirety to Albania. Commenting later on the deployment, one Army officer complained that the Army is "still organized to fight in the Fulda Gap." Even the outgoing Army chief of staff, General Dennis Reimer, admitted in an internal memo to senior Army staff officers once the deployment package had finally been assembled in theater that the manifold problems encountered by TF Hawk had underscored a "need for more adaptive force packaging methodology."¹¹²

In all events, the Apaches with their attached equipment and personnel arrived in Albania in late April. No sooner had the Army declared all but one of the aircraft ready for combat on April 26 when, only hours later, one crashed at the Tirana airfield in full view of reporters who had been authorized to televise the flight. (The 24th Apache had developed hydraulic trouble en route and remained on the ground in Italy.) Neither crewmember was injured, but the accident was an inauspicious start for the widely touted deployment. Less than two weeks later, on May 5, a second accident occurred, this time killing both crewmembers during a night training mission some 46 miles north of Tirana. The aircraft was carrying a full load of

¹¹¹That said, it bears noting that the threat of Serbian forces coming across the Albanian border did not appear to be a matter of great concern to anyone in the Allied Force command hierarchy *before* the arrival of TF Hawk, even though there were U.S. troops already on the ground in Albania as a part of JTF Shining Hope, the Albanian refugee relief effort, who were not provided with any comparable force-protection package.

¹¹²Elaine M. Grossman, "Army's Cold War Orientation Slowed Apache Deployment to Balkans," *Inside the Pentagon*, May 6, 1999, p. 6. Notably, the C-17 demonstrated for the first time the ability to air-deliver a significant Army force of M1 tanks, M2 AFVs, MLRSs, howitzers, and engineering equipment.

weapons and extra fuel. A subsequent investigation concluded that the first accident had been caused by the pilot's having mistakenly landed short of his intended touchdown point.¹¹³ The second was attributed to an apparent failure of the tail rotor because the aircraft had been observed to enter a rapid uncontrolled spiral during the last moments before its impact with the ground.

As of May 31, the cost of the TF Hawk deployment had reached \$254 million, much of that constituting the expense for the hundreds of C-17 sorties that had been needed to haul all the equipment from Germany to Albania, plus the additional costs of building base camps and port services and conducting mission rehearsals.¹¹⁴ Yet despite SACEUR's intentions to the contrary, the Apaches flew not a single combat mission during the entire remainder of Operation Allied Force. The reason given afterward by the JCS chairman, General Shelton, was that Serb air defenses in Kosovo, although noticeably degraded by early May, remained effective enough to warrant keeping the Apaches out of action until SEAD operations had "reduced the risk to the very minimum."¹¹⁵

In a final coda to the Army's plagued TF Hawk experience, Shelton conceded in later testimony to the Senate Armed Services Committee that "the anticipated benefit of employing the Apaches against dispersed forces in a high-threat environment did not outweigh the risk to our pilots."¹¹⁶ Shelton added that by the time the deployment had reached the point where the Apaches were ready to engage in combat, VJ ground formations were no longer massed but had become dispersed and well hidden. Moreover, he went on to note, the weather had improved, enabling Air Force A-10s and other fixed-wing aircraft to hunt down dispersed and hidden enemy forces while

¹¹³Paul Richter and Lisa Getter, "Mechanical Error, Pilot Error Led to Apache Crashes," *Los Angeles Times*, May 13, 1999.

¹¹⁴Ron Lorenzo, "Apache Deployment Has Cost Quarter Billion So Far," *Defense Week*, June 7, 1999, p. 6.

¹¹⁵Molly Moore and Bradley Graham, "NATO Plans for Peace, Not Ground Invasion," *Washington Post*, May 17, 1999.

¹¹⁶Sheila Foote, "Shelton: Risk Was the Key in Decision Not to Use Apaches," *Defense Daily*, September 10, 1999, p. 2.

incurring less risk from enemy infrared SAMs, AAA, and small-arms fire than the Apaches would have faced.¹¹⁷

Beyond the problems created for the deployment by the Army's decision to bring along so much additional overhead, there was a breakdown in joint doctrine for the combat use of the helicopters that was disturbingly evocative of the earlier competition for ownership and control of coalition air assets that had continually poisoned the relationship between the joint force air component commander (JFACC) and the Army's corps commanders during Desert Storm.¹¹⁸ The issue stemmed in this case from the fact that the Army has traditionally regarded its attack helicopters not as part of a larger air power equation with a theater-wide focus, but rather as an organic maneuver element fielded to help support the ground maneuver needs of a division or corps. Apache crews typically rely on their own ground units to select and designate their targets. Yet in the case of Allied Force, with no Army ground combat presence in theater to speak of, they would either have had to self-designate their targets or else rely on Air Force forward air controllers flying at higher altitudes to designate for them. The idea of using Apaches as a strike asset in this manner independently of U.S. ground forces was simply not recognized by prevailing Army doctrine. On the contrary, as prescribed in Army Field Manual FM 1-112, *Attack Helicopter Operations*, an AH-64 battalion "never fights alone. . . . Attacks may be conducted out of physical contact with other friendly forces," but they must be "synchronized with their scheme of maneuver." FM 1-112 expressly characterizes deep-attack missions of the sort envisaged by Clark as "high-risk, high-payoff operations that must be exercised with the utmost care."¹¹⁹

¹¹⁷True enough, the terrain and weather presented by Kosovo were more challenging than the open and featureless Iraqi desert, where the Apaches had performed so effectively against enemy armor in Desert Storm. Yet the biggest concern in the minds of many U.S. leaders was the specter of a replay of the 1993 "Bloody Sunday" horror in Mogadishu, Somalia, with dead Army Rangers and crewmembers from downed Blackhawk helicopters being dragged through the streets on live television worldwide.

¹¹⁸David Atkinson and Hunter Keeter, "Apache Role in Kosovo Illustrates Cracks in Joint Doctrine," *Defense Daily*, May 26, 1999, p. 6.

¹¹⁹Quoted in Elaine M. Grossman, "As Apaches Near Combat, White House Seeks Diplomatic Solution," *Inside the Pentagon*, May 6, 1999, p. 7.

In light of this, the Army's V Corps commander, Lieutenant General John Hendrix, was willing to have the Apaches included in the USEUCOM Air Tasking Order (ATO), but demurred on having them incorporated as well into the separate NATO ATO, notwithstanding General Short's insistence that such inclusion would be essential in any situation in which the attack helicopters were ever committed to actual combat. Apart from that, however, Short never sought operational control of the Apaches or attempted to task them. He also offered to provide TF Hawk as much operational support (including EA-6B jamming support) as possible, and even went so far as to propose to subordinate himself and his CAOC to Hendrix, who as V Corps commander was also the ultimate commander of TF Hawk, as a supporting (as opposed to supported) combat element.¹²⁰

In the end, an agreement was reached that included the Apaches with all other ATO missions yet left to Hendrix's discretion much essential detail on mission timing and tactics. A window was provided in the ATO such that the Apaches would be time-deconflicted from friendly bombs falling from above and also assured of some fixed-wing air support. However, the agreement reached in the end was so vague that it allowed each service to claim that it maintained tactical control over the Apaches in the event they were ever committed to combat. For their part, Army officers insisted that fire support for the AH-64s would come *only* from MLRS and Army tactical missile systems (ATACMS) positioned on the Albanian side of the border. That doctrinal stance was enough all by itself to ensure that the Apaches would never see combat, considering that the massive MLRS and ATACMS fires envisaged for any AH-64 operations would have rained literally multiple thousands of CBU submunitions all over Kosovo in an indiscriminate attempt to suppress enemy AAA and IR SAMs, a tactic that was out of the question from the very start, given NATO's determination to avoid any significant incidence of noncombatant casualties. In contrast, Air Force planners maintained that excluding the Apaches from CAOC control would increase their level of risk by depriving them of support from such key battlespace awareness assets as Joint STARS, Rivet Joint, Compass Call, and the EA-6B. As a USAF officer attached to Hendrix's deep operations coordination cell

¹²⁰Telephone conversation with Lieutenant General Michael Short, USAF (Ret.), August 22, 2001.

(DOCC) reportedly put it, “they do not know, nor do they want to know, the detailed integration required to get the Prowler to jam the priority threats, provide acquisition jamming on the correct azimuth, etc. . . . The benefits of integrating with platforms like Compass Call, Rivet Joint and others are off their radar scope.”¹²¹

After Allied Force ended, the assistant chief of staff for operations at Supreme Headquarters Allied Power Europe (SHAPE), USAF Major General John Dallager, touched the heart of the overriding interests and equities at stake here when he stated, during a briefing at a NATO Reaction Force Air Staff conference on JFACC issues: “Clearly the JFACC’s authority must not infringe upon operational C2 [command and control] relationships within and between national or service commands and other functional commands. But to ensure deconfliction of simultaneous missions and to minimize the risk of fratricide, all air operations within the [joint operating arena] must be closely coordinated by the JFACC through the ATO . . . process. This last point may be difficult to swallow for land and maritime commanders, but if air history teaches us anything, it is that air, the truly joint activity, needs to be coordinated centrally if we are to make efficient use of scarce resources and if we are to avoid blue-on-blue.”¹²²

¹²¹Elaine M. Grossman, “Army Commander in Albania Resists Joint Control over Apache Missions,” *Inside the Pentagon*, May 20, 1999, p. 9. In his memoirs, Clark later scored this article for “personally attacking Jay Hendrix and claiming, among other accusations, that he would not allow the Apache sorties to appear on Short’s Air Tasking Order.” Clark made no attempt to refute that accusation, however, but merely dismissed it as the complaint of a “disgruntled Air Force officer” whose “misunderstanding, communicated without perspective to friends in other units, suddenly surfaced to make news weeks after it had been written, after the problems it addressed, if real then, had been corrected.” General Wesley K. Clark, *Waging Modern War: Bosnia, Kosovo, and the Future of Combat*, New York, Public Affairs, 2001, p. 320.

¹²²Major General John Dallager, USAF, “NATO JFACC Doctrine,” briefing at a conference on “The NATO Joint Force Air Component Commander Concept in Light of the Kosovo Air Campaign,” Headquarters NATO Reaction Force Air Staff, Kalkar, Germany, December 1–3, 1999. It might be noted in passing here that another Army–Air Force difference of view that had an even greater operational impact than the joint doctrinal disagreement discussed above (because all involved had to live through its consequences) was the disconnect between the two services at Tirana as to who was in charge of the airfield and force protection, a disconnect that, according to one senior USAF planner who was involved, created “some real problems.” Comments on an earlier draft by Brigadier General Robert Bishop, Hq USAF/XOO, April 17, 2001.

Interestingly, the Army leadership in the Pentagon seemed far more disposed than General Hendrix, at least in principle, to assign operational control of the Apaches to the CAOC. The incoming Army vice chief of staff, Lieutenant General Jack Keane, frankly commented at an industry symposium that “it boggles my mind, but we still have senior leaders, people who wear stars . . . that don’t recognize that if you’re going to fly Apaches at a distance and range, it’s got to be on the [air tasking order].” General Keane added that the Apaches had to be under the operational control of the JFACC in the Army’s “self-interest” because that arrangement offered a more effective way of employing them in this particular instance: “The JFACC should determine what the Apache’s targets are as a result of the entire responsibility he has in conducting that air campaign.” He further noted that the JFACC had the comparative advantage of being able to retask combat assets based on real-time intelligence, something that the Army could take advantage of as well if it could get itself out of “the business of being myopic about ground operations.” In closing, he acknowledged that in the Army, “we’ve got this nagging fear that somehow, if we turn over our organization to somebody in another uniform, that that organization is somehow going to suffer as a result of that. And I just fundamentally disagree with that.”¹²³

In yet further testimony to the ill-fated nature of the Army’s TF Hawk experience, an internal Army memorandum written after Allied Force ended acknowledged that the aircrews sent with the Apaches had been both undertrained and underequipped for their intended mission. In a report to the incoming chief of staff, General Eric Shinseki, then–Brigadier General Richard Cody, the Army’s director of operations, resources, and mobilization, warned that because of those shortcomings, “we are placing them and their unit at risk when we have to ramp up for a real world crisis.” Cody, who earlier had planned and executed the Army’s highly successful Apache operations during the Gulf War, noted that more than 65 of the assigned aviators in TF Hawk had less than 500 hours of flight experience in the Apache and that none were qualified to fly missions requiring night-vision goggles. He further noted that the radios in the deployed Apaches had insufficient range for conducting deep operations and that the crews were, in the absence of night-vision goggles,

¹²³Ibid.

dependent solely on their forward-looking infrared (FLIR) sensors. Given the rugged terrain, unpredictable weather, and poorly marked power lines that crisscrossed Kosovo, relying on FLIR alone, he suggested, "was not a good option." Moreover, he added, in order for the Apaches to have flown the required distances and crossed the high mountains of Kosovo, Hellfire missiles would have had to be removed from one of their two wing mounts to free up a station for auxiliary fuel tanks. As for the MANPADS threat, Cody remarked that "the current suite of ASE [aircraft survivability equipment] was not reliable enough and sometimes ineffective."¹²⁴

The TF Hawk experience underscored how little the U.S. Army, by its own leadership's candid admission, had done since Desert Storm to increase its capacity to get to an emergent theater of operations rapidly and with sufficient forces to offer a credible combat presence. Shortly after the Gulf War, the Army's leadership for a time entertained the thought of reorganizing the service so that it might become more agile by abandoning its structure of 10 combat divisions and opting instead for 25 "mobile combat groups" of around 5,000 troops each. Ultimately, however, the Army backed away from that proposed reform, doing itself out of any ability to deploy a strong armored force rapidly and retaining the unpalatable alternatives of airlifting several thousand lightly armed infantrymen to a theater of conflict within days or shipping a contingent of 70-ton M1A2 Abrams main battle tanks over the course of several months.¹²⁵

On his second day in office as the Army's new chief of staff, General Shinseki acknowledged that the Army had been poorly prepared to move its Apaches and support overhead to Albania. Part of the problem, he noted fairly, was that the only available deployment site that made any operational sense had poor rail connections, a shallow port, and a limited airfield capacity that could not accommodate the Air Force's C-5 heavy airlifter. However, he admitted that the Army

¹²⁴George C. Wilson, "Memo Says Apaches, Pilots Were Not Ready," *European Stars and Stripes*, June 20, 1999.

¹²⁵Thomas E. Ricks, "Why the U.S. Army Is Ill-Equipped to Move Troops Quickly into Kosovo," *Wall Street Journal*, April 16, 1999. The most fully developed and widely cited articulation of this proposed Army reorganization, which failed to take root, may be found in Colonel Douglas A. Macgregor, USA, *Breaking the Phalanx: A New Design for Landpower in the 21st Century*, Westport, Connecticut, Praeger, 1997.

was nevertheless overdue to develop and act on a plan to make its heavy forces more mobile and its lighter forces more lethal.¹²⁶ In what may have presaged a major shift in Army force development policy for the years ahead, he declared: “Our heavy forces are too heavy and our light forces lack staying power. Heavy forces must be more strategically deployable and more agile with a smaller logistical footprint, and light forces must be more lethal, survivable, and tactically mobile. Achieving this paradigm will require innovative thinking about structure, modernization efforts, and spending.”¹²⁷

One positive role played by TF Hawk after the KLA’s counteroffensive began registering effects in late May was the service provided by the former’s counterbattery radars in helping NATO fixed-wing pilots pinpoint and deliver munitions against enemy artillery positions. Its TPQ-36 and TPQ-37 firefinder radars were positioned atop the hills adjacent to Tirana to spot Serb artillery fire and backtrack the airborne shells to their point of origin. Army EH-60 helicopters and RC-12 Guardrail electronic intelligence aircraft were further able to establish the location of VJ command posts whenever the latter transmitted. Although TF Hawk’s Apaches and other combat assets never saw action, its ISR assets exerted a significant influence on the air effort at one of its most crucial moments. The KLA’s counteroffensive had forced the VJ to mass its forces and maneuver, to communicate by radio, and to fire artillery and mortars to protect itself. In response, the sensors of TF Hawk, operating in conjunction with the Army’s Hunter UAVs, spotted VJ targets and passed that information on to those in the command loop who could bring air-delivered ordnance to bear in a timely manner. “The result,” said a retired Army three-star general, “was that NATO air power was finally able to target precisely and hit the Serb army in the field. The Kosovars acted as the anvil and TF Hawk as the eyes and ears of the blacksmith so that the hammer of air power could be effective.”¹²⁸ Echoing this conclusion, USAFE’s commander, General Jumper, con-

¹²⁶Eric Schmitt, “New Army Chief Seeks More Agility and Power,” *New York Times*, June 24, 1999.

¹²⁷“Shinseki Hints at Restructuring, Aggressive Changes for the Army,” *Inside the Army*, June 28, 1999, p. 1.

¹²⁸Lieutenant General Theodore G. Stroup, Jr., USA (Ret.), “Task Force Hawk: Beyond Expectations,” *Army Magazine*, August 1999.

firmed that the counterbattery radars of TF Hawk had played “a very big part” in allied targeting during the final stages of Allied Force.¹²⁹

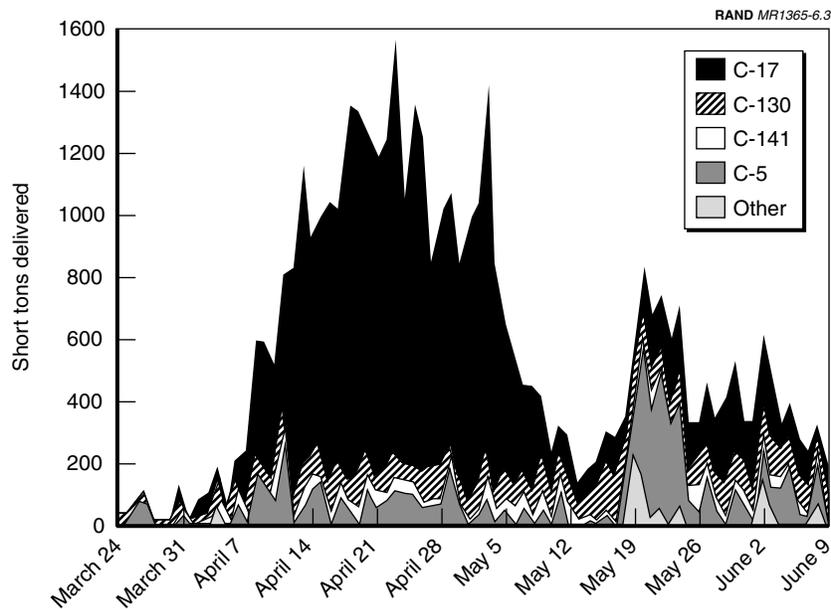
Another bright spot in the otherwise troubled TF Hawk experience was the USAF air mobility system's superb performance in opening up the Rinas air base in Albania and flowing forces and relief supplies into it. The combined efforts of USAFE's Air Mobility Operations Command Center (AMOCC), the Allied Force Air Mobility Division, USAFE's 86th Contingency Response Group at Ramstein Air Base, Germany, and multiple supporting Air Mobility Command entities resulted in a stand-out success amid the generally dismal story of TF Hawk's immobility and the Army's persistent go-it-alone approach to command relations and putting the Apaches into the ATO. Simply put, the C-17 made the TF Hawk movement possible. (See Figure 6.3 for the sharp spike in C-17-delivered short tonnage connected with TF Hawk from the second week of April through the first week of May.) No other aircraft could have done the job—yet another testimonial to the direct-delivery concept that shaped the aircraft's design and got it through one of the most hard-fought acquisition battles in the USAF's history. Thanks to the C-17 acquisition, TF Hawk (despite its near-fatal growing pains) got in, and many thousand Albanian refugees survived—two signal accomplishments of what the commander of the U.S. Army in Europe, General Montgomery Meigs, later called one of the most successful airlift operations in history.¹³⁰

SHORTCOMINGS IN INTELLIGENCE CYCLE TIME

Commanders and other air operators throughout the course of Allied Force found themselves repeatedly frustrated by the amount of time it often took to cycle critical information about enemy pop-up

¹²⁹Response to a question at an Air Force Association Eaker Institute colloquy, “Operation Allied Force: Strategy, Execution, Implications,” held at the Ronald Reagan International Trade Center, Washington, D.C., August 16, 1999.

¹³⁰Comments on an earlier draft by Brigadier General Robert Bishop, Hq USAF/XOO, April 12, 2001, and Colonel Robert Owen, Hq AMC, May 10, 2001. See also General Charles T. Robertson, Jr., USAF, commander in chief, U.S. Transportation Command, and commander, Air Mobility Command, “Air War Over Serbia: A Mobility Perspective,” briefing charts, 2000, Hq USAFE/SA library.



SOURCE: Hq USAFE/SA.

Figure 6.3—Short Tonnage Delivered by USAF Airlift

targets of opportunity from sensors to shooters who were positioned to engage them effectively. Although the requisite architecture was in place throughout most of the air war once a flexible targeting cell had been established by the end of the first month, it lacked a sufficiently high-volume data link with enough channels to quickly get the information where it needed to go.

To be sure, there were occasional instances of major success stories. For instance, the U-2 demonstrated its ability to be retasked in real time to image a reported SA-6 site, data-link the resulting imagery via satellite back to its home base at Beale AFB, California, within minutes for an assessment of the target's coordinates, and have the results transmitted back to the cockpit of an F-15E just as its pilot was

turning inbound toward the target to fire an AGM-130.¹³¹ In another such case, on Day 4 a Navy TLAM on short notice successfully attacked a “target of opportunity” believed to have been a pop-up MiG-29 detected on the runway at Batajnica by real-time imagery from a U-2.¹³² Although those examples were not representative, they previewed the sort of fusion toward which the U.S. ISR system is heading and represented what USAF Lieutenant General Marvin Esmond later described as “the first-ever distributed ISR architecture.”¹³³

More typically, however, target images from Predator UAVs flying over Kosovo would be transmitted to the CAOC in real time, only to encounter difficulty being forwarded from there to operating units in time for them to be tactically useful. In addition, the Joint STARS crew complement was found to be too small to accommodate many of the data processing and reporting demands it was asked to handle. The aircraft was said to require either more battle managers integrated closely enough into the commander’s loop for targets to be identified and attacked in near-real time, or wider-band data links to ground stations, where a larger number of mission specialists could do the analysis and handling.¹³⁴

Yet a third bottleneck identified was the classified worldwide Internet link called SIPRNET (Secure Internet Protocol Router NETWORK), upon which USEUCOM’s Joint Analysis Center (JAC) at RAF Molesworth, England, relied heavily. As a rule, intelligence sources would forward proposed target materials to Molesworth for validation, with the JAC staff tasking additional intelligence collection as deemed necessary. That process would have been all but impossible

¹³¹The AGM-130 is a rocket-boostered variant of the electro-optical and infrared guided GBU-15 2,000-lb PGM featuring midcourse GPS guidance updates. At the start of the air war, 200 of these weapons had been fielded, and those used were pulled from Air Combat Command’s Weapons System Evaluation Program (WSEP), leaving no munitions for training. William M. Arkin, “Kosovo Report Short on Weapons Performance Details,” *Defense Daily*, February 10, 2000, p. 2.

¹³²*Ibid.*

¹³³Lieutenant General Marvin R. Esmond, testimony to the Military Procurement Subcommittee, House Armed Services Committee, Washington, D.C., October 19, 1999.

¹³⁴David A. Fulghum, “Lessons Learned May Be Flawed,” *Aviation Week and Space Technology*, June 14, 1999, p. 205.

without the aid of the Internet, which made for vastly more rapid worldwide information availability than did the former hard-copy practices. Frequently, however, because of the absence of institutionalized procedures, the use of SIPRNET made for confusion and difficulty in finding some target materials on short notice. In addition, real-time target information would be withheld from U.S. allies as U.S. officials argued over who should be allowed to see what. Finally, NIMA was frequently slow to deliver overhead photography of proposed targets and of targets already attacked, which in turn slowed the battle-damage assessment process and the decision as to whether to retarget a previously attacked site. One informed source commented that ISR fusion worked better in Allied Force than it did during Desert Storm, but that it still rated, at best, only a grade of C-plus in light of what remained to be done. In contrast, what generally worked well was the “reach-back” procedure first pioneered in Desert Storm, in which commanders and planners in the forward theater used secure communications lines to tap into information sources in the intelligence community in Washington and elsewhere.¹³⁵

AIRSPACE AND TRAFFIC FLOW MANAGEMENT

A major concern for Allied Force mission planners entailed the coordination of air operations with so many allied aircraft transiting the relatively dense and compact airspace between Italy and the Balkans. Among other things, the CAOC coordinated operations by some 200 NATO tanker aircraft operating out of eight countries to support strikers flying from 15 bases in Germany, France, Italy, Hungary, Spain, the United Kingdom, and the United States.¹³⁶ There were numerous reported instances of near-midair collisions caused by marginal weather and an insufficiency of battle management information relayed by AWACS to friendly aircraft operating in and near the combat zone. Mission planners at the CAOC sought to deconflict allied aircraft by parceling out the most impacted airspace so that only a given number of friendly aircraft would be operating inside

¹³⁵Rowan Scarborough, “Kosovo Target Data Stalled in Transit,” *Washington Times*, July 28, 1999.

¹³⁶Tim Ripley, “Tanker Operations,” *World Air Power Journal*, Winter 1999/2000, p. 121.

any block at a given time. The danger of midair collisions was of particular concern in designated engagement zones, or “kill boxes,” in the KEZ, with only a few allied aircraft being permitted to operate within a given box at any time for that reason. Both the E-3 AWACS and the EC-130 ABCCC carried copies of the daily ATO, which allowed them to keep track of scheduled flight operations and remind allied aircrews of pertinent details as necessary. Another problem caused by the unusually congested airspace over and near Yugoslavia entailed linking some combat aircraft with their assigned tankers, particularly the German Tornado ECR variants and the EA-6B, which lacked air-to-air radars and had to be vectored to their tankers by AWACS.¹³⁷

In an important contribution to easing the air traffic nightmare that threatened to ensue over the Adriatic and in the adjacent airspace as the air effort unfolded, Italian air traffic authorities lent their expertise to the CAOC's air traffic control cell in order to make key staffers there more familiar with Italian airspace structure and regulations. They also dispatched a representative to the military cell of the regional civilian air traffic control (ATC) center to smooth out potential difficulties in controlling the heavy flow of ATO sorties going in and out of the area of responsibility (AOR). Measures taken to manage that flow and to deconflict it from civil traffic included closing the airspace over parts of the Adriatic, establishing a no-fly zone encompassing the airports of Bari and Brindisi, suppressing all or parts of some airways, establishing a special corridor to permit the transit of Italian airspace by air traffic entering from outside the AOR, providing a system of safe operating routes to allow the departure and return of combat aircraft loaded with weapons operating from Italian air bases, and establishing six emergency weapons jettison areas in international waters and six active inflight refueling zones over the Adriatic 24 hours a day.

Not surprisingly, the Italian ATC system experienced considerable difficulty in handling this large volume of daily traffic. To begin with, because of the air war's length and the shortage of available controllers, ATC found it a major challenge to maintain round-the-clock control of all the active and alternate military airfields that were in-

¹³⁷Wall, “Airspace Control Challenges Allies.”

volved in air operations. Second, Eurocontrol experienced problems managing civil aviation flight plans, given the density of military traffic, and was not always able to maintain the impermeability of the posted no-fly zone over the Adriatic. Third, ATC was frequently unable to track military aircraft operating from the several aircraft carriers that were deployed in the Adriatic and, for that reason, faced serious deconfliction problems with civil traffic flying along the southern air routes toward Greece and Turkey. Fourth, communication problems were often encountered between and among the various agencies engaged in air traffic flow management, such as airfield control towers, approach and departure control centers, military regional control, air defense radars, and AWACS. Finally, there was far too little time available to debug, test, and properly validate these highly jury-rigged arrangements. Although the system worked in the end with no catastrophic or otherwise untoward incidents, numerous aircrews reported that the aerial traffic jams of ingressing and egressing NATO aircraft transiting the AOR throughout Allied Force often appeared more dangerous than the threat presented by Serbia's SAMs and AAA.¹³⁸

As it unfolded and expanded in scope and intensity, Operation Allied Force became the largest civilian emergency ever confronted by the airlines, although it produced little major traffic dislocation in the end. Before the cold war ended, there had been only two options from which to choose—either a peacetime operating mode, with the military taking only a small portion of the available airspace and time for training, or a wartime mode, with no civil operations whatever and unrestricted military flying. This time, as NATO's top official on civil airspace put it, the coalition was “waging what we may plainly call war in a localized area of Europe, while throughout the rest of the continent it was business as usual.”¹³⁹ The situation required air traffic controllers to reroute as many as 8,000 airliners a day on some occasions. One concern was that inconveniencing civilians at peak summer travel time would erode public support and cause a back-

¹³⁸Colonel E. Baldazzi, Italian Air Force, “Host Nation Support for the Kosovo Air Campaign,” briefing at a conference on “The NATO Joint Force Air Component Commander Concept in Light of the Kosovo Air Campaign,” Headquarters NATO Reaction Force Air Staff, Kalkar, Germany, December 1–3, 1999.

¹³⁹Joseph Fitchett, “For NATO, Keeping Peak Air Traffic on the Go Was a Critical Goal,” *International Herald Tribune*, March 31, 2000.

lash against the effort. Another was to avoid any replay of the downing of an Iranian airliner, which the cruiser USS *Vincennes* mistook for an Iranian F-14 over the Persian Gulf in 1988. That latter concern led to a double-checking of identification procedures for electronically identifying aircraft operating in and near the combat zone. Toward the end of the air war, NATO finally succeeded in easing the airspace congestion problem at least marginally, when it in effect opened a second front by initiating Marine F/A-18D operations out of Hungary and USAF fighter operations out of Turkey.

DEFICIENCIES WITH RESPECT TO SPACE

Fortunately, U.S. space superiority was not challenged during Operation Allied Force. Against the remote yet distinct possibility that Milosevic and his erstwhile supporters in Moscow might somehow have sought to do so, however, the enemy's space order of battle, rudimentary though it may have been, was never seriously examined. Nor was the vulnerability of U.S. space systems sufficiently assessed and hedged against using the needed countermeasures. Other space-related problems were also highlighted by the Allied Force experience. With respect to ISR, intelligence collectors and combat aircrews both had repeated difficulty finding mobile targets. Adverse weather and enemy camouflage, concealment, and deception measures presented additional complications, with the result that the "kill chain" was too long by a discomfiting margin. Relatedly, space-based weather support suffered. For example, there was no continuous weather coverage of the theater of operations, so some scheduled strike missions may have been needlessly canceled because available weather information was not current. Battlespace characterization also suffered because of a lack of enough space-derived imagery of the right kinds.¹⁴⁰

As for other deficiencies in the availability of on-orbit assets, some satellites that had been tasked primarily against the Middle East and Pacific basin were recommitted to the Balkans, leaving important ar-

¹⁴⁰"Space Support to Operation Allied Force: Preliminary Lessons Learned," briefing to the author by Colonel Robert Bivins, Director of Operations, U.S. Air Force Space Warfare Center, Schriever AFB, Colorado, February 25, 2000.

eas of interest uncovered in other theaters.¹⁴¹ Moreover, the United States was shown to continue to lack a real-time targeting capability and to suffer significant problems with respect to real-time distribution, all of which pointed to the still-unresolved challenge of getting the right information to the right people at the right time. To be sure, information cycle time was compressed significantly in comparison to earlier aerospace operations, as attested by one case in which a single TLAM was targeted and launched early during Allied Force against a MiG-29 that had suddenly been detected in the open at a Serbian air base. However, there was no mechanism available for providing shooters in near-real time with radar imagery and other intelligence gathered by the multitude of collection platforms and surveillance systems that were available and functioning. Joint STARS is slated to receive an upgrade that will permit it to transmit a map through a satellite uplink directly into a fighter cockpit, but that capability is not yet in place.¹⁴² Also, U.S. space-based intelligence assets, including NRO's classified ELINT and SIGINT satellites, DSCS, and other systems, were shown not to have improved greatly since Desert Storm. As one U.S. intelligence official noted, "three to four hours is the best we can do" from target identification to weapons delivery.¹⁴³ The good news in all this is that many needed fixes were discovered to lie in the realm of essentially cost-free improvements in techniques, tactics, and procedures rather than in more expensive hardware solutions.

Finally, the Allied Force experience indicated that considerable room remains for further progress in bringing operators to a fuller appreciation of what space systems now have to offer. The director of NRO, Keith Hall, commented after the air war ended that although allied operators turned in an effective performance, they made some important aspects of the operation harder for themselves than they needed to be. Stressing that professional military education and officer specialization training at all levels in the four U.S. services still do

¹⁴¹Bill Gertz and Rowan Scarborough, "Dangerous Drawdown," *Washington Times*, April 30, 1999.

¹⁴²"Space Support to Operation Allied Force: Preliminary Lessons Learned," briefing to the author by Colonel Robert Bivins, director of operations, U.S. Air Force Space Warfare Center, Schriever AFB, Colorado, February 25, 2000.

¹⁴³Roy Bender, "Allies Still Lack Real-Time Retargeting," *Jane's Defense Weekly*, April 7, 1999.

not offer enough needed first-hand exposure to space systems and their capabilities, he went on to say: "I impress upon [the service chiefs] the need to organize, train, and equip to use this stuff if they're going to rely on it, and not just call up the NRO and say, 'Can you do this for us?' when we're engaged in an operation. . . . We're dealing with a situation where people are not trained, it hasn't been practiced in peacetime, and you have to scramble. . . . If they're going to rely on it, they're going to have to do their part of it."¹⁴⁴

Air Force space professionals would undoubtedly concur that shortcomings in the use of available space assets identified during Allied Force highlighted a continuing need for more space involvement in peacetime exercises, on the sensible premise followed as gospel for years by fighter pilots that you should "train like you expect to fight." That means a need for advanced space education and training of a highly specific and focused nature—not just greater "space awareness"—for operators at all levels, from the most senior command echelons all the way down to shooters working within tactical confines. It also means a need for better development and documentation of space operational support capabilities and options in theater contingency plans worldwide. Acknowledging this and more after the air war was over, the commander in chief of U.S. Space Command, Air Force General Richard Myers, remarked frankly that in terms of using space assets, the Kosovo operation was "probably the best we've done—surely superior to Desert Storm from everything we can learn. But there's still a long way to go before space is really integrated with the rest of the campaign."¹⁴⁵

INTEROPERABILITY PROBLEMS

One of the most surprising aspects of the Allied Force experience was what it revealed about the extent of the discontinuity that had been allowed to develop between U.S. air power and that of most other NATO allies who participated.¹⁴⁶ One concern had to do with inade-

¹⁴⁴John Donnelly, "NRO Chief: Services Ill-Prepared to Work with Spy Satellites," *Defense Week*, July 12, 1999, p. 2.

¹⁴⁵Quoted in *The Air War Over Serbia*, p. 53.

¹⁴⁶For a fuller treatment of the allied contribution to the air war and the interoperability problems that became manifest as a result of it, see John E. Peters, Stuart John-

quacies in the equipment operated by the allies. To begin with, there was a pronounced dearth of interoperability with respect to rapid and secure communications. Only at Aviano were there some old STU-2 secure telephones that allowed the U.S. participants to transfer classified information quickly to allied units. (The STU-3 secure phone system used by U.S. forces was not available to the allies.) Other classified communications required passing a hard copy of the information by hand, repeating one of the worst command and control deficiencies that had been exposed earlier in Desert Storm, when the ATO had to be flown every day to each of the Navy's six participating aircraft carriers because the latter were not equipped to receive it electronically.

In addition, many NATO European fighters lacked Have Quick-type frequency-hopping UHF radios and KY-58-like radios allowing encrypted communications. As a result, U.S. command and control aircraft were often forced to make transmissions in the clear to those fighters about targets and aircraft positions, enabling the enemy to listen in and gain valuable tactical intelligence.¹⁴⁷ Also, in at least one case, British Harrier GR. Mk 7 pilots were said to have observed suspected refugees in a convoy but were unable to communicate that information to the ABCCC or to USAF F-16s operating in the same area.¹⁴⁸ For their part, U.S. aircraft equipped with JTIDS frequently were not allowed to rely on that asset, but were instead obliged to use voice communications to ensure adequate situation awareness for all players, notably allied participants not equipped to receive JTIDS signals.¹⁴⁹

son, Nora Bensahel, Timothy Liston, and Traci Williams, *European Contributions to Operation Allied Force: Implications for Transatlantic Cooperation*, Santa Monica, California, RAND, MR-1391-AF, 2001.

¹⁴⁷Since allied aircraft could not receive Have Quick radio transmissions and since enemy forces made no effort to jam allied UHF communications, which Have Quick was expressly developed to counter, the Have Quick capability was not used by U.S. combat aircrews during Allied Force.

¹⁴⁸"NATO Jets May Have Erred in Convoy Attack, General Says," p. 102.

¹⁴⁹David A. Fulghum and Robert Wall, "Data Link, EW Problems Pinpointed by Pentagon," *Aviation Week and Space Technology*, September 6, 1999, pp. 87–88. The JTIDS offers aircrews a planform view of their tactical situation, as well as a capability for real-time exchange of digital information between aircraft on relative positions, weapons availability, and fuel states, among other things. It further shows the position of all aircraft in a formation, as well as the location of enemy aircraft and ground threats. Fighters can receive this information passively, without highlighting them-

Second, among all participating allied air forces, only U.S., British, Canadian, French, Spanish, and Dutch combat aircraft had the ability to deliver LGBs without offboard target designation assistance. General Short frankly admitted that he could not risk sending the aircraft of many allied countries into harm's way because of concern for the safety of their pilots and for the civilian casualties that might be caused by inaccurately aimed weapons. Largely for that reason, around 80 percent of all strike sorties flown in Allied Force were carried out by U.S. aircraft.

Additional problems making the job of AWACS operators difficult included the absence of a robust alliance-wide IFF (identification friend or foe) system, the lack of a capability to detect which SAM systems were targeting allied aircraft, and the small number of non-U.S. aircraft able to laser-designate targets, all of which inhibited the usefulness of many allied assets. Some aspects of the discrepancy between U.S. and allied capability were a result of the fact that the European nations typically spend only half the annual U.S. percentage of defense expenditure on military procurement and a third of the annual U.S. percentage on research and development.¹⁵⁰ Others merely reflected allied decisions to invest in different types of equipment. Largely because of that asymmetry, however, the United States provided almost all of the aerial intelligence employed in Allied Force and selected virtually every target attacked in Operation Allied Force. Commenting on these and other interoperability problems, General Naumann expressed concern that the growing technology gap between the United States and its allies could eventually lead to their inability to fight together or even communicate in the same battlespace.¹⁵¹

To be sure, not all participating allied air forces suffered equally pronounced problems with respect to capability and versatility. The Royal Netherlands Air Force, for example, not only kept its F-16s up to date but also provided some aerial refueling capability. The Dutch

selves through radio voice communications. See William B. Scott, "JTIDS Provides F-15Cs 'God's Eye View,'" *Aviation Week and Space Technology*, April 29, 1996, p. 63.

¹⁵⁰John D. Morrocco, "Kosovo Reveals NATO Interoperability Woes," *Aviation Week and Space Technology*, August 9, 1999, p. 32.

¹⁵¹Barton Gellman and William Drozdiak, "Conflict Halts Momentum for Broader Agenda," *Washington Post*, June 6, 1999.

and the Belgians operated a total of 28 Block 15 F-16A/B midlife update (MLU) aircraft as a single detachment at Amendola AB, Italy, incorporating modifications that made the aircraft, to all intents and purposes, Block 50-equivalents. A Dutch F-16 downed a Serb MiG-29 with an AIM-120 AMRAAM during the opening night of the air war, and another used its LANTIRN targeting pod to identify and successfully attack a MiG-29 on the ground while ignoring several decoys that were parked directly adjacent to it. According to the principal Dutch airman assigned to the CAOC, the Royal Netherlands Air Force (RNLAF) was “not 100-percent interoperable but close” and was characterized by senior U.S. airmen as being “most definitely on the A-Team.”¹⁵²

Moreover, German and Italian Tornados contributed valuable SEAD capabilities, firing some 37 percent of all HARM shots taken during Allied Force. Seven of the nine allies contributing aircraft that dropped bombs in the air war operated PGM-capable aircraft, which at least made them effective in precision attacks in clear weather against fixed targets. USAF Block 40 F-16CGs equipped with low-altitude navigation and targeting infrared for night (LANTIRN) targeting pods and using cooperative strike tactics designated targets for numerous allied aircraft, including the Italian AMX, which were capable of dropping LGBs but lacked any onboard self-designation capability.

With the USAF now out of the manned tactical reconnaissance business altogether and the Navy’s TARPS-equipped F-14s providing the only remaining U.S. operational capability of that nature, three of the five remaining French Mirage IVP supersonic bombers, since converted to the reconnaissance role, added valuable support by being flown daily when the weather permitted, accounting in the end for 20 percent of the Allied Force reconnaissance missions. Operating out of Solenzara, Italy, they flew at 40,000–50,000 ft at a speed of Mach 2.05, typically entering the war zone over Belgrade and exiting over Kosovo, covering some 20 targets on each flight in around 15 minutes. Returning traditional wet-film photographs to Solenzara, they eventually developed a routine whereby high-quality images anno-

¹⁵²Conversation with Major General P. J. M. Godderij, deputy commander in chief, RNLAF, Scheveningen, the Netherlands, June 7, 2000.

tated with target information would be digitized for transmission to the CAOC and to French headquarters in Paris.¹⁵³

Finally, two decades of multinational training at Red Flag and elsewhere paid off handsomely in Allied Force. There were no midair collisions or other near-catastrophic aerial incidents resulting from allies operating from their own private playbooks.

THE WAGES OF U.S. OVERCOMMITMENT

The demands placed by Allied Force on U.S. equipment and personnel underscored the extent to which the U.S. defense posture has been stretched dangerously thin by the post-cold war force draw-down and concurrent quadrupling of deployment commitments worldwide. During the initial post-cold war decade of the 1990s, the U.S. active-duty force in all services shrank by 800,000 personnel to 1.4 million, a reduction of more than one-third. The Army was cut from 18 to 10 active divisions, the Navy diminished in size from 567 ships to just over 230, and the Air Force lost half of its 24 fighter wings. Yet during that same period, the U.S. armed forces were tasked with 48 major deployment missions overseas, in contrast with only 15 between the time of the U.S. exit from Vietnam and the collapse of the Soviet Union nearly two decades later.¹⁵⁴

The first practical effect of this drawdown manifested during Allied Force was the unexpectedly high rate at which scarce and expensive consumables were being expended to meet the air war's demands. After only the first week, the Air Force found itself running low on CALCMs, with the initial stock of 150 down to fewer than 100.¹⁵⁵ The Air Force had had preexisting plans in hand to convert 92 additional nuclear-configured ALCMs to CALCMs, but that process was expected to take more than a year. JDAM was still being tested at the time it was committed to combat. As of April 20, less than a month into Allied Force, there were only 609 JDAM kits remaining in

¹⁵³Chris Pocock, "Mirage IV Reconnaissance Missions," *World Air Power Journal*, Winter 1999/2000, p. 111.

¹⁵⁴Rowan Scarborough, "Record Deployments Take Toll on Military," *Washington Times*, March 28, 2000.

¹⁵⁵Hewson, "Operation Allied Force," p. 21.

stock.¹⁵⁶ The burdens placed by the air war's demands on materiel of all kinds prompted a rising groundswell of military complaints that the results of seven years of underfunding were finally making their impact fully felt.¹⁵⁷

On that point, a memorandum from Air Combat Command (ACC) to the Air Staff in late March frankly admitted that "our operational units are suffering, with few serviceable engines [and] depleted wartime spare kits."¹⁵⁸ ACC's commander, General Hawley, reported a month later that five weeks of bombing had left U.S. munitions stocks, notably CALCM and JDAM, in critically short supply, adding that "it's going to be really touch-and-go as to whether we'll go Winchester [the pilot's term for running out of ammunition] on JDAMs." Hawley warned that should a more serious crisis erupt elsewhere, ACC would be "hard-pressed to give them everything that they would probably ask for. There would be some compromises made."¹⁵⁹ The later resort to an increased use of dumb bombs in Allied Force was driven in part by the steady depletion of stocks of precision munitions of all kinds.

Seeking an explanation for this increased stress on the U.S. defense establishment across the board, General Hawley laid the blame squarely on the nation's military overcommitment: "I would argue that we cannot continue to accumulate contingencies. At some point you've got to figure out how to get out of something." Hawley added that because of a fourfold spike in the number of deployments in the 1990s at the same time the force was undergoing a reduction by half, "we are going to be in desperate need, in my command, of a significant retrenchment in commitments for a significant period of time. I think we have a real problem facing us three, four, five

¹⁵⁶The principal deputy assistant secretary of the Air Force for acquisition at the time, then-Lieutenant General Gregory Martin, acknowledged that the shortage of JDAMs was the result of a conscious choice made five years ago to emphasize other procurement needs. David A. Fulghum, "Bomb Shortage Was No Mistake," *Aviation Week and Space Technology*, May 17, 1999, p. 55.

¹⁵⁷See Rowan Scarborough, "Smaller U.S. Military Is Spread Thin," *Washington Times*, March 31, 1999.

¹⁵⁸Ibid.

¹⁵⁹Bradley Graham, "General Says U.S. Readiness Is Ailing," *Washington Post*, April 30, 1999.

months down the road in the readiness of the stateside units.”¹⁶⁰ Earlier during Allied Force, even before SACEUR's twofold force increase request was approved, Hawley cautioned that because of the existing strain on the system, “if we deploy the additional forces that are under consideration, those strains will become more evident,” causing a “significant decline in the mission-capable rates” of the remaining forces to as low as 50 percent or less for some aircraft types.¹⁶¹

A second indication of the extent to which the U.S. military had come to find itself strapped as a result of the force drawdown was the sharply increased personnel tempo that was set in motion by the air effort. In all, some 40 percent of the active-duty U.S. Air Force was committed to Operation Allied Force and to the concurrent Operations Northern and Southern Watch over Iraq. That was roughly the same percentage of Air Force personnel that had been committed during Operation Desert Storm, when the total force was much larger. Among other things, as noted earlier in Chapter Three, the heightened personnel tempo obliged President Clinton to approve a Presidential Selected Reserve Call-Up authorizing a summons of up to 33,102 selected reservists to active duty.¹⁶² It further prompted the Air Force chief of staff, General Michael Ryan, to insist that the USAF needed a recovery time no less than that routinely granted to the Navy every time one of its carriers returns from a deployment. Ryan flatly declared that “we are not a two-MTW [major theater war] Air Force in a lot of areas, and one of them is airlift.” That shortfall made for one of many reasons why the Air Force later insisted that it needs 90 days to reconstitute its forces between MTWs.¹⁶³

Earlier, as Allied Force entered its second month, Ryan told reporters that “the U.S. Air Force is in a major theater war.” (He later amended that remark to indicate that he had meant to say that the Air Force's commitment level included Operations Northern and Southern

¹⁶⁰Ibid.

¹⁶¹John A. Tirpak, “The First Six Weeks,” *Air Force Magazine*, June 1999, p. 27.

¹⁶²“U.S. Mobilizes Guard, Reserve for Balkan Duty,” *Air Force Magazine*, June 1999, p. 16.

¹⁶³Vince Crawley, “Air Force Needs 90 Days Between Wars, Chief Says,” *Defense Week*, August 9, 1999, p. 12.

Watch over Iraq.)¹⁶⁴ In the eight years since Desert Storm, deployment demands on Air Force assets had never before exceeded the level of two AEFs of around 175 aircraft each. NATO's air war for Kosovo, however, demanded four AEF-equivalents' worth of USAF assets. Then-acting Secretary of the Air Force F. Whitten Peters declared that as a result, the AEF concept would need to be reexamined.¹⁶⁵

Third, the demands of Allied Force placed a severe strain on such low density/high demand (LD/HD) aircraft as Joint STARS, AWACS, the U-2, the B-2, the F-16CJ, and the EA-6B.¹⁶⁶ So many of these scarce assets were committed to the air effort that day-to-day training in home units suffered major shortfalls as a result. The most acute strains were felt in the areas of surveillance, SEAD, and combat search and rescue. Almost every Block 50 F-16CJ in line service was committed to support SEAD operations, necessitating a virtual halt to mission employment training in the United States. (Figure 6.4 shows the overall USAF commitment to Allied Force, broken down by aircraft type.)

Similarly, Vice Admiral Daniel Murphy, the commander of the 6th Fleet, which provided the U.S. naval forces that were operating in the Adriatic, reported that there was an insufficiency of EA-6B jammers and they, along with their aircrews, were being worn out by the air war's demands.¹⁶⁷ Almost half of the initial batch of 11 EA-6Bs used to spearhead the air operation had been drawn from assets previously committed to Operation Northern Watch at Incirlik Air Base, Turkey. Navy and Marine spokesmen declined to admit that their EA-6Bs were being stressed to the danger point, but they did concede that they were being run ragged trying to marshal enough aircraft out

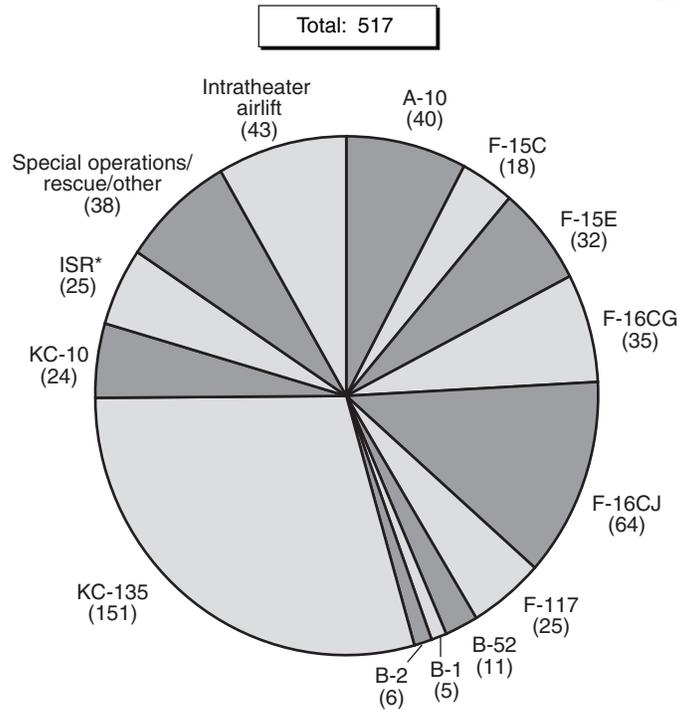
¹⁶⁴Tirpak, "The First Six Weeks," p. 27.

¹⁶⁵John T. Correll, "Assumptions Fall in Kosovo," *Air Force Magazine*, June 1999, p. 4.

¹⁶⁶Characteristics of LD/HD include single-unit asset, limited numbers of aircraft and pilots, and likely tasking in more than one theater. Joint Vision 2010, the "revolution in military affairs," improved sensor to shooter links, and decisive attack operations all depend on more support to LD/HD assets. They transcend individual service and weapon system boundaries.

¹⁶⁷Dale Eisman, "Kosovo Lesson: Navy Says It Needs More High-Tech Tools," *Norfolk Virginian-Pilot*, June 10, 1999.

RAND MR1365-6.4



*ISR includes RQ-1, E-3, E-8, RC-135, U-2, and EC-130 ABCCC.

SOURCE: AWOS Fact Sheet.

Figure 6.4—USAF Aircraft Types Employed

of the total inventory of 124 to support the launching of Allied Force.¹⁶⁸

An even greater demand was imposed on the Air Force's various ISR platforms, which left none available for day-to-day continuation training once the needs of Allied Force were superimposed on preexisting commitments. During the time in question, the Air Force had

¹⁶⁸Greg Seigle, "Prowler Jammers Used to Aid NATO Air Assault," *Jane's Defense Weekly*, March 31, 1999.

only four operational E-8 Joint STARS aircraft, two of which were committed to Allied Force (it has since acquired a fifth). As a result, the Joint STARS community found itself so stripped of its most skilled personnel that there was no instructor cadre left to work with new crewmembers who were undergoing conversion training. The low Joint STARS availability rate made for a typical Allied Force E-8 mission length of more than 17 hours, with the longest missions lasting 21 hours. It took two or more inflight refuelings and backup pilots and crews to sustain each mission.¹⁶⁹ Some Joint STARS aircraft were flown at more than three times their normal use rates, creating a major maintenance and depot backlog that would take months to clear up. In all, U.S. LD/HD assets were stretched to their limit with tasking demands whose reverberations will continue to be felt for years in the areas of platforms, systems, reliability, parts, personnel, retention, and replacement costs. On this point, Admiral Ellis cautioned that the trend line is working in precisely the wrong direction—the demand for these assets in the future will only grow and they should be viewed as national assets requiring joint funding, irrespective of service, as the highest priority.¹⁷⁰

Finally, Operation Allied Force exposed the extent to which U.S. forces are being stretched to the limit to support real-world peacekeeping and peacemaking commitments on a routine basis, while also meeting the demands of engaging successfully in two simultaneous or near-successive major theater wars. In the prevailing defense lexicon, Kosovo was supposed to be only a “smaller-scale contingency.” Yet the number of U.S. aircraft committed to Allied Force quickly approached the level of a major theater war and exposed shortcomings in the availability of needed assets in all services. For example, the diversion of the USS *Theodore Roosevelt* from the Mediterranean to the Adriatic to support the air effort deprived U.S. Central Command of a vital operational asset. Likewise, the later redeployment of the USS *Kitty Hawk* from the Pacific to the Persian

¹⁶⁹Edmund L. Andrews, “Aboard Advanced Radar Flight, U.S. Watches Combat Zone,” *New York Times*, June 14, 1999.

¹⁷⁰Briefing by Admiral James O. Ellis, USN, commander in chief, U.S. Naval Forces, Europe, and commander, Allied Forces Southern Europe and Joint Task Force Noble Anvil, “The View from the Top,” 1999.

Gulf deprived U.S. Pacific Command of a carrier in the western Pacific for the first time since the end of World War II.

The Air Force was similarly forced to juggle scarce assets to handle the overlapping demands imposed by Kosovo, Iraq, and Korea. It positively scrambled to find enough tankers to support NATO mission needs in Allied Force. Ironically, both Kosovo and Iraq, in and of themselves, represented lesser contingencies whose accommodation was not supposed to impede the U.S. military's ability to handle two major theater wars. Yet the burdens of both began to raise serious doubts as to whether the two-MTW construct, at least at its current funding level, was realistic for U.S. needs. For example, when USEUCOM redeployed 10 F-15s and 3 EA-6Bs from Incirlik to support Clark's requirements for Allied Force, it was forced to suspend its air patrols over northern Iraq immediately. Air patrols to enforce the no-fly zone over southern Iraq were continued, but at a slower operational tempo. The net result was U.S. aircraft being flown two to three times more often than in normal peacetime operations.¹⁷¹

One example of the negative effects on combat readiness that surfaced during Allied Force was the frequent and widespread complaint by unit personnel in all services that their combat performance suffered because their lack of prior training opportunities with live weapons adversely affected their precision-weapons employment techniques and procedures in actual combat. Indeed, the majority of American bomb-droppers had never dropped a live LGB in training. That shortfall in combat proficiency was partly a reflection of limited range space, but it was also the result of under-resourcing of combat units in the training-munitions category. Numerous misses in Allied Force occurred because aircrews did not understand target-area effects such as thermal bloom, smoke, and dust, which cannot be duplicated in peacetime training without live weapon drops. By one informed account, civilians were injured in Pristina and Surdulica as a direct result of smoke and IR bloom effects. Targets were also missed when aircrews discovered several surprising effects in the LANTIRN system when using the combat laser in the presence of clouds. The training laser (which is eye-safe)

¹⁷¹Elizabeth Becker, "Needed on Several Fronts, U.S. Jet Force Is Strained," *New York Times*, April 6, 1999.

fires at a much lower power and rate, with the result that the noted effects were not discovered until they were actually seen in combat—usually in the middle of a drop.¹⁷² Bowing to the inevitable, General Shelton finally acknowledged the cumulative impact of these multiple untoward trends when he admitted to Congress at the beginning of May 1999 that there was “anecdotal and now measurable evidence . . . that our current readiness is fraying and that the long-term health of the total force is in jeopardy.”¹⁷³

¹⁷²Comments on an earlier draft by Hq USAF/XOXS, July 9, 1999.

¹⁷³Kate O’Beirne, “Defenseless: The Military’s Hollow Ring,” *National Review*, May 3, 1999, p. 18.