CASE STUDIES

The cases were selected because they represent diverse kinds of operations, from peace support efforts to major theater war. They also differ in other key characteristics, including coalition structure (parallel, lead-nation, and integrated)[1] and participation, the role played by the United States, and time-related issues such as preparation and duration of operation.

In examining the three operations, particular care was taken to identify which technological disparities were important at what stage, and what was done or could have been done to minimize problems. As previously mentioned, the emphasis of the case studies is on the broader issue of compatibility rather than the narrower, technology-specific question of interoperability.

OPERATION DESERT STORM

Desert Storm was a major theater war that involved over 300,000 U.S. Army troops (at its peak) and 160,000 troops from partner countries.[2] The operation sought to repel the Iraqi invasion of Kuwait as well as destroy Iraq's military capability to wage war. Large force contributions were made by the United Kingdom, France, Saudi

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[1] See *The Army in Multinational Operations* (FM-100-8), Chapter 2.

[2] The U.S. Marine Corps also participated in the ground component of Desert Storm, with a peak contribution of over 92,000 troops. See Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War, Volume IV: The Gulf War*, Boulder, CO: Westview Press, 1996, p. 141.

Arabia, Egypt, Syria, Kuwait, and Gulf Cooperation Council (GCC) states.[3]

Command and control arrangements took the form of a U.S.–Saudi Arabia parallel command structure. The American chain of command coordinated the activities of units from the United States and other NATO allies, including the British and French divisions. Most U.S. Army units were part of Army Component, Central Command (ARCENT). ARCENT consisted of the XVIII Airborne Corps and VII Corps; the British division participated in VII Corps's offensive, which constituted the main armored thrust of the ground war. The French division operated in the western flank with XVIII Airborne Corps. Saudi-led forces were organized in Joint Forces Command North and East (JFC-N and JFC-E). JFC-N consisted of Egyptian, Syrian, Saudi, and Kuwaiti forces. It was deployed east of VII Corps. JFC-E occupied the right flank along the coast, and was made up of units from Saudi Arabia and Gulf Cooperation Council states.[4]

The Coalition Coordination, Communication, and Integration Center (C3IC) served as the link between the two chains of command. It facilitated coalition-wide planning, training, firing exercises, logistics, radio frequency management, intelligence gathering and sharing, boundary changes, and fire support.[5] While no coalition member relinquished ultimate control over its military forces, the United States was given substantial freedom to organize and direct the operation. The dominance displayed by the United States in planning, fighting, and supporting Desert Storm effectively made what for-

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[3]The United Kingdom contributed the 1st Armoured Division, while France sent the 6th French Light Armored Division. Saudi Arabia's forces included five independent brigades and smaller units, while Egypt contributed the 4th Armored Division, 3rd Mechanized Division, and 20th Special Forces Regiment. Syria's 9th Armored Division and Special Forces regiment participated as reserves, and Kuwaiti forces included three independent brigades and smaller units. GCC states Bahrain, Oman, and Qatar also contributed forces. Countries such as Morocco, Canada, Senegal, Pakistan, Hungary, Czechoslovakia, Poland, and Argentina also contributed troops. See Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress*, April 1992, p. 500; Cordesman and Wagner, op. cit., p. 95.

[4]For a summary of task organization of U.S. and non-U.S. ground forces, see *Conduct of the Persian Gulf War*, op. cit., pp. 232–234 and pp. 257–258.

[5]*Conduct of the Persian Gulf War*, op. cit., pp. 235, 559.

mally was a parallel C2 structure a *de facto* parallel/lead-nation hybrid.

Compatibility Issues

Before and during the ground campaign, several compatibility issues arose in the realm of C4I, doctrine, and procedures. The high-intensity nature of the operation highlighted the presence of several technological and operational incompatibilities among allies. The most U.S.-compatible coalition members were Britain and France, partly because these NATO allies deployed units with previous training in high-intensity operations that placed a premium on ma-neuver. British and French assets were successfully employed by American C4I systems (SATCOM capability from Britain's SKYNET system, and reconnaissance data from French helicopter-mounted radar).[6] The British armored division integrated with U.S. forces more deeply than its French counterpart did—although the French division was effective in carrying out its mission, it was thought to be too light to engage the best Iraqi units. Due in part to their separa-tion from NATO's military structure, French forces had not exercised with U.S. units intensively enough to be able to use American battle management systems. The lack of night-vision equipment in most French vehicles impeded their full employment at night or under unfavorable weather conditions.[7] The French division also lacked the trained intelligence personnel to adequately carry out the intelli-gence preparation of the battlefield (IPB) process.[8]

Intelligence sharing was at times problematic. While officers from Britain were well integrated into CENTCOM intelligence operations, the flow of intelligence data among all partners was hampered by U.S. procedures stressing information security. The release of classi-fied information to coalition members was hampered by the lack of clear guidelines and procedures.[9]

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[6]Cordesman and Wagner, op. cit., pp. 258, 318.

[7]Ibid., pp. 170, 592–599.

[8]James J. Cooke, *100 Miles from Baghdad: With the French in Desert Storm*, Westport, CT: Praeger, 1993, pp. 57–58.

[9]Cordesman and Wagner, op. cit., pp. 281, 289.

Non-NATO coalition partners were less compatible than French and British units; for instance, the C4I systems deployed by Arab partners were not sophisticated and had to be supplemented with U.S. equipment. Arab coalition members were also not prepared—from an organizational and training standpoint—to fight a maneuver war with the high combat tempos characteristic of AirLand Battle. Equipment diversity in Arab arsenals (with systems of varying ages originating from different countries) was a source of logistics problems, since it placed great pressure on spares and maintenance.[10]

Incompatibility Mitigation Measures

While the high intensity of the conflict stressed compatibility among coalition partners, command and control arrangements helped attenuate political and military incompatibility. The existence of a parallel command structure eased Saudi concerns about being part of a U.S.-dominated coalition, and designating Arab forces as part of the Saudi chain of command resolved other political dilemmas, including the impact of Syria's differences with the rest of the coalition (the Syrian division remained in reserve as part of JFC-N). Separation of forces simplified the division of labor and eased compatibility concerns from the technological, operational, and political standpoints. The lead-nation overtones of the parallel C2 structure also facilitated coordination by striking a balance between the need to address political sensitivities and the military requirement to centralize command and control.

Coalition military planners acknowledged the differences in British and French compatibility with U.S. forces, positioning British units with VII Corps in the main thrust of the armored assault and moving the French division to what was thought to be a less demanding sector to the west, alongside forces from the XVIII Airborne Corps.[11] The French *Daguet* Division was clearly separated from the rest of XVIII Corps by using an Iraqi highway (MSR TEXAS) as the boundary

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[10]For a detailed account of the military shortfalls of non-NATO coalition partners, refer to Cordesman and Wagner, op. cit., pp. 173–209.

[11]*Conduct of the Persian Gulf War,* op. cit., p. 557.

between U.S. and French ground units.[12] Although more compatible than French forces, the British division suffered from important limitations compared with U.S. counterparts. Lack of self-sufficiency in logistics and service support, electronic warfare, and command and control systems was addressed by the provision of U.S. systems and assistance.[13]

The United States also played a key role in loaning equipment to allies. Five ground-mobile force/defense satellite communications systems were transferred to British units to address C2 shortfalls between Britain's command headquarters and British forces on the ground. The United States improved the robustness of Saudi command and control assets by providing secure communications systems such as radios, phones, encryption equipment for computers, and fax machines.[14]

The United States made extensive use of liaison teams to train Saudi forces and to augment their command and control assets. Liaison teams—referred to as non-U.S. Coalition Partner Support Units— were assigned to coalition forces at every command level down to the battalion. Partner Support Units used U.S. communications systems to maintain voice connectivity with U.S. headquarters.[15] Teams of 35 liaison officers were assigned to JFC-North and JFC-East; in addition to providing satellite communications, they operated as battle staff members.[16] Saudi officers have argued that pre-Desert Storm training (under Operation Desert Shield) enhanced their ability to breach the Iraqi forward defenses. U.S. partner support units boosted Saudi communications compatibility with U.S. commands immediately before and during the ground offensive. Moreover,

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[12]See *The Army in Multinational Operations* (FM-100-8), p. 4-13. Additionally, the U.S. 2nd Brigade, 82nd Airborne Division, and its adjacent French units, the 3rd Rima and the 4th Dragoons, conducted detailed coordination on their respective maneuver plans following the map exercises.

[13]Cordesman and Wagner, op. cit., pp. 143, 158–162.

[14]For instance, in the summer of 1990 Saudi forces acquired more than 100 secure high-frequency (HF) radios. See *Conduct of the Persian Gulf War*, op. cit., pp. 562–568.

[15]Ibid., p. 501.

[16]Cordesman and Wagner, op. cit., p. 561.

U.S.-augmented systems proved to be the most reliable C2 systems for Saudi forces.[17]

There was also considerable use of liaisons between XVIII Airborne Corps and the French division. Corps headquarters, the 82nd Airborne Division, the 24th Infantry Division, the 101st Air Assault Division, and the 18th Field Artillery Brigade exchanged liaison teams with the *Daguet* Division. These teams used organic U.S. radio equipment between the French division headquarters and their parent unit's headquarters. The teams also served as sources of information on the doctrine, tactics, standard operating procedures, force structure, and capabilities of their respective units. To ensure accurate and timely indirect fire during the operation, a U.S. Army fire control system (TACFIRE) detachment was integrated into the French fire support coordination center at *Daguet* Division headquarters to orchestrate fire coordination measures. This ensured face-to-face coordination between U.S. and French artillerymen at the decisionmaking point.[18]

Despite the fast-paced and high-intensity nature of the conflict—which placed a great deal of stress on the performance of coalition members who were neither trained nor equipped to operate in such conditions—the United States was able to mitigate technological disparities by assuming responsibility for most coalition capabilities. For example, the United States provided most coalition C4I. Intelligence collection relied extensively on U.S. satellite systems, while approximately nine-tenths of all airborne coverage originated from U.S. communications and dissemination capabilities.[19] Indeed, the U.S. C4I advantages helped centralize effective command of the operation.

The long lead time between coalition unit deployment in theater and the start of the ground offensive was also important. It allowed friendly forces to improve their combined warfighting effectiveness, making possible, for instance, the substantial Saudi-U.S. training ef-

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[17]Ibid., p. 183.

[18]Adapted from *The Army in Multinational Operations (FM-100-8)*, p. 2-21.

[19]Cordesman and Wagner, op. cit., p. 282.

fort begun in September 1990.[20] It also allowed the modification of tactical communications systems deployed by the United States, Britain, and France to ensure interoperability.[21] The variety of equipment and standards employed by coalition forces posed unique challenges for the construction of a communication architecture and logistics channels. Such systems had to be improvised, and they required several "workarounds" that became possible only with months of preparation. These short-term compatibility shortcuts may not have functioned appropriately in a higher-intensity, longer conflict, and could have jeopardized operational success.

OPERATION UPHOLD DEMOCRACY AND UNMIH

The peacekeeping and humanitarian assistance nature of Operation Uphold Democracy made the coalition effort, which was centered mainly around ground forces, significantly different from Desert Storm. There were two distinct phases to the multinational operation, with different C2 arrangements. Operation Uphold Democracy was conducted by a U.S.-led multinational force (MNF) deployed in September 1994 to secure domestic law and order. In March 1995, Uphold Democracy and the MNF were followed by a United Nations peacekeeping operation named UNMIH (United Nations Mission in Haiti). UNMIH's mission was to maintain order and promote the democratization of Haiti.

The United States played a preponderant role in both Haiti operations; although U.S. forces substantially decreased from the MNF's peak of 20,000, America was the largest troop contributor to the much smaller UNMIH operation (2,400 out of a total of 6,000 personnel).[22] The lead-nation nature of the coalition allowed the United States to exercise tactical control over all multinational forces. While the MNF/UNMIH transition required adjustment of procedures and systems to reflect the new UN orientation, the United States retained control of the force.

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[20]Ibid., p. 185.

[21]Ibid., p. 260.

[22]Adam B. Siegel, *The Intervasion of Haiti*, Alexandria, VA: Center for Naval Analyses, Professional Paper 539, August 1996, p. 29.

A large number of countries participated in the Haiti peace operations. The Caribbean Community (CARICOM) and Bangladeshi battalions provided important force contributions in the early phases of MNF and in UNMIH. Troops from other countries, including Pakistan, Nepal, and Canada, widened the multinational element over time.[23] In both operations, participating nations' forces were separated geographically—contingents operated in sectors where they were under the mission commander's control. A quick-reaction force composed of U.S. troops was created to support the separated contingents in crises.[24]

The phasing out of MNF and its replacement with UNMIH allowed coalition forces to deploy in and out of theater at staggered times. While the U.S. military provided almost all of the intervention forces at the outset, the foreign element of Operation Uphold Democracy and UNMIH steadily increased over time. The first non-U.S. contingent to join the MNF was a 266-man composite battalion from CARICOM in early October, followed by the lead element of the Bangladeshi battalion later that month. Smaller Guatemalan and Costa Rican contingents deployed before the end of 1994. The first contingent of International Police Monitors (IPMs) also arrived early in October.[25]

Compatibility Issues

The relatively peaceful nature of the operations and the benign environment encountered by the multinational forces greatly eased the compatibility concerns caused by technological disparity. Overall, command and control arrangements worked well. While the organizational structure of the MNF was subjected to several changes to integrate contingents arriving in theater at different times, no significant stresses were placed on multinational command and control.

The transition from MNF to UNMIH was relatively smooth, although U.S. forces had to adjust to UN procedures and doctrine. Several of

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[23]For a detailed description of Operation Uphold Democracy, see Siegel, op. cit.

[24]Hal Klepak, "Haiti Takes Its Next Step," *Jane's Defence Weekly*, May 13, 1995, pp. 19–20.

[25]Siegel, op. cit., p. 26.

the lessons learned from Somalia, including the need for a clear chain of command and sufficient time to transfer responsibilities, were applied in the context of UNMIH. The transition from MNF to UNMIH was facilitated by appointing a U.S. commander, by training UN personnel in the United States before the handoff, and by seeking to complete the integration of UNMIH contingents not in MNF well before the official transfer of authority.[26]

The standard UN procedures for C4I and support activities were inconsistent and underdeveloped, and could have led to greater compatibility problems without an active U.S. role. Compatibility concerns arose in the area of communications under UNMIH. Communications was a UN responsibility, and all units to the battalion level were to be provided with telephone service and ultra high frequency (UHF) radio communications to ensure connectivity with UNMIH headquarters. The fact that the UN communications network was not entirely operational immediately after the MNF/UNMIH transfer of authority forced the coalition to rely on a patchwork system that included the Haitian telephone system, two UN INMARSAT terminals, the UHF radio system, U.S. Army tactical satellite terminals, and the U.S.-contracted commercial voice network. The ad hoc nature of the communications system made it vulnerable and did not allow the exchange of classified or encrypted messages among coalition members. UN communications doctrine did not foresee the provision of horizontal communications links between national contingents to complement the vertical ties between the contingents and headquarters. Such communications shortfalls could have made coordination among adjacent but separate forces more problematic in a crisis.[27]

Communications problems extended to the contingent of IPMs, which lacked compatible communication equipment and had only a few vehicles to allow mobility independently of the United States. Some international police units operated under doctrines that were at variance with U.S. military police tactics and procedures. For instance, the Indian police company replacing the U.S. 58th Military

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[26]Center for Army Lessons Learned, *Operation Uphold Democracy: Initial Impressions*, Volume III (The U.S. Army and United Nations Peacekeeping), July 1995, p. 89.

[27]Ibid., pp. 86–87, 100–101.

Police Company after the transition from MNF to UNMIH had fewer personnel than the 58th and was organized into large, squad-like units. They lacked vehicles for transportation and patrolling, and the few radios they carried were not compatible with U.S. tactical radios. Though well trained and disciplined, the Indian company could not carry out independent operations.[28]

The breadth and sophistication of the C4I systems used by U.S. troops and commanders could not be matched by other participants. In fact, there was no other coalition C4I structure with which to make the U.S. system compatible. U.S. intelligence "releasability" procedures were followed so strictly that almost no intelligence data were directly available to multinational contingents. These procedures were adapted over time, and some information such as imagery was downgraded and released.[29] While most intelligence-sharing issues affected both MNF and UNMIH, some affected only the latter since they were related to differences in U.S. and UN intelligence-gathering doctrines. In UN peacekeeping operations, intelligence activities are usually kept at a minimum and are termed "information operations." The distinctions led to some confusion—at times U.S. military intelligence personnel assumed "UN restricted" information to be equivalent to "U.S. secret." Such confusion stifled the flow of intelligence data, especially in the first months of UNMIH.[30]

Logistics under UNMIH also required adjustments from the United States, since a number of U.S. requests for materiel had to be approved by a UN-appointed Chief Administrative Officer. The UN approval process was often unresponsive and caused delays in the support chain. Despite the presence of a UN logistics framework, the United States remained the chief provider of logistics support for coalition contingents during UNMIH.[31]

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[28]Ibid., pp. 118–121.

[29]*Operation Uphold Democracy: Joint After Action Report (Draft)*, p. 41, and *Operation Uphold Democracy: Initial Impressions*, Volume II, p. 171.

[30]*Operation Uphold Democracy: Initial Impressions*, Volume III, p. 44.

[31]Ibid., p. 169.

Incompatibility Mitigation Measures

Given the inability of most partners to field their own national support and C4I structures, mission effectiveness hinged on a strong U.S. role. In fact, the United States provided the bulk of communications equipment and logistics support during MNF and UNMIH. American tactical communications systems supported coalition operations, including UN personnel, the CARICOM battalion, the International Police Monitoring Agency, and other coalition forces. Equipment sharing was complemented by the extensive use of liaison teams for C4I support and training.[32] The use of liaisons for intelligence data sharing, for instance, minimized the impact of U.S. doctrinal obstacles to releasing classified information.[33]

A large portion of coalition communication and training support came in the form of coalition support teams (CSTs). Composed of special forces units, CSTs served as advisory groups. CST-supported initiatives included training on American C2 relationships, communications, staff relationships, supply requisitions, and medical procedures. CSTs operated the telecommunications equipment (tactical network phones, SATCOM, SINCGARS) necessary to maintain connectivity between headquarters and the coalition partners. U.S. forces in Haiti supported the CARICOM contingent in other ways, including housing, food, transportation, and vehicle maintenance.[34]

Predeployment training of coalition forces played a crucial role in minimizing compatibility problems—as in the case of the CARICOM battalion. Command and control of the CARICOM battalion was undermined by discipline problems during the Haiti operations, in part due to the battalion commander's lack of authority over troops from different countries. However, the performance of the CARICOM battalion would have worsened considerably without the assistance of the CST prior to and during deployment. The CST joined the CARI-

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[32]Atlantic Command, *Operation Uphold Democracy: Joint After Action Report (Draft)*, 1995, p. 9.

[33]*Operation Uphold Democracy: Joint After Action Report (Draft)*, p. 41, and *Operation Uphold Democracy: Initial Impressions*, Volume II, p. 171.

[34]Center for Army Lessons Learned, *Operation Uphold Democracy: Initial Impressions*, Volume II (D–20 to D+150), April 1995, pp. 136–138, and *Operation Uphold Democracy: Joint After Action Report (Draft)*, p. 33.

COM battalion in Puerto Rico before MNF and trained CARICOM forces. The close involvement of CST members in CARICOM's training process led to a cooperative relationship between CARICOM and U.S. troops.[35] Troops from Bangladesh as well as IPMs and UN officials also benefited from predeployment training.

Not all potential compatibility issues were addressed by training, however, and not all could be. For instance, the CST trained the CARICOM battalion in basic infantry skills and placed less emphasis on battle staff procedures. In the case of the Indian military police company, incompatibility was caused by different doctrinal requirements and could not be rectified in a short period. Despite its limitations, predeployment training and the use of liaisons helped to bring about a minimum level of compatibility between coalition forces.

The success of the efforts in Haiti is also related to the extensive preparation time available to military planners; in fact, Atlantic Command foresaw the possible use of XVIII Airborne Corps in a forcible entry mission as early as October 1993. The operational plan that guided the deployment of U.S. troops in Haiti was adopted in early September 1994, but it was based on alternative operational plans devised months in advance. The importance of giving Uphold Democracy a multinational character was also foreseen in the planning phase. The United States managed to gain the support of Latin American and Caribbean countries for the operation—leading to the direct involvement of CARICOM and Latin American troops.[36]

Other time-related issues were important in Haiti. The staggered deployment schedule for multinational forces minimized the impact on the operation's conduct of disparities in capabilities and assets among coalition partners. The United States began the MNF phase unilaterally, and other contingents deployed only after U.S. forces could guarantee relative safety. The phased-in deployment also made the preparation and incorporation of less technologically capable units smoother and more manageable. Thus, the timing decisions in Operation Uphold Democracy stemmed from deliberate

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[35]*Operation Uphold Democracy: Initial Impressions*, Volume II, p. 138.

[36]Siegel, op. cit., p. 9.

efforts to minimize the impact of technological and operational disparities on coalition effectiveness.

NATO'S IMPLEMENTATION FORCE (IFOR)

The NATO Implementation Force (IFOR) was very different from its UN-led peacekeeping predecessor, the United Nations Protection Force (UNPROFOR). IFOR was an alliance operation, with a corps-sized land component composed of the Allied Command Europe Rapid Reaction Corps (ARRC). Its peace enforcement mandate included ensuring compliance by the former warring factions with the cease-fire, maintaining the separation of forces, and ensuring the demobilization of remaining forces.

IFOR had a unified command and was NATO-led, under the political direction and control of the Alliance's North Atlantic Council. Overall military authority was in the hands of NATO's Supreme Allied Commander, Europe (SACEUR), General George Joulwan. General Joulwan designated Admiral Leighton Smith (NATO's Commander in Chief Southern Command (CINCSOUTH)) as the first commander-in-theater of IFOR (COMIFOR). With the retirement of Admiral Smith in July 1996, Admiral Joseph Lopez was appointed as CINC-SOUTH and also replaced Admiral Smith as COMIFOR. For the duration of the Bosnia operation, the COMIFOR headquarters was split-based between Sarajevo and Naples.[37]

Forces were both multinationally integrated and geographically separated. While the three most important contributors—the United States, France, and Britain—operated in different sectors, each led a multinational division (MND) with a considerable number of troops from different countries. The U.S.-led MND, for instance, included brigades from Turkey, Russia, and a third non-U.S. brigade made up of troops from Finland, Sweden, Norway, and Poland (the NORDPOL brigade).

The U.S. role in IFOR was substantial. Its division was the largest, and its deployable satellite communications capabilities proved

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[37]Larry K. Wentz, "Bosnia—Setting the Stage," in Wentz (ed.), *Lessons from Bosnia: The IFOR Experience*, Washington, D.C.: NDU Press, 1998.

critical in supporting IFOR C4I. The American intelligence effort in-
cluded manned and unmanned airborne systems, as well as surface
and satellite intelligence platforms. Despite the important role
played by the United States, American superiority was less over-
whelming than in Desert Storm.[38] NATO allies such as Britain,
France, Italy, and Germany deployed their tactical communications
systems, and some communication deficiencies were offset by rely-
ing on commercially available assets. Some C4I needs were ad-
dressed by alliance-wide information systems. NATO deployed its
own data communications and intelligence sharing systems—Crisis
Response Operations in NATO Operating Systems (CRONOS) and
the Linked Operational Intelligence Centers Europe (LOCE).[39]

European countries were more effective than U.S. forces in collecting
human intelligence (HUMINT), in part due to the links established
by their units during the UNPROFOR operation. U.S. doctrinal re-
quirements also placed restrictions on the ability of American forces
to mix with the local population and collect HUMINT. While signal
intelligence and overhead surveillance were essential, HUMINT
proved to be equally important.[40] Moreover, U.S. high-technology
intelligence assets did not always perform as expected. The Joint
Surveillance Target Attack Radar System (JSTARS), for instance, was
at times unable to distinguish friend from foe given the lack of a clear
dividing line between friendly forces and those of the former warring
parties.[41]

Compatibility Issues

IFOR forces encountered a relatively benign environment. The low
degree of opposition placed minimal stress on the compatibility of
systems and multinational C2 arrangements. The ad hoc C4I system
worked reasonably well, although it was a patchwork of NATO, UN,
national, and commercial systems. Moreover, the NATO analog

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[38]Gompert, Kugler, and Libicki, op. cit.

[39]These were not extended to Partnership for Peace (PfP) partners. See Barbara Starr,
"Learning Zone," *Jane's Defence Weekly*, May 27, 1998.

[40]*Operation Joint Endeavor Lessons Learned*, U.S. Army Europe, 1996.

[41]Larry K. Wentz, "Intelligence Operations," in Wentz (ed.), op. cit.

interface to ensure system interoperability (STANAG 5040) was slow and did not cover the strategic-tactical integration of voice networks. The ad hoc and patchwork nature of the system caused the C4I architecture to be bloated—given the presence of multiple networks, up to seven different telephone sets could be found at headquarters in the early phases of the operation. Switching calls from one voice network to another was complicated, and calls experienced a 20 percent probability of being blocked in IFOR's early months.[42] The complex and ad hoc nature of NATO's communication and information system also made it vulnerable, although there were no attacks on command facilities and communications infrastructures.[43]

Command and control relationships were at times strained given the differences between SHAPE and IFOR and between the ARRC and the multinational divisions. The command relationships between NATO, IFOR, and USAREUR were at times ill defined. U.S. requirements for force protection and support prompted U.S. Army Europe to deploy a forward headquarters in Hungary, which influenced the operations of the U.S. MND outside IFOR C2.[44] The presence of a relatively large number of forces outside coalition command and control would have become problematic had the conflict unexpectedly intensified.

Some of the compatibility problems in Bosnia reflected NATO's inexperience in forward-deploying significant strategic C4I capabilities. The alliance had no doctrine or operating procedures to guide the planning and implementation of the multinational communications system and intelligence architecture. CRONOS was essential in connecting SHAPE and NATO headquarters with IFOR, but its lack of an interface to national networks meant that data had to be transferred manually from the NATO to national systems. LOCE promoted the sharing of classified information; however, it lacked the

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[42]David C. Gompert, Richard L. Kugler, and Martin C. Libicki, *Mind the Gap*, Washington, D.C.: National University Press, 1999.

[43]C4I Integration Support Activity (CISA), *Compendium of Operation Joint Endeavor Lessons Learned Activities*, 1996, Chapter 6.

[44]For instance, "force protection teams" were deployed by USAREUR in Bosnia, outside the established NATO command and control structure. See *Bosnia-Herzegovina After Action Report I*, Peacekeeping Institute, Army War College, Carlisle Barracks, PA, 1996.

necessary bandwidth for fast and high-volume communications. Moreover, the United States did not use LOCE to transmit its highly classified information.[45]

Incompatibility Mitigation Measures

Incompatibility and its deleterious impact were decreased before the operation by good planning and training within the Alliance. Military commanders had years to plan for the deployment of their forces, and such lead time allowed Partnership for Peace (PfP) and NATO countries to train prior to deployment. NATO allies also ran several tests to verify the interoperability of their communications equipment.[46]

Nonmilitary communications systems were used and allowed NATO to offset some of the limitations of its C4I structure. The presence of a UN satellite telephone network (a remnant of UNPROFOR) facilitated communications in a mountainous environment. Commercial satellite communications systems provided connectivity between troops on the ground and national and NATO command authorities. However, the rotation of the ARRC out of theater after the transfer of authority from IFOR to SFOR created some difficulties, since the information systems replacing ARRC's were not as functional.[47]

IFOR participants shared intelligence internally to an unprecedented degree and managed to exploit the large contribution of U.S. assets and systems to coalition C4I. In fact, the United States released classified information to allies more quickly and regularly than in Haiti or Desert Storm. NATO devised a new classification category (IFOR-releasable) to maximize the intelligence flow to non-NATO countries. The United States also allowed Russian units to use All Source Analysis System (ASAS) WARLORD intelligence work-

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[45]Barbara Starr, "Learning Zone," *Jane's Defence Weekly*, May 27, 1998.

[46]Prior to deployment, NATO held a major interoperability exercise (INTEROP 95) to improve system integration and address interface compatibility issues. INTEROP 95, held in April 1995, included more than 250 participants from 8 nations and tested all anticipated interfaces necessary to execute the AFSOUTH and ARRC OPLANs. See Wentz, "C4ISR Systems and Services," in Wentz (ed.), op. cit.

[47]Ibid. On the use of commercial satellites to support strategic connectivity, see also 5th Signal Command, *Operation Joint Endeavor: Lessons Learned Book*, 1997.

stations.[48]   While the integration of PfP countries in Bosnia was successful, some of their contingents faced equipment shortages. To address such problems, the United States provided liaison officers and equipment, including STU-IIBs (secure telephone units).[49]

Despite its complexity, the Bosnia operation did not present challenging conditions from a military standpoint. The operation was facilitated by the relative proximity between the theater of operations and NATO territory, making logistics and movement relatively simple. Deployment was also eased by the fact that two framework nations—France and Britain—had troops deployed in theater before the transfer of authority from UNPROFOR to IFOR. Moreover, the security environment in Bosnia remained benign, and the Alliance had several months to plan for the operation and solve several interoperability problems before deployment.

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[48]However, allies did not always match U.S. openness in sharing information, often adopting strict need-to-know criteria. See Wentz, "Intelligence Operations" and "C4ISR Systems and Services," op. cit.

[49]These efforts, however, were undermined by the fact that a fraction of U.S. forces operated STU-IIIs not interoperable with the NATO standard STU-IIB. PfP contingents also experienced communication problems because of the lack of English speakers among their ranks. See Jeffrey Simon, "The IFOR/SFOR Experience: Lessons Learned by PfP Partners," *Strategic Forum*, Number 120, Institute For Strategic Studies, July 1997, and *Operation Joint Endeavor Lessons Learned*, U.S. Army Europe, 1996.