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JOINT ENGINEERS:
FULL SPECTRUM SUPPORT-FROM PEACE TO WAR

BY

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19990611 030

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USAWC STRATEGY RESEARCH PROJECT

JOINT ENGINEERS: FULL SPECTRUM SUPPORT-FROM PEACE TO WAR

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ABSTRACT

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TITLE: Joint Engineers: Full Spectrum Support-from Peace to War

FORMAT: Strategy Research Project

DATE: 7 April 1999 PAGES: 48 CLASSIFICATION: Unclassified

Joint engineers can provide significant and sustained engineer support to joint operations across the full spectrum of warfare. Operations PROVIDE COMFORT, RESTORE HOPE, RESTORE DEMOCRACY, and JOINT ENDEAVOR all show that engineers need to be interoperable. They should be capable of performing a range of tasks to include operating with other services, operating with non-governmental organizations, contracting for construction and services, and planning and executing joint operations. This study advocates establishing sound joint engineer doctrine to improved joint engineer training. This initiative will improve interoperability and develop a strong cadre of highly skilled joint engineers. Better trained engineers supporting a joint force commander who better understands the engineers' full range of capabilities will provide the flexibility to enhance joint task force engineer operations for full spectrum support from peace to war.

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JOINT ENGINEERS: FULL SPECTRUM SUPPORT-FROM PEACE TO WAR

> The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow.
>
> -- John M. Shalikashvili

After a series of military operations failed in the 1970s and 1980s, Congress passed the Goldwater-Nichols Act to integrate individual service capabilities into a more efficient joint team.[1] The implementation of this law has contributed to a number of recent joint operational successes such as those in Kuwait and Iraq, Somalia, Haiti, and Bosnia. Despite these great strides in joint operations over the last decade, however, the Department of Defense now must further integrate service capabilities to effectively support the national security strategy.[2] The engineer field is one area ripe for further joint integration.

Joint engineers can provide significant and sustained engineer support to joint operations across the full spectrum of warfare. Recent operations have shown that the engineering challenge is disproportionately large when compared to the total military effort.[3] To accomplish current operations, engineers must be fully interoperable. They should be capable of engaging in a range of tasks that include operating with other services, operating with non-governmental organizations (NGOs),

contracting for construction and services, and planning and executing joint operations.

The Joint Vision 2010 implementation process identifies six areas where focused study and deliberate action will be required to build the capabilities needed for a fully interoperable joint engineer force.[4] These six areas are high-quality people, innovative leadership, joint doctrine, joint education and training, agile organizations, and enhanced materiel.[5] Of these important strategic areas, three are critical for successful integration of forces: doctrine, organization (command and control relationships), and training. Review of Operations PROVIDE COMFORT, RESTORE HOPE, RESTORE DEMOCRACY, and JOINT ENDEAVOR reveal that the joint doctrine, the command and control, and the training available to engineer units were not sufficient to guarantee their ability to accomplish engineer warfighting tasks. Nor are these units exercised as frequently as needed to enable JTF engineers to meet the joint engineer challenge and conduct synergistic joint engineer operations.[6]

HISTORY OF JOINT ENGINEERS

Since 1990, engineer efforts have progressed from "specialized" to a near "synergistic" level of joint engineer operations. Operation DESERT STORM illustrates specialized joint engineer operations. The Coalition employed an array of

multinational, multi-service, and multifunctional forces to achieve common objectives. General Sheehan describes "synergistic" joint operations as involving massed, redundant forces providing necessary capabilities with various service capabilities orchestrated by the joint force commander (JFC) toward a common objective.[7] Although joint operations in the Gulf War improved multi-service engineer operations, there were nonetheless problems with the doctrine, command and control, and training.[8] We cannot afford an inefficient system that brings redundant engineer forces together for the first time on the battlefield.

Joint operations since DESERT STORM, like RESTORE HOPE in Somalia, UPHOLD DEMOCRACY in Haiti, and JOINT ENDEAVOR in Bosnia, have approached the level of synergistic joint operations. Yet lack of common joint engineer doctrine, ineffective command and control, and lack of training have prevented engineers from reaching the synergistic joint level.

Military engineers offer support across the continuum from strategic to operational to tactical levels of war. The focus of the engineer effort varies according to the level of support. The theater Commander-in-Chiefs (CINCs) are primarily concerned with the overall deployment of forces in the context of theater war plans. Thus engineering at the theater strategic level tends to focus on major facilities, theater-wide construction

management policy, and the allocation of scarce engineer resources. At the other end of the spectrum, tactical-level engineering activities are expeditionary or combat-related, which is primarily a Service concern. Between these two is the operational level (i.e., subunified commands and joint or combined task forces), where JFCs plan and fight campaigns. At this level, there must be balanced emphasis on both deliberate and combat engineer activities.[9]

To fully exploit military engineers at the operational level, the JFC must rely on doctrine that explains engineer capabilities and tasks, must select command and control options that include appropriate engineering support, and must use trained engineers in the conduct of joint synergistic operations. At the operational level, careful planning and seamless execution of deliberate and combat engineer functions supporting a well synchronized, integrated force gives the JFC freedom of action.[10]

Engineer resources sufficient to satisfy all requirements probably will not be available in all contingencies. Priorities will change as a contingency evolves from reception, beddown, and sustainment to force protection, operational maneuver, and ultimately, termination of operations and withdrawal. Maximizing resources to meet operational needs will depend on the JFC's flexible use of task organized engineers. The JFC

needs a well-trained joint engineer staff to effectively influence the full range of engineer functions.[11]

CHALLENGES IN FUTURE

"Jointness" has come of age; it will be more critical in the future. To achieve synergistic joint operations, Service engineers must focus on joint doctrine, joint command and control, and joint training. To be prepared for vastly different missions, from MOOTW to a major theater war, joint engineers need better doctrine and more training.[12] They must develop competencies for contingency operations to enhance joint warfighting in a resource-constrained environment. Engineers must clearly understand operational-level engineer missions in support of joint and coalition operations. They must distinguish between Service and joint engineer capabilities in order to support commanders on the battlefield. Navy Captain John Lehman notes that since DESERT STORM, the military has operated as a joint force in humanitarian and regional contingency operations, disaster recoveries, and nation assistance operations.[13] Rear Admiral Jack E. Buffington further adds that unified operations shape the way we think and train for war. Each Service's mission and capabilities now requires development of doctrine to support effective joint operations.[14]

To respond effectively in today's dynamic environment,

joint forces need to be expeditionary. The Marines have always been able to respond rapidly to any situation. The Air Force (AF) introduced the Air Expeditionary Force (AEF) concept to provide rapid, responsive, and reliable airpower tailored to the specific needs of the situation.[15] The Army is trying to introduce a rapid reactive force to respond to smaller contingencies and MOOTWs.

What are expeditionary forces? Lieutenant General Charles Wilhelm describes their role: "They have an expeditionary state of mind; they are comfortable with uncertainty and capable of handling adversity; they have the ability to adapt to 'out there' and to improvise; they have an ability to start from scratch and make up solutions as they go; and they have the ability to do it with less—to drive a nail with a shovel if they don't have a hammer."[16] Joint engineers must be expeditionary. They must have the doctrine, command and control structure, and training to guide individual service engineers toward joint mission and provide the framework to train and fight in a joint expeditionary environment.

HOW IT IS SUPPOSED TO WORK

Joint Engineer Capabilities

Our Services are carrying out more missions with fewer resources. Joint operations are here to stay; they are changing

the way Service engineers train and support contingency operations. To ensure the optimum use of assets and mission success in joint engineer operations, all Service engineers and JFCs must become familiar with the capabilities that other Services bring to the fight. Unfortunately, no single document exists that lists capabilities of each Service's engineers.

Commanders need to know that AF Prime Base Engineer Emergency Forces (BEEF) and Rapid, Engineer-Deployable, Heavy, Operational, Repair Squadron (RED HORSE) squadrons are premier expeditionary construction forces, as are Army combat heavy battalions, Navy mobile construction battalions (Seabees), and Marine engineer support battalions. AF Prime BEEF units provide beddown, sustainment, and survivability capabilities worldwide.[17] Army Engineers provide terrain visualization, mobility, countermobility, survivability, and force support. They enable the JFC to fight and move where he wills; to use the terrain as a weapon; to mount, sustain, and recover from operations by creating and maintaining lines of communication.[18] Marine combat engineers perform missions similar to those performed by Army combat engineers, but they focus on expeditionary engineering that support Marine Air-Ground Task Force land operations with mobility, countermobility, survivability, and general engineering.[19]

All services have special engineer units that provide unique capabilities, such as Navy underwater-construction teams, Air Force pavement-repair teams, and Army prime-power teams. The Army Corps of Engineers (COE) and Naval Facilities Engineering Command both provide additional civilian capabilities in areas such as construction contracting, real-estate acquisition, and construction management. Specific service engineer capabilities are critical. The JTF commander needs to understand all of them. Training engineers to the same level in fundamental principles will ensure interoperability, unity of effort, and effective command and control. Beyond understanding of each Service's engineering capabilities, the JFC must be aware of the level of contractor and host nation support for successful joint engineer operations.

Contractors have always enhanced engineer capabilities; they work side-by-side with military engineers in peace and war. Service contracts for operations in Somalia, Haiti, and Bosnia have emphasized sustainment operations. As the Army downsized, it did not retain organic engineer sustainment capabilities; rather it developed the Logistics Civil Augmentation Program (LOGCAP) to fill the void. LOGCAP has successfully supported sustainment, but not initial or beddown missions. So military engineers carry the ball until LOGCAP contractors arrive in

theater. LOGCAP usually can meet large-scale construction requirements 30 days after an operation begins.[20]

The AF found initial responses to contingencies and MOOTWs required military engineers to meet rapid response and initial beddown requirements. After military engineers establish a base of operations, sustainment from a contractor becomes a resource option. The AF introduced Air Force Contract Augmentation Program (AFCAP) in 1997 to fill this resource option. AFCAP provides a complete range of civil engineer support, except fire/crash rescue and explosive ordinance disposal, and provides installation support for noncombat military MOOTW.[21] The program serves as a force multiplier by freeing up AF people to hone their combat skills, care for people, and modernize facilities and equipment. Similarly, the Navy established Navy Contract Augmentation Program (NAVCAP).

Host nation support (HNS) provides critical engineering support in a theater. Construction materials, equipment, facility repair parts, and labor may be available locally in a theater to assist engineers as they support an operation. Standards, quality of materials, and equipment will vary, but engineers and JFCs must be prepared to adapt and use host nation support.

Doctrine

Joint doctrine guides the integration and use of the Services in joint operations, but current joint engineer doctrine is not comprehensive. Joint Publication 4-04, "Joint Doctrine for Civil Engineering Support," provides the basic joint engineer doctrine for JTF and combatant commanders and their staffs. It does not offer engineer principles and options to guide JFCs in organizing the engineer staff and determining where engineers fit into the joint force. "In particular, it fails to present principles underpinning the nature of engineer support for operational maneuver at the joint or combined-task force level and does not address gaps and inconsistencies elsewhere in joint doctrine."[22] Furthermore, it does not reflect lessons learned from recent operations.

All Services acknowledge it is inadequate as an overarching doctrine across the full spectrum of joint operations, but joint engineer doctrine is still evolving. A new joint publication currently in coordination, Joint Publication 3-34, "Engineer Doctrine for Joint Operations," seeks to fill the void. It has an operational focus over the full range of engineer capabilities and will provide the JFC with guidance on how best to use available engineer capabilities to achieve mission success.

Command and Control

Joint doctrine places engineer functions under the logistics staff. Navy and AF engineers provide infrastructure and sustainment capabilities, so they are comfortable with this arrangement. Whereas Army engineers focus more on ground combat support and align more naturally with the operations functions. At the Corps level, the Army establishes engineers as a separate special staff element because they coordinate all types of engineering tasks. Support to the maneuver commander is their first priority,[23] because "All engineer units (combat, construction, or topographic) are focused on operations in the combat zone."[24] Therefore, engineers must be involved in planning and integrating engineer capabilities into the commander's concept of operations.

But joint doctrine organizes engineer functions under the J-4. This is effective in JTF operations that require engineering skills primarily for beddown and sustainment operations, but when engineers need to support combat operations, it may be more practical for the engineer staff element to fall under J-3. In some cases, establishing engineers as a separate staff element with engineer liaisons in J-3, J-4, and J-5 staffs improves unity of effort.

Effective control of joint engineers is an essential battle-command decision, but current doctrine does provide

commanders flexibility. Joint Publication 4-04 authorizes the CINC "to exercise directive authority over engineer forces within their AORs to ensure effective execution of approved OPLANs, provide efficiency and economy of operations, and prevent or eliminate unnecessary duplication of facilities and overlapping of functions among component commands."[25] Further, the CINC has "the authority to transfer civil engineering functions between or among Service components within the AOR."[26] Additionally, Joint Publication 4-04 states "peacetime organizations should be tailored and trained to meet those requirements."[27]

Training

Since passage of the Goldwater-Nichols Act, engineer training has indeed changed. Since 1995, Army, AF, Navy, and Marine Corps enlisted engineers are training as carpenters, builders, and steelworkers at Gulfport Naval Station, Mississippi; mechanics are training at Port Hueneme, California; heavy engineer equipment operators are training at Fort Leonard Wood, Missouri; and plumbers and electricians are training at Sheppard Air Force Base, Texas. The benefits resulting from this joint training include appreciation for different tactics, techniques, operating procedures and engineer equipment in addition to cost savings.[28] This training provides common

fundamental skills and makes it easier for enlisted personnel to work together while attaining synergistic joint engineer operations.[29] It is critical that JFCs understand engineer capabilities and integrate them into operational plans. The JFC's ability to integrate engineers in their operations was essential to successful military operations in Somalia, Haiti, and Bosnia.[30]

Unfortunately, current joint engineer training is not adequate. There is no training for joint engineer officers and JTF staffs for contingency operations. Gaps and inconsistencies in current joint doctrine and the lack of joint engineer staff training programs simply reduce a JTF staff's competence. It is important that staff members have a common basis for interacting as a team, but lack of relevant doctrine and the limited number of personnel experienced in joint contingency engineering operations means that painful lessons often must be relearned. Typically, few engineers participate in joint exercises, and operational commanders assume engineering issues away.[31] However, joint training is critical to assure synergistic joint engineer operations because it "prepares them to operate in the joint world."[32]

HOW IT REALLY WORKS -- LESSONS LEARNED

In today's turbulent world, we can expect engineer involvement across the full spectrum of conflict from peace to war. Operations in Somalia, Haiti, and Bosnia and lesser contingencies such as Operation PROVIDE COMFORT are only a few examples of the kinds of operations engineers can expect to support in the future. Both current strategy and recent experiences indicate that future operations will be joint. Certainly they will require a significant engineering effort. Recent operations have emphasized the importance of joint engineer interoperability and the need to reach a synergistic level. To achieve this level, joint engineer doctrine, command and control, and training are essential to provide full spectrum support to the JTF commander. Both Navy Seabees and Army engineers worked on a bypass road project in Haiti. A Navy Seabee detachment operated Army equipment to complete its projects and along with AF RED HORSE and Prime BEEF units built base camps in Bosnia. In Somalia, AF, Navy, Army, and Marine Corps engineers performed a wide range of engineer missions in support of Operation RESTORE HOPE. Despite the success of these recent operations, the need to improve joint engineer interoperability has become increasingly evident. More importantly, improvement in joint engineer doctrine and training has been considered essential.[33]

Iraq and the Kurds -- Operation PROVIDE COMFORT

After DESERT STORM in 1991, Coalition forces provided humanitarian support to the Kurdish people of northern Iraq through Operation PROVIDE COMFORT, which presented unique challenges to engineers. The JFC established a separate staff element for engineer command and control, while engineer liaisons in J-3, J-4, and J-5 ensured scarce engineer assets were properly managed to ensure mission success. In these operations, the engineer had access to the JFC and clearly understood the commander's intent. He was thus able to translate the vision into a total engineer effort.

Command and control responsibility was given to an Army brigade which controlled all coalition engineer units in the region, including AF Prime BEEF and RED HORSE units, Navy Seabee units, and engineer units from the United Kingdom and Netherlands.[34] Engineer resources were diverse, but scarce. So the brigade prioritized several engineer missions, which enabled the brigade to manage the construction of ten camps for 200,000 displaced Kurds.[35] Joint engineers initially designed camp layouts, built road systems, erected tents, and installed lighting and fencing. Then they constructed hospital administration areas, playgrounds, and storage facilities for NGOs.[36]

The second mission provided sustainment engineering for 15,000 coalition forces in northern Iraq, which was no easy task. Initially, engineers provided minimal latrine and shower facilities, protective berms, roads, and logistic storage areas. After the brigade completed the higher priority tasks, they improved the quality of life for all troops.[37]

The third mission managed real estate allocation because of limited space which several units completed for. In addition, the brigade served as combat engineers providing mobility, countermobility, and survivability engineering for Coalition forces should Iraq attack.

Engineers were task organized and prepared to support military operations by constructing obstacles and building fighting positions. Shortage of engineers and heavy equipment made the task difficult, but engineers employed innovative and expedient methods to accomplish mission requirements. Contractors constructed utility and latrine systems and some facilities, and NGOs eventually took over the operation of the transient camps.

PROVIDE COMFORT provided several lessons learned. First, engineers need to deploy early and in sufficient strength to do the job. During the early stages of the operation, engineers were most needed.[38] It would have helped to have engineers involved earlier in operational plans on the joint and combatant

command staff. In addition, the JFC needs to know what service-specific engineer capabilities are available so he can tailor his forces and request the right engineers at the right time for the mission. The Services should develop joint contingency engineer packages comprised of light, mobile equipment to meet joint expedient engineer requirements in the field.[39]

Dedicated and well-trained engineers adapted very well to the situation and exceeded expectations. Engineers trained on all types of equipment are immediately useful to the commander. A single command and control element in the field was crucial to prioritize missions and allocate scare engineer resources properly to ensure mission accomplishment.[40]

Somalia -- Operation RESTORE HOPE

Operation RESTORE HOPE offers an example of the typical engineer mission in the post-Cold War era. Joint and combined engineers constructed roads, base camps, and airfields in Somalia. They continued a worldwide legacy of providing special engineer support such as well drilling, port construction, mapping, and power generation.[41] Somalia demonstrated the need for theater engineers to coordinate their activities within the JTF, as well as with coalition engineers.

RESTORE HOPE followed joint doctrine. Initially, engineer assets were inefficiently managed because no single engineer

effort was established. Further, the broad scope and intensity of the engineer's mission was too cumbersome to manage under the J-4.[42] Engineers provided engineering services and construction while simultaneously supporting combat arms operations. Proper planning and execution of mobility, countermobility, and survivability operations in support of maneuver elements was critical. Their subordination under J-4 detracted from the engineer's ability to internalize the commander's intent and support the full range of engineer requirements.[43]

Theater command relations were confusing, thereby making routine duties more trying than necessary.[44] No single engineer was in charge, therefore, to simplify work, the JTF held weekly meetings with in-theater staff engineers, military engineer units, civilian contractors, and NGOs to coordinate efforts.[45] The meetings improved communications, expedited tasks, and improved work efficiency.

The Operation RESTORE HOPE Lessons Learned Report suggests an alternative command and control structure for operations requiring a large engineer effort like that in Somalia. It recommends establishing a JTF engineer as a special staff element reporting directly to the commander so the engineer would understand the commander's intent and thus meet mission requirements.[46] Direct access to the JTF commander to determine engineer priorities for critical needs within the theater of

operations is essential to ensure adequate transportation assets, supplies, and engineer equipment.[47]

Haiti -- Operation RESTORE DEMOCRACY

Joint and coalition engineers teamed to help stabilize Haiti. Engineers split resources between a UN supported effort to secure and stabilize Haiti and a U.S. effort to assist the government of Haiti in strengthening its fragile government. The UN engineers consisted of Canadian vertical construction engineers, U.S. Army engineers for command and control, and LOGCAP for additional engineer expertise and logistical support.

Engineers constructed force protection at the base camps and key installations. They repaired other facilities improving lighting, along with water and sanitation systems. Beyond force protection, military engineers focused on force beddown, providing almost all of the construction at several base camps. LOGCAP supplemented joint engineer efforts, focusing on logistics support and quality of life improvements in the base camps.[48]

The final UN engineer phase focused on civil-affairs projects. Engineers made significant improvements to roads, bridges, and water distribution systems to support the long-term security and stability of Haiti.[49]

To support the U.S. mission, an AF officer led the joint engineer staff subordinated under the J-3.[50] The lead engineer had access to the JFC and clearly understood the commander's intent and translated his vision into reality.[51] Navy Seabees and AF RED HORSE provided horizontal and vertical construction capability. They constructed a base camp to accommodate incoming U.S. engineers, aviators, logisticians, and medical personnel. Infrastructure and facility renovation projects - such as road and bridge repairs, water distribution repairs, school and hospital renovations - were completed.[52]

Lessons learned included the importance of joint doctrine and the need to understand joint engineer operations and capabilities. Joint engineer doctrine must address command and control relationships as well as staff relationships. Brigadier General Anderson, Commander U.S. Support Group Haiti, recommends an independent engineer staff answer to the JFC and that the JFC retain independent command and control of joint engineers. An independent staff would be more responsive and would help prioritize all engineer missions to effectively use scarce engineer resources.[53] General Anderson also noted that engineers need more joint training. He observed that engineers in Haiti acquired significant joint training on wartime mission essential tasklists (METLs) without prohibitive costs to the government.[54]

Bosnia -- Operation JOINT ENDEAVOR

The Bosnia operation supports the Dayton Peace Accords through efforts to bring peace to the former Yugoslavia republic. The complexity of JOINT ENDEAVOR tested joint engineer capabilities and resources across the full range of engineer support from mobility,[55] countermobility, survivability,[56] sustainment,[57] to topography.[58] Just as in Somalia and Haiti, in Bosnia AF RED HORSE and Prime BEEF and Navy Seabee engineers quickly built essential beddown facilities and LOGCAP provided sustainment operations and improved quality of life.[59] Much of the initial Army engineer effort involved combat engineering tasks, follow-on efforts focused on base camp construction.

The JTF commander did not assign a lead engineer to prioritize engineer missions. The COE handled deployed unit requirements. As an outgrowth of the LOGCAP contract administration, COE checked facility and logistical requirements reported by units against the LOGCAP contract.[60] LOGCAP's scope of work called for base camp set up, basic life support facilities, and primary logistics service support.[61] Nevertheless, as soon as troops arrived, they asked for specialized engineering goods and services unique to their missions. USAREUR needed better command and control relationships to efficiently and effectively manage engineer

resources within the theater. Managing the beddown of a military force in an austere environment is a tremendous task. It must be part of the overall JTF commander's theater plan.[62]

In this operation, LOGCAP did not provide an effective beddown capability because they could not meet mission time requirements. LOGCAP faced many of the same deployment challenges that affect deploying military units. Sustainment engineering capabilities may have a faster response time if they are provided, at least initially, by the military, rather than a contractor.[63] The initial sustainment engineering was a success story for joint engineers. Army, Navy and AF engineers constructed base camps, facilities, and force protection structures. Navy and AF engineers constructed the majority of base camps, while Army combat heavy engineers assisted with base camp development and maintenance. LOGCAP constructed some camps for later deploying units, and maintained and operated existing base camps, as well as feeding and laundry services.[64]

Bosnia reemphasized the need to develop doctrine identifying joint engineer tasks required for every operation. This doctrine would reduce the problem of "reinventing the wheel" for subsequent operations.[65] The Services' must review current training policy and provide multi-skill cross training for all engineers. In MOOTW, all engineers must be cross-trained and capable of performing engineering missions beyond

their service-specific scope of duties.[66] All engineers in Bosnia, "regardless of their branch of service or country of origin, must be clearly dedicated to completing the planning mission to the best of their ability."[67]

HOW IT SHOULD WORK -- RECOMMENDATIONS

Without doubt, engineers have met mission requirements from major theater wars like DESERT STORM to MOOTWs like Somalia, Haiti, and Bosnia. They succeeded mostly because the Service engineers worked jointly, but there is still room for improvement. Several initiatives could improve interoperability and better prepare engineers to jointly support JTF operations across the spectrum of conflict.

Doctrine

Joint operations like UPHOLD DEMOCRACY and JOINT ENDEAVOR revealed serious deficiencies, especially lack of doctrine for joint engineer operations. Current Joint Publication 4-04 defines general engineering and facility terms and specifies the responsibilities of the combatant or JTF commander, but it does not provide joint engineer staff or organization structure. Nor does current doctrine inform the commander of the capabilities each service brings to the fight or specify what tasks joint engineers can perform. Therefore, the right amount of the right kind of engineers may not be available when needed.

A new joint engineer publication currently in final review addresses most of these concerns. Draft Joint Publication 3-34, "Engineer Doctrine for Joint Operations," fills voids left from Joint Publication 4-04 and Joint Publication 5-00.2, "Joint Task Force Planning and Guidance Procedures." It addresses joint engineer fundamentals, command relationships, planning, operations, and capabilities of all service engineers for the joint force commander and his staff.

Thus, emerging joint doctrine is making great strides toward meeting the demands of future contingencies. Even so, leaders and doctrine writers should more carefully analyze the limited wars of the 1950s and 1960s. The counter-insurgency warfare and low-intensity conflicts of the past 40 years could be very instructive, since they mirror future MOOTW and small-scale contingencies. Doctrine developers also should reexamine Reserve and Guard experience in humanitarian assistance operations, disaster relief, community action, and domestic support missions for insights that could be incorporated for wider application. Lessons learned in these operations apply to future joint and expeditionary operations.

Command and Control

As engineers deploy all over the world to support both combat operations and MOOTW, "commanders struggled to come to

grips with how best to organize, command and control the engineer forces."[68] Organizational structures have varied. Some have indeed violated joint doctrine in order to establish effective command and control relationships and to give the JFC maximum flexibility. These make shift organizational changes suggest there could be better command and control alternatives for engineers. Options include the status quo of placing engineers under J-4, of placing engineers under J-3, or of establishing engineers as a separate staff agency. The Services do not use engineers in the same ways. Most Navy and AF engineer units have a civil engineering focus: Placing their real estate acquisition, facilities management and repair, and sustainment functions under J-4 is logical.

Using current doctrine, JFCs have two extreme views of the engineer function: It is theater strategic (sustainment engineering), or it is tactical (combat engineering). "They often fail to recognize or fully capitalize on the advantages of a total engineer effort that is integrated as an essential part of their operational scheme of maneuver."[69] Working under J-4 in large operations, engineers have much difficulty providing timely support to all phases of a JTF operation. Frequently they are "torn" between providing support to combat maneuver forces and building or repairing infrastructure as the mission expands.[70]

Engineers are an essential combat multiplier. They must be properly integrated and task organized from the outset of an operation. At the operational level within the theater, the engineer and the logistician share numerous interests; however, they have a fundamentally different focus, so their command and control structures are generally not combined.[71]

Subordinating engineers under J-3 would keep engineers within the operational planning loop and give the J-3 full visibility over all operations to maximize all participants' potential as force multipliers. A J-3 engineer cell could coordinate forces across the entire spectrum of the mission and effectively incorporate and capitalize limited engineer resources. Anticipation of the commander's needs based on an understanding of his intent, is a valid reason for revising doctrine to place all engineering staff functions under the J-3, but then, logistic missions would suffer.

Another alternative would be to establish a special engineer staff element on the JTF staff to maintain visibility over the entire spectrum of engineer requirements. The JTF lead engineer would participate in operational planning and could then establish priorities and make direct recommendations to the commander on the best use of limited engineer assets to support the commander's intent. Then placing engineer liaisons in J-3, J-4, and J-5 would ensure seamless engineer support and unity of

effort and command. Joint Vision 2010 foresees an independent, flexible, versatile engineer special staff element tailored to any contingency.

War fighters will have to do more with less in the future. So we cannot afford to waste time deciding organizational issues in the midst of crisis planning. Each of the foregoing command and control options may be viable, depending on the situation. In effect, the JFC needs the flexibility to organize engineers as required to support the contingency operation. Draft Joint Publication 3-34 gives the commander that opportunity. The draft doctrine states: "Joint Force Commanders organize joint forces to best accomplish the assigned mission based on their concept of operations."[72]

Training

Engineers in all Services receive a great deal of service-specific training, but joint engineer training is limited. Nonetheless, Joint Publication 4-04 stipulates that "CINC engineering staffs are expected to be prepared to respond immediately to wartime and MOOTW requirements."[73] To prepare properly for future missions and to comply with doctrine, we must reexamine joint engineer training programs to determine the future role of joint engineers and the skills and competencies engineers will need to support the commander. Lessons learned

in recent operations repeatedly emphasize the importance of improving joint engineer training as part of an overall improvement in synergistic joint engineer interoperability.

Experience has shown that all Services can achieve greater effectiveness through joint training because it provides a better shared perspective of each Service's engineering strengths and missions. Navy, Marine Corps, AF, and Army engineers have specific skills and competencies. Once these capabilities are understood by the JTF engineer and his staff, they can be used to their fullest to meet the commander's intent.

The Joint Engineer Training Working Group (JETWG), chartered in 1996 to improve joint engineer training, is developing a Joint Engineer Training (JET) web page to enable JFCs to identify engineer skills and competencies.[74] The JETWG also incorporated the JET list into Joint Publication 4-04 and draft Joint Publication 3-34 to ensure joint doctrine and training are interrelated.[75] All Service engineers must develop plans to integrate these skills and competencies in all enlisted and officer training schools, from basic, upgrade, and specialty training to professional military education.

The JETWG pointed out that only limited training exists for engineers assigned to unified commands and for those planning a JTF. Currently, there is no training those

participating in joint operations. Engineers must participate more fully in future joint exercises.[76]

Consolidated joint training and exercises for engineers will ensure consistency across the range of engineer capabilities. It will ensure that all engineers are familiar with the same doctrine and procedures. Participation in joint exercises would upgrade and enhance service skills and capabilities in a joint environment. Joint engineer experience in Partnership for Peace exercises, humanitarian assistance operations, and peace operations in Haiti and Bosnia should provide a firm foundation for developing joint engineer doctrine and training. Joint training would not eliminate the COE as an Army combat support branch, or AF RED HORSE and Prime BEEF units, or the Navy Seabees. Everyone acknowledges that service-specific engineer capability is required in tomorrow's dynamic world.[77] Leader development programs for engineers would enhance joint service awareness and capabilities and certainly improve future joint and combined warfare operations.

Challenging joint training programs are the key to mission success. Each Service must continue training for service-specific capabilities <u>and</u> devise joint training plans focusing on individual and unit combat engineer skills to meet future requirements. We must teach sound principles and fundamental skills to ensure all Service engineers are competent for joint

operations. By training together, engineers will be ready to respond and shape the battlefield together whenever the need arises.[78] To meet the challenge of the future with smaller engineer forces we must depend on sound joint training.

CONCLUSION

To serve effectively in the future, all military engineers must be able to meet explicitly with the full range of challenges facing us in tomorrow's dynamic world. Engineers will continue to be valuable combat multipliers in the 21st century. We can capture and retain critical lessons learned in emerging joint doctrine; we can use the right command and control structure for the situation; and we can train engineers to be a synergistic force. Joint and civilian engineers will be part of most, if not all, future military engineer operations. Therefore, commanders and Service engineers must be knowledgeable about the engineering capabilities and limitations of each Service and of civilian contractors to fully integrate them into future contingency operations.[79]

Joint engineers must have the capability to link with any Service engineer or task force to combine into a relevant combat force multiplier that the JFC can bring to any mission. Engineers must be prepared to operate in a seamless,

interoperable environment and have a diverse structure that is task-organized to support the joint commander.

Service engineers need to train together in classrooms, exercise together in command post exercises and field training exercises, and deploy together into theater during times of crisis to attain synergistic joint operations. Each Service component endorses the idea of jointness, but because of limitations in current doctrine, each remains focused primarily on service-oriented missions and functions. To improve interoperability of Service engineers in joint operations, jointness itself must become reality. We must draft new joint engineer doctrine; improve command and control relationships; and train together at all levels to fulfill the spirit of the Goldwater-Nichols Act.

The importance of establishing a firm foundation embedded in sound joint engineer doctrine, combined with improved joint engineer training are the key ingredients to improving joint engineer interoperability and developing a strong cadre of highly skilled joint engineers. Better trained engineers supporting a JFC who better understands the engineers' full range of capabilities will give the JFC the flexibility to organize engineers in the most efficient and effective structure to accomplish the mission. Improved joint engineer doctrine, flexible command and control structure, and integrated training

programs will significantly enhance joint task force engineer operations - thereby providing full spectrum engineering support from peace to war.

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