When a River Runs Through It:

A team of Soldiers from Company A, 3rd Battalion, 187th Infantry Regiment, 3rd Brigade Combat Team, 101st Airborne Division (Air Assault) patrol the Euphrates River during a demonstration at Patrol Base Kemple, Iraq, on 5 May 2008.

Photo by 1LT Jodi Krippel

Riverine Operations in Contemporary Conflict

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During conflict, control of the rivers is often vital to controlling a country. The Tigris and Euphrates Rivers define Iraq. During the Iraq conflict, the resistance used these rivers as major lines of communication and supply.[1] Yet, the United States and coalition forces never succeeded in dominating these rivers or establishing lasting presence on them. The U.S. Navy deployed a single squadron (12 boats and 200 sailors) for riverine operations in Iraq to control the 2,890 miles of the rivers. Even then, the squadron did not always patrol the rivers; rather it spent considerable time in the Delta and maintaining security on the vital Haditha Dam. The squadron was deployed after the U.S. had already been in Iraq for four years. It came without organic combat service-support assets, so it was incapable of sustaining itself.[2]

The U.S. Army tried to subdue parts of the Tigris and Euphrates with the use of drones, helicopters, occasional motorized and foot patrols, and even some small boats. There was no comprehensive riverine theater plan, and these attempts failed while the insurgency enjoyed access and use of these rivers throughout the long conflict. Perhaps the conflict could have been shortened if the enemy had been denied use of these key lines of communication.[3] Are the U.S. armed services better prepared to control enemy waterways as a result of this experience? The U.S. Navy has since disbanded part of its small riverine force and the other services do little comprehensive riverine training other than small boat handling. The Army needs to develop the education and training for riverine operations and to develop appropriate equipment.

Amphibious operations are used to gain a bridgehead on land using naval and ground elements. Riverine operations are conducted to control inland rivers, lakes, and waterways. Why should the Army even care about riverine operations? Aren't riverine operations a navy problem? Historically, whenever the United States has conducted riverine operations, the Army has most often supplied the bulk of personnel and resources. There is usually a need for the riverine force to be able to fight ashore or work with a ground force. This is where Soldiers and Marines are necessary. United States riverine operations include:

- **American Revolution** — Lake Champlain campaign
- **Lewis and Clark Expedition** (1804-1806)

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Figure 1 — Battle of Fredericksburg

• **War of 1812** — Great Lakes campaign; Chesapeake Bay, Patuxent and Potomac Rivers; New Orleans

• **Seminole and Creek Wars** in the Everglades

• **Mexican War** — San Juan Batista and Tabasco River (USMC provided ground force)

• **Civil War** — Failed Union crossing of the Rappahannock River at Fredericksburg, James River, Ohio and Upper Mississippi and Tennessee Rivers Campaign, Vicksburg Campaign, and Red River Campaign

• **Philippine Insurrection** — Malolos Campaign, 1st and 2nd San Isidro Campaign, Zapote River Campaign, and 1904-1905 1-22 Infantry gunboats on Lake Lanao

• **Boxer Rebellion**

• **Yangtze River Patrol** — 1854-1941 (USMC provided round force)

• **Panama Canal** — 1904-1914 construction; 1914-1999 protection

• **World War II** — Solomon Islands, Philippines, and Rhine River Crossing

• **Vietnam** — Mekong River Delta, Co Chien and Han Luong Rivers

• **Latin America counter-narcotics efforts** in 1990s involving USMC small boat units and II Marine Expeditionary Force.

Other countries have also conducted riverine operations (see Figure 2).

Riverine operations are not restricted to the Navy, Army, Air Force, and Marines. Coast Guard, river police, federal agencies, militia, and naval auxiliaries have conducted riverine actions in various countries. Currently, the Texas State Highway Patrol conducts riverine actions on a stretch of the Rio Grande using six armed, fast, shallow-draft vessels in a counter-drug smuggling effort.

Riverine 101

Riverine operations may occur under conditions of war, peace, peace-keeping, or peace-making.[4] Riverine operations are axial or trans-sectional. They can deal with control of the entire length of a waterway (axial) or with a slice of it, usually for water-crossing (trans-axial). Axial riverine operations may be categorized by situation or mission. The situations are:

1. The force controls both banks.
2. The force controls only one bank.

Figure 2 — Notable Riverine Operations

59 BC-507 AD	Roman occupation of Gaul and parts of Germany using the Danube, Neckar and Rhine River as barrier and supply route
862-1598 AD	Viking penetration, consolidation and rule of Russia along waterways.
845, 857, 861, 865, and 885-886 AD	Viking operations on Seine River against Paris
1520-1521	Spanish siege of Tenochtitlan (modern Mexico City)
1667	Dutch fleet destroys English fleet on Thames and Medway Rivers
1768-1774	Russo- Turkish War actions of Don Military Flotilla
1775	British –French Battle for Quebec
1840-1890	French conquer and control Indochina using Red River and Mekong Deltas
1859-1869	Suez Canal Company builds canal under French direction
1888-1956	Britain protects Suez Canal
1877-1878	Russian and Turkish flotillas contest the Danube
1884-1885	British Nile River War and Siege of Khartoum
1899	Battle of Rio Magdalena in the One Thousand Day War in Colombia
1914-1917	British and German actions on Lake Victoria and Tanganyika during East Africa Campaign
1914-1918	British Mesopotamian Campaign against Turkey
1918-1919	Caspian Sea actions between British/White Russian flotilla and Bolshevik flotilla
1919	British and Bolshevik actions on the Kama River in Siberia
1919	British and Bolshevik actions on Northern Dvina River
1932-1935	Paraguayan fleet during Chaco War with Bolivia
1937-1945	Japanese control of Chinese and Indo-Chinese rivers
1939	Soviet-Japanese Battle of Khalkhin Gol
1939-1942	Soviet Lake Ladoga and Onega Flotillas during Soviet-Finnish War and Siege of Leningrad
1941	Soviet Danube Flotilla defense of Danube and withdrawal
1941	Soviet Pinsk Flotilla defense of Pripiat' River
1941	Soviet Dnepr Flotilla defense of Kiev
1941	Soviet Caspian Sea Flotilla during occupation of North Iran
1942-1943	Soviet Volga River Flotilla during Battle of Stalingrad
1944	Dnepr Flotilla in Soviet Belorussia offensive
1944-1945	Soviet Danube Flotilla at Yasi-Kishenev, forcing of Danube and capture of Bulgaria, Yugoslavia, Hungary, Czechoslovakia and Austria
1945	Dnepr Flotilla in Soviet Berlin offensive
1945	Amur River Flotilla on Amur and Sungai Rivers during Soviet Manchurian operation
1945-1954	French riverine operations in Indochina on Red. Black, Clear, Mekong, Bassac, Dong Nai, Saigon, and Vain Co Rivers
1969	Damanskii (Zhenbao) Island Sino-Soviet clash on Ussuri River
1965-2012	Colombian riverine operations on multiple rivers against FARC

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Armored troop carriers from the Army-Navy Mobile Riverine Force move ashore in Vietnam.

3. The force does not control either bank.

4. The force controls the river but not all banks or sections along the banks.

5. The force controls the river and the banks.

6. The force does not control the river.

The purpose of riverine operations may be to facilitate or prevent river traffic, or the river may be ancillary to the main purpose which is on the banks, not the river itself. Missions may include: naval combat; fire support; landing assault; mine and obstacle removal; reconnaissance; line of communication security; logistics support; ground force movement; line of communication interdiction; raids; patrolling; presence; piracy suppression; smuggling and contraband suppression; suppression of human trafficking (prostitution, slavery, illegal immigration); police support; fishing support; host nation training; vessel recovery; medical support/evacuation; humanitarian aid; and liaison with naval/ground units and local civilians. Trans-axial riverine operations may be categorized by the situations above and include most of the above missions. Historically, the U.S. Army has devoted more thought to crossing rivers than controlling them until confronted with the opportunity to exploit terrain for maneuver, advantage, and supply.

Riverine operations present their own set of challenges. River navigability can be an issue. Rivers need to be deep, wide, and slow enough. Some mountain-fed rivers run too fast after the spring thaw and are too shallow in the summer and fall. Many rivers change their course or jump their banks and require dredging and channel marking. Rocks, rapids, ice, debris, low bridges, overhanging trees, logs and stumps, fishing traps/nets, and other obstacles can present a problem. River current is not constant but slows down and speeds up with the river's configuration and water volume. Banks, levees, river junctions, whirlpools, quick sand, vegetation, animal life, docks, bridges, fords, water gates, and dams may complicate or ease riverine operations.

River movement is predictable. Watercraft move slower going upstream versus downstream. The deeper the vessel's draft, the more restricted it is to the navigation channels. At river bends, the channel will run close to the bend while the opposite bank is more shallow. The river current accelerates at bends. Predictable speed and the navigation channel facilitate attacking vessels with underwater mines, improvised explosive devices (IEDs), and obstacles. Ambushes often enjoy the advantage of height and overlook.

Riverine operations are usually joint and frequently combined. Whereas most joint and combined operations are usually conducted at fairly senior levels (Army Major Command - MACOM), the coordination of actions and commingling of forces may occur at a fairly low tactical level. These are the levels that have the least experience dealing with the friction and vagaries of interservice and international actions. Setting boundaries and areas of responsibility is difficult since different services and nations have different understandings of what boundaries mean and what responsibility for an area entails.[5] Further, governments and services may restrict the actions their forces are permitted to undertake. Coordination of fire and movement are frequent areas of difficulty. Command relations are often difficult, tedious, tendentious, and time-consuming. "Turf battles" and parochialism can bring actions to a halt. Another source of friction is usually logistics. Unless the riverine force is well-established and mature, the "tooth-to-tail" ratio is usually skewed to put a lot of firepower forward that is backed by inadequate logistics and maintenance support. The ground force usually ends up supplementing the logistics effort and the "maintenance-lite" posture means that vessels are often down for long periods of time awaiting maintenance.

Riverine operations cover more than the actual river, canal, or lake. They might include the surrounding land,

(especially the civilian communities), communications and transport infrastructure, industry, and trade. In major combat situations, riverine units will frequently work in close support of air and ground forces and will need training in target identification and marking, adjusting artillery and aviation strikes, calling in aerial medical evacuations, loading and unloading weapons and personnel, plus direct fire support of other vessels and units on shore.

Riverine actions are not stand-alone. An accompanying ground force is essential and is frequently in front of the riverine force to prevent ambush since a patrol boat on open water is a target with few places to hide.

Visibility is a problem with many vessels. The banks are higher than the river, and unless the vessel has a superstructure, it sometimes cannot see much of the banks and hostile elements that might be located there. Fortunately, the lower the water level, the harder it is for ground elements to engage the vessel with direct fire without coming right up to the bank's edge or setting up on overlooking ground that is in range and vision of the vessel's weapons. Indirect mortar and artillery fire are an important element of a riverine vessel's lethality. Standard firing practices need to be modified since it is hard to register a weapon from a moving vessel. The old "hip-shoot" artillery mission has been subsumed by global positioning system (GPS) technology, and as long as this technology is working, rounds can be on target quicker and more accurately.

Riverine craft come in a variety of shapes and sizes from jet skis to artillery barges. What works on the Missouri River may not be optimum for the Elbe, Mekong, Vaupes, or Congo Rivers. Fast, shallow-draft, and heavily armed are often the first consideration for riverine craft. However, light-weight, shallow-draft vessels are not usually good artillery or helicopter-support platforms. Communications with other vessels and ground elements is vital and usually requires some superstructure to support antennae and GPS technology. Yet, superstructure is a problem on waterways with low-hanging branches and low bridges. Weed-choked waters require different engine propulsion, such as airboats, than for fast-moving, weed-free rivers. Armor protection reduces speed or requires larger engines that consume more fuel and make more noise.

Riverine tactics are similar to ground movement in that vessels should be mutually supporting and frequently use supporting fire to cover movement. Shock action, firepower, and maneuver may facilitate overcoming heavy enemy defense. Smoke or morning fog may cover movement or hide the enemy. Riverine vessels should work in conjunction with ground maneuver and fire support units in order to conduct an advance to contact, develop the enemy situation, attack the enemy on multiple axes, reinforce success, as well as conduct pursuit and deep penetration. Ground maneuver and fire support units work with riverine units in the conduct of mobile defenses or defenses in-depth and counterattack. Riverine actions are not stand-alone. An accompanying ground force is essential and is frequently in front of the riverine force to prevent ambush since a patrol boat on open water is a target with few places to hide. In addition, riverine forces often provide their own reconnaissance vessels and forward-looking infrared (FLIR) technology to prevent ambush.

If civilian water traffic is permitted in the zone of contention, problems arise over right of way and the wake created by the riverine craft. Noise is always a problem and the details of riverine operations are difficult to conceal from the local population.

Training for riverine combat is essential. Boarding and disembarking are very routine actions, yet for untrained personnel they are always confused, cumbersome, and slow. Soldiers need training on on-board actions: how to stay out of the way of the vessel crew; how to provide on-board security watch and fires; how to read waterways and shorelines; how to navigate while underway; how to tie up and cast off; how to eat, sleep, and observe sanitary measures on board; how to operate on-board ordnance and communications gear in an emergency; and how to observe proper naval protocol and customs. Soldiers also need training in ground tactics that emphasize conducting on-shore combat while protecting the riverine vessels.

Aviation is an integral part of riverine operations. Satellite, drone, and aerial reconnaissance provide current information for the command, watercraft, ground maneuver forces, and supporting units. Drones and manned aviation may provide fire support and electronic countermeasures. Aviation may move rapid reaction forces in support of the riverine operation. Frequently riverine forces will have their own organic aviation — often helicopters ferried on floating, mobile helipads. Air defense of a riverine force is primarily ground and air-based, yet on-board man-portable air defense systems (MANPADS) and heavy machine guns should be considered depending on the situation.

Riverine operations are often essential but usually not the main effort. Riverine operations are most often supporting efforts that provide fire support, logistics support, rear-area security, and presence.

Soldier-sailors

The U.S. Army owns more than 100 cargo ships, tugs, and landing craft, and more than 2,000 Soldiers and Army Civilians maintain and operate these vessels. They are used to transport cargo and equipment for the Army. These vessels are not optimum for riverine operations, but there is a cadre of Soldiers who know how to pilot watercraft professionally and to "speak Navy." Further, there is a large recreational boat culture in America. Fishermen, water skiers, rafters, and party boaters have a familiarity with inland waters and boating, and many Soldiers in combat arms come with this background and culture.

Occasionally in United States history, Soldiers have been stationed on-board river craft in combat, although this is an extraordinary measure. During the American Civil War, Union Army Colonel Charles Ellet Jr. commanded the U.S. Ram Fleet — nine steam-driven ram vessels that defeated the Confederate River Defense Fleet during the Battle of Memphis. Following his death, the fleet remained under Army

command throughout the Vicksburg Campaign, even when integrated into the U.S. Navy Western Gunboat Flotilla. From January 1967 to July 1969 during the Vietnam Conflict, the 2nd Brigade, 9th Infantry Division was part of the Army-Navy Combined Task Force 117 based out on Dong Tam near My Tho. The brigade was garrisoned on navy barracks ships and conducted patrols, raids, and sweeps from their landing craft. The 9th Division also had an "experimental armor platoon" — a platoon of armed hovercraft that patrolled the reed-covered marshes of the Mekong Delta.

Often in U.S. history, Soldiers have been temporary guests of the U.S. Navy as they moved on navy transport or accompanied the Navy as an amphibious landing force or a rapid reaction force for shore-based contingencies.[6]

Command and control and areas of responsibility are often problem areas in riverine operations. In amphibious operations, the traditional rule was that the naval commander was in charge from the sea to the beach head area defined by the range of naval gun fire and then the ground commander was in charge. The decline of the role of naval gun fire and the growth of naval aviation has blurred this definition. This approach to determining ultimate command authority does not work in riverine operations. Dividing responsibility by land and water is an invitation to snarls at the shoreline — or if there is no shoreline. There needs to be an overall commander, preferably from the service contributing the most in personnel and material, who understands the sister services. Dedicated air should be included in this command and control arrangement. The overall commander will have responsibility for deconflicting fires and enforcing boundaries and will need a joint or combined headquarters.

Hydrology

Rivers start on high ground and run to lower. Upriver, the river is normally deeper, narrower, and faster. The river valley is V-shaped and the river forms waterfalls, rapids, gullies, and potholes. River erosion is primarily at the river bottom. Mid-river, it widens and slows as the slope lessens. The river valley widens and forms a flood plain. Erosion is from the river bottom and banks. Downriver, it widens more, becoming shallower and slower. The river slope is gradual. The erosion is primarily from the banks. At places the river may split or bend (meander). The river may form terraces, levees, and swamps. Where the river meets the sea or lake, the river may braid over its flood plain, forming multiple channels and islands.

River bottoms tend to change depending where they are on the river. Upriver, the bottom is usually bed rock, and boulders. Mid-river, the bottom is usually gravel and sand in the channel with fine sandy mud over older sediment closer to the banks. Downriver, the bottom is usually mud and fine sand. Where the river meets the sea or lake, the river bed rises and the river becomes shallower from the built-up sediment. River aquatic vegetation increases mid-river and downriver.

Iraqi police patrol the Tigris River in southern Maysan with U.S. Navy advisors from Detachment 2, Riverine Squadron 3 in April 2010. The Sailors are attached to 4th Battalion, 6th Infantry Regiment deployed from Fort Bliss, Texas, to advise and assist Iraqi security forces.

Photo by MAJ Myles B. Caggins III

Rivers are best crossed at bends which loop into the side of the crossing element. This means that the channel runs next to the bank held by the crossing party, and the deepest part of the river is closest to the crossing party. Further, the opposite bank is the shallowest part of the river. Thus the crossing party can deal with the hardest part of the crossing from the adjacent, friendly shore and land on the shallowest.

Canals are man-made, generally straight, of uniform depth, and have steep sides. They are difficult to cross due to the high, steep, often-concrete banks. They have less current than nearby rivers and are primarily located on flat ground. Special locks and other devices are sometimes needed to deal with changes in elevation.

Lake and inland sea shores vary from shallow and sediment-covered to steep and inaccessible due to prevailing winds and geologic formations. Large lakes and inland seas can be treacherous during harsh weather and high winds.

Key terrain in riverine operations includes population centers, industry, bridges, fords, dams, headwaters, river junctures, levees, canals, pumps, effluent stations, and dominating ground that threatens primary movement on or adjacent to the waterway.

Time and the River

Waterways and population centers will be factors in future war. Frequently they will be collocated and will become operational key terrain. They won't be just the Navy's, Army's, Air Force's, or Marine Corps' problem. They will affect all services and other departments, bureaus, and agencies of government. Riverine operations will be a part of future military actions and will be an Army problem. The best way to prepare for a future problem is through study, training, and equipment design and development.

Technology will not readily resolve the difficulties of future riverine operations. A major challenge will be developing the leadership that can function effectively in a joint or combined environment and understands the language, culture, employment, capabilities, and limitations of the sister services or international forces involved in riverine actions. Success in future riverine operations begins in the school house of today.

One of the pioneer American practitioners of riverine warfare, Civil War Flag Officer Andrew H. Foote, was queried as to which was more important in riverine operations, the Army or Navy. He replied, "…the blades of a shears, when properly joined, made an efficient and useful instrument; separated, neither blade was of much use."[7] It is a lesson needed for the development of doctrine, tactics and the education of future leaders of all the services.

Notes

[1] Interview with British Major Stephen Campbell, 21 September 2012 in Lewis and Clark Building, Fort Leavenworth. "In the Basra area, the enemy used the river with impunity to move men and supplies and we were never able to do anything to prevent it."

[2] Daniel A. Hancock, "The Navy's Not Serious About Riverine Warfare," *Proceedings* Magazine, January 2008, Volume 134/1/1.259, http://www.usni.org/magazines/proceedings/2008-01/navys-not-serious-about-riverine-warfare, accessed 8 August 2012. The Navy formed three riverine squadrons, but only one was on duty in Iraq at any time. The tour of duty was only seven months. Part of the reluctance of the U.S Navy to conduct riverine operations is that riverine service is not career enhancing. Navy officers specialize in carrier aviation, the surface fleet, and submarines. Small craft fit in none of these groups. SEALs are highly qualified in special operations, but would not be best used in extended patrolling and presence missions. Consequently, there is no large riverine advocacy group within the U.S. Navy. The Navy prefers the term "brown water navy" to riverine. It should be noted that the U.S. Marine Corps (USMC) deployed a small craft company into Iraq at the start of the conflict. It destroyed an Iraqi reconnaissance company. However, the unit was disbanded after the first year of the war. Interview with USMC COL (Retired) Darrell Combs, 30 October 2012, Fort Leavenworth, Kan.

[3] Control of these rivers was an important part of the Iran-Iraq War (1980-1988). Before, during, and after the war, Saddam Hussein conducted other riverine operations to control the restive Shia population along the Euphrates River and conducted a major marsh-reduction program in order to dominate the "marsh Arabs." These successful Iraqi plans were available should the coalition have considered these major lines of communication (LOCs) during the intelligence preparation of the battlefield (IPB) process. In the authors' opinion, control of these LOCs would have slowed the formation of enemy resistance, frustrated their supply, and allowed for faster success in political engagement.

[4] The U.S. Army Corps of Engineers has been involved in improvement, control, and preservation of the major national rivers and waterways since 1824. Coupled with the Coast Guard, the Corps of Engineers has long been involved in flood management and rescue operations — another form of riverine operations.

[5] Frequently, rivers are the boundaries between states and countries. The involved governments can either try to patrol half of a river or, more commonly, not patrol it at all. This, of course, gives free rein to smugglers, illegal immigrants and miscreants to use the river as their own.

[6] Longer-term guests of the Navy are called Marines.

[7] Bern Anderson, *By Sea and By River, the Naval History of the Civil War* (NY: DaCapo, 1989): 107.

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