Chapter 2
Terrain and Threat

GENERAL

Estimate of the Situation

Commanders and staffs develop estimates of the situation, described in *FM 101-5,* during the decision-making process. This chapter discusses terrain and threat aspects applicable to estimates for river crossing operations. Much of it has direct application to the intelligence preparation of the battlefield (IPB), covered in *FM 34-130.*

Tactical Requirements

Terrain characteristics strongly influence technical support for crossing operations, but tactical requirements drive crossing-area selection. River conditions must allow employment of available crossing means and the tactics required for the operation.

The far-shore terrain must support mission accomplishment; otherwise, crossing the river there serves little purpose. Crossing sites must also support rapid movement of units to the far shore, or the threat can win the force buildup race. Commanders balance tactical use of the far-shore terrain against technical crossing requirements at the river to determine suitable crossing locations.

Near-shore terrain must support initial assault sites, raft and bridge sites, and the assembly and staging areas used by the force. Routes to and from the river must support the quantity and weight of traffic necessary for the operation and for sustainment of the force in subsequent operations.

The threat disposition of forces limits options for the commander. Because the river physically splits his force, he should execute his crossing operation where the threat is most vulnerable or least able to react. This gives the commander time to mass his force on the far shore before the threat can concentrate against it.

TERRAIN

Characteristics

Rivers form unique obstacles. They are linear and extensive and normally cannot be bypassed. Meandering bends in rivers provide far-shore defenders with opportunities for flanking fires and observation. The combined-arms team, as normally configured for combat, needs special preparation and equipment to carry it across river obstacles. After an attacking force crosses the river, the river remains an obstacle for all following forces.

A formation cannot cross a river wherever desired, as it can with most field obstacles. Likely crossing sites can be few and equally obvious to both attacker and defender.

The river provides excellent observation and fields of fire to both attacker and defender. It exposes the force on the water and makes it vulnerable while entering and leaving the water. It is also an aerial avenue of approach, allowing threat aircraft low-level access to crossing operations.

Tactical employment of the force on the far shore depends on the crossing plan. Force buildup on the far shore is a race between defender and attacker. The river can be an obstacle behind the initial force across the river, allowing the threat to pin and defeat it in detail while preventing rapid reinforcement.

Military Aspects

As with other operations, terrain analysis for a river crossing considers the normal military aspects of terrain, which are observation, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA). However, many details are peculiar to river crossings. These details include the specific technical characteristics of the river as an obstacle.

River Current

The current is the primary consideration. It imposes limits on all floating equipment, whether rubber assault boats, swimming armored vehicles, rafts, or bridges. Current velocity determines how much the floating equipment can carry or if it can operate at all. Current affects the distance that floating equipment will drift downstream. Therefore, commanders must either select an offset starting point upstream to reach a desired point on the far shore or take additional time to fight the current. High current velocities make control of a heavy raft difficult and require more time and higher skill from boat operators and raft commanders for landings.

Current causes water pressure against floating bridges. Bridge companies use boats or an anchorage system to resist this pressure. The higher the current, the more extensive the anchorage or boat system must be. Current also provides velocity to floating objects, which can damage or swamp floating equipment.

Current can be measured easily (by timing a floating stick, for example) but is normally not constant across the width of the river. Generally, it is faster in the center than along the shore. It is also faster on the outside of a curve than on the inside.

Water Measurements

Water depth influences all phases of river crossing. If it is shallow enough, fording is possible. If the force uses assault boats, the water must not become shallow in the assault area, or the force will have to wade and carry their equipment. Shallow water also causes difficulty for swimming vehicles, as the rapidly moving tracks can dig into a shallow bottom and ground the vehicle. The water must be deep enough to float bridge boats and loaded rafts on their crossing centerlines and deep enough in launch areas to launch boats and bridge bays. Water depth is not constant across a river; it is generally deeper in the center. Either a bottom reconnaissance with divers or sounding from a reconnaissance boat is necessary to verify depth.

River width is a critical dimension for bridges (where it determines how much equipment is necessary) and for rafts. The distance a raft must travel determines its round-trip crossing time, which in turn determines the force buildup rate on the far shore.

Water Changes

Swell is the wave motion found in large bodies of water and near the mouths of rivers. It is caused by normal wave action in a larger body, from tidal action, or from wind forces across the water. It is a serious consideration for swimming armored vehicles and is less important for assault boats, heavy rafts, and bridges. Hydrographic data and local residents are sources of information. Direct observation has limited use, as swell changes over time with changing tide and weather conditions.

Tidal variation can cause significant problems. Water depth and current change with the tide and may allow operations only during certain times. Tidal variation is not the same every day, as it depends on lunar and solar positions and on the river velocity. Planners need tide tables to determine the actual variation, but they are not always available for rivers. Another tidal phenomenon found in some estuaries is the tidal bore, a dangerous wave that surges up the river as the tide enters. It seriously affects water operations.

Rivers may be subject to freshets or sudden floods due to heavy rain or thawing upstream. This will cause bank overflow, higher currents, deeper water, and significant floating debris. If the threat possesses upstream flood-control structures or dams, they can cause these conditions also.

Obstructions

All rivers contain sand or mud banks. They are characteristic of low-current areas along the shore and on the inside of river curves, but they can be anywhere. Since they cause problems for swimming vehicles, assault boats, outboard engines, bridge boats, and rafts, troops must find them through underwater reconnaissance or sounding.

Rocks damage propellers, floats, ground rafts, boats, and floating bridges. They cause swimming armored vehicles to swamp if the vehicle body or a track rides up on them high enough to cant the vehicle and allow water into a hatch or engine intake. They can also cause a fording vehicle to throw a track. Rocks are found by underwater reconnaissance or sounding.

Natural underwater obstructions and floating debris can range from sunken shipping to wreckage and snags. The current in large waterways can carry significant floating debris, which can seriously damage boats and floating equipment. Floating debris can be observed, generally after flooding or rapidly rising waters. Underwater reconnaissance or bottom-charting sonar are the only ways to locate underwater obstructions.

Man-made underwater obstacles can be steel or concrete tetrahedrons or dragons' teeth, wood piles, or mines. The threat places them to deny a crossing area and designs them to block or destroy boats and rafts. Underwater reconnaissance or bottom-charting sonar can locate these obstacles.

Vegetation in the water can snag or choke propellers and ducted impellers on outboard motors and bridge boats. Normally, floating vegetation is not a significant problem. Thick vegetation beds that can cause equipment problems are found in shallow water and normally along the shore. As thick vegetation must extend to within 1 to 2 feet of the surface to hinder equipment, it can normally be seen from the surface.

The Friendly Shore

Concealment is critical to the initial assault across the river. The assaulting unit must have concealed access to the river. It must also have concealed attack positions close to the river in which to prepare assault boats. The overmatching direct-fire unit prepares concealed positions along the friendly shore, taking full advantage of vegetation and surface contours. Salients formed by river meanders limit the number of threat positions that can see or fire on friendly operations.

Dominant terrain formed by hill masses or river bluffs provides direct-fire overwatch positions. If the dominating terrain is along the shore, it also covers attack positions, assembly areas, and staging areas. Air defense sites need terrain that dominates aerial

avenues of approach, one of which is along the river itself.

Approaches to the river must support every stage of the crossing. Critical elements include the following:

- Initial dismounted avenues allow silent and concealed movement of assault battalions to the river.
- Attack positions are very close to the water along the dismounted avenue.
- Avenues from the attack positions to the water have gradual slopes and limited vegetation to allow the assaulting unit to carry inflated assault boats.
- Bank conditions are favorable. Dismounted forces must be able to carry assault boats to the water, and engineer troops must be able to construct and operate rafts with little bank preparation.
- Road nets feed the crossing sites and support movement of construction equipment between sites. These road nets must be well constructed to carry large amounts of heavy vehicle traffic.
- Potential staging areas can support large numbers of tracked and wheeled vehicles without continual maintenance.

The Threat Shore

River meanders form salients and reentrant angles along the shore. A salient on the threat shore is a desirable crossing area for two reasons. It allows friendly fires from a wide stretch of the near shore to concentrate against a small area on the far shore and limits the length of threat shore that must be cleared of direct fire and observation. Additionally, salients on the threat shore generally mean that the friendly shore banks are steeper and the water is deeper, while the threat shore tends to have shallow water and less challenging banks. See *Figure 2-1.*

Dominant terrain is undesirable on the threat shore. Any terrain that permits direct or observed-indirect fires onto crossing sites is key terrain. Friendly forces must control it before beginning the raft or bridge phases.

Natural obstacles must be minimal between the river and the bridgehead objectives. River valleys often have parallel canals, railroad embankments, flood-control structures, swamps, and ridges that can impede more than the river itself. Obstacles perpendicular to the river can help isolate the bridgehead.

Exits from the river must be reasonably good without preparation. Initially, the bank should allow the assaulting unit to land and dismount from the assault boats. This requires shallow banks with limited vegetation, The assaulting unit also requires concealed dismounted avenues up from the river large enough to move assaulting battalions. Bank conditions must allow vehicles to debark from rafts and move up from the river. If banks require earthwork, at least one unimproved crossing site must allow landing earthmoving equipment. The most important far-shore requirement is a road net to carry high volumes of heavy vehicle traffic.

THREAT

Leaders who understand threat tactics can defeat the threat at the river for a successful crossing. Many potential enemies use Soviet doctrine, making Soviet tactics the most likely ones US forces must overcome during a crossing. Therefore, this discussion describes a Soviet-style defense and attack at rivers as the most likely threat. See *FM 1OO-2-1* for details on Soviet defense, *FM 100-2-2* for Soviet river crossings, and *FM 100-2-3* for Soviet equipment capability.

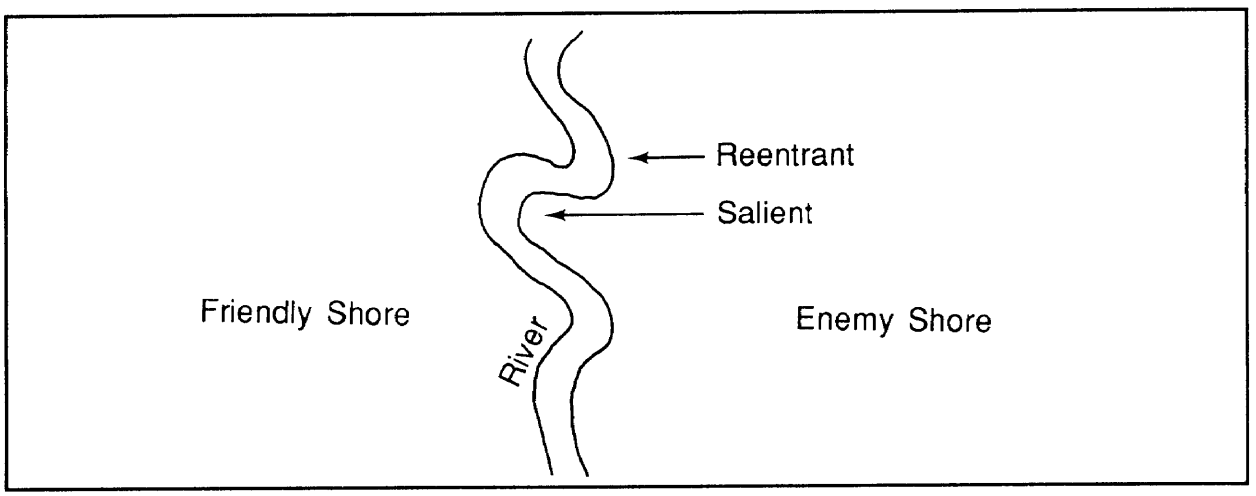

Figure 2-1. Salient and reentrant on enemy shore

Threat River Defense

The threat considers a water obstacle to be a natural barrier, enabling a strong defense on a wide front with small forces. It prefers to defend on the bank of the river that is under its complete control. It can, however, defend forward or to the rear of the river. Its choice depends on the terrain, forces available to it and their strengths, and whether its forces are in or out of contact. The threat considers the defensive characteristics of the terrain. It weighs the severity of the obstacle, the effect of lost crossing sites, and the possibility of severed supply lines,

The threat may defend forward when the terrain is favorable, when it has sufficient reserve combat power, or when it plans to resume the offense immediately. When defending forward, it intends to defeat the crossing force before it reaches the river. The threat will place its defensive forces as far forward of the river as possible.

First-echelon regiments of a division in the main defensive belt forward of the river establish initial defensive positions 10 to 15 kilometers from the river. Second-echelon regiments occupy positions within a few kilometers of the river. These positions are astride major avenues of approach to block attacking forces so that a counterattack can destroy them.

When defending along the river, the threat places most of its forces as close to the exit bank as defensible terrain permits. Their mission is to protect the crossing sites and defeat the force attempting to cross while it is divided by the river. The arrangement of defensive belts is similar to the defense forward of the river, except that the distance between first- and second-echelon regiments may be less. This increases the volume of fires on crossing sites and concentrates more force to defeat lead elements on the exit bank.

Threat engineers destroy existing bridges and mine known crossing sites. They keep only a few sites open for withdrawal of the predominantly amphibious security force. Engineers also emplace obstacles along approach and exit routes, including the river banks. As time and assets permit, they add obstacles such as floating mines and underwater obstructions to further disrupt crossing efforts.

First-echelon defensive forces maneuver to bring maximum defensive fire on the threat. These forces engage the threat with all possible organic and support weapons at crossing sites and while it is crossing. Their mission is to defeat the threat before it can establish a bridgehead.

Second-echelon battalions, astride major egress routes from the river, block assault elements so counterattacking forces can engage and destroy battalion or smaller assault elements. Second-echelon regiments occupy positions 4 to 5 kilometers behind the first echelon. They provide depth to the defense. The threat launches local counterattacks into this area.

The threat undertakes a defense to the rear of the river when time or terrain precludes a defense forward of the river or on the exit bank. In this situation, security elements deploy on the exit bank to harass and disrupt the attacker's assaulting and supporting units. These security elements delay the attacker to provide time to establish the main defense.

A significant threat capability against a river crossing is artillery. It is not sufficient to eliminate only threat observation of the river before building bridges, as the concentration of artillery fires can deny an entire bridge or raft centerline without the necessity for observed fires. Counterbattery fire must be planned to neutralize enemy artillery attacks on the crossing area.

Threat Offensive River Crossing

The threat's offensive river crossing capability has a significant effect on retrograde crossings by US forces. Threat doctrine espouses direct and parallel pursuit. The threat's ability to force a crossing on a flank and cut off friendly elements before they can complete the retrograde crossing is a major concern.

The threat is well prepared to cross water obstacles. On the average, it anticipates that a formation on the offense will cross one water obstacle of average width (100 to 250 meters) and several narrower ones each day. It considers the crossing of water obstacles to be a complex combat mission but regards this as a normal part of a day's advance.

The threat has two assault crossing methods. The first one is an assault crossing from the line of march. This it does on the move, having prepared its subunits for the crossing before they approach the water obstacle. The other method is the prepared assault crossing, where main forces deploy at the water obstacle and cross after making additional preparations. The threat considers the success of a crossing in both cases to be determined by –

- Careful preparation,
- Reconnaissance of opposing forces and the water obstacle.
- Surprise.
- Air cover.
- Destruction of opposing forces by fire.
- Timely advance of crossing resources.
- Personnel and equipment control at the crossings.
- Strict compliance with safety measures.

Development of the offense creates the conditions for an assault crossing from the line of march. Therefore, threat doctrine calls for relentless pursuit to prevent the opponent from disengaging, to seize available crossing sites quickly, and to cross the river on the heels of withdrawing forces. Forward detachments and advance guards have a large role in this. A forward detachment reaches the water obstacle as quickly as possible, bypassing strongpoints and capturing existing bridges or river sections suitable for an assault crossing. It crosses the water, seizes a line on the opposite bank, and holds until the main force arrives.

The threat achieves protection from its opponent along routes to the river by using concealing terrain and creating vertical screens out of vegetation and metallic camouflage nets. Once the crossing begins, it uses smoke and thermal decoys to defeat precision-guided munitions.

Threat tactical doctrine recognizes that time has a decisive significance for success in an assault crossing from the march. The threat anticipates that it should take a forward detachment (battalion) 1 to 1 1/2 hours, a first-echelon regiment 2 to 3 hours, and a division 5 to 6 hours to cross a river of moderate width (100 to 250 meters).

When the assault crossing from the line of march is not feasible, the threat uses the prepared assault crossing. Here, the main force deploys at the water obstacle with subunits in direct contact with the opponent. The threat then makes more thorough preparation for the crossing. Success depends on covertness, so the crossing usually takes place at night.

INTELLIGENCE

Detailed knowledge of the river and the adjacent terrain is critical to both tactical planning and to engineer technical planning. The keys are early identification of intelligence requirements and an effective collection plan. Space-based imaging and weather systems can provide invaluable information to the terrain data base. Additionally, information can be gained from other imagery-gathering systems and human intelligence-gathering systems (HUMINT). Multispectral imagery (MSI) from satellites can give the engineer terrain detachment a bird's-eye view of the area of operations. Satellite images, the largest 185 kilometers by 185 kilometers, can be used to identify key terrain and provide crossing locations. They can provide information concerning river depth and turbidity and can be used to identify line of site for weapons and communications systems. With MSI products, commanders can identify and exploit prospective construction materials, locations of existing crossing sites, and near- and far-shore road nets.

When MSI is combined with satellite weather receivers, processors, and the terrain data base, it can be used to identify mobility corridors and establish flood-plain trafficability. When these space systems are used together, the effects of the weather on terrain can be analyzed and used to develop decision-support products for the commander.

The terrain data base is the starting point for obtaining terrain information. Hydrographic studies exist for most rivers in potential theaters of operation around the world. Many of these studies have sufficient detail for identification of feasible crossing sites. Modern information collection and storage technology permit frequent revision of existing data.

Engineer terrain detachments at corps and division maintain the terrain data base and provide information in the form of topographic products. Their use with other tools, such as computers and photography, develops terrain intelligence for staff planners. The planners' terrain analyses in turn determine initial crossing requirements and estimated crossing rates.

Early in the situation analysis, planners identify further terrain intelligence needs for the crossing. They provide this to the Assistant Chief of Staff, G2 (Intelligence) (G2) for inclusion in the intelligence collection plan. This plan directs the intelligence system to gather essential terrain information for a more detailed analysis. Aerial and ground reconnaissance obtain this information on specific river segments and the surrounding terrain and verify the information.

Priority Intelligence Requirements (PIRs)

The following items of tactical and technical information are often PIRs for executing a successful crossing:

- Threat perceptions of friendly crossing intentions,
- Threat positions that can place direct or observed-indirect fires on crossing sites and approaches.
- Location and type of threat obstacles, particularly mines, in the water and on exit banks.
- Location of threat reserves that can counterattack assault units.
- Location of threat artillery that can range crossing sites, staging areas, and approaches.
- Location and condition of existing crossing sites.
- River width, depth, and velocity.
- River bottom conditions and profile.
- Bank height, slope, and stability.

More information requirements are –

- Previous threat tactics defending water obstacles.
- Condition of near-shore and far-shore road nets.
- Flood plain trafficability.

Information Collection

Engineer units have the primary responsibility to collect the terrain information needed for river crossings. If the river is under friendly control, engineer units collect river, bank, and route information. If it is not, maneuver reconnaissance units with attached engineer, long-range surveillance (LRSU), or special operation forces (SOF) can conduct reconnaissance operations or deep patrols to obtain needed information. Organic reconnaissance swimmers from the corps bridge companies obtain far-shore, near-shore, river bottom, and underwater obstacle information. Local inhabitants provide additional information about bridges, river flow, bank stability, road network, ford sites, and other river conditions. Normal intelligence collection assets develop the picture of the threat defense necessary for templating.