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The Battle of Mosul began on October 16, 2016, ending when a final pocket of defending forces was cleared on July 20, 2017. The city is located in northern Iraq's Nineveh province. Its **seventy square miles** are bisected by the Tigris River, which flows through the city from the northwest to the southeast.

## THE BATTLE

The battle occurred between fighters from the Islamic State of Iraq and al-Sham (ISIS) on one side and Iraqi security forces, supported by an international coalition, on the other. Mosul was defended by approximately **three thousand to twelve thousand ISIS fighters**. The attacking force was a patchwork coalition of **over one hundred thousand fighters**: the Iraqi army provided all or part of four divisions numbering forty thousand personnel; Iraqi federal police brigades numbered thirty thousand personnel; the Iraqi Ministry of the Interior's Emergency Response Division (ERD); the Counter-Terrorism Service (CTS), which is independent of both the Ministries of

Defense and Interior; forty thousand fighters from the Kurdish Regional Government's Peshmerga; Kurdistan Workers' Party guerrillas; various Turkmen, Christian, Sunni and Shi'a militias; and Combined Joint Task Force – Operation Inherent Resolve's (CJTF-OIR) sixty Western nations with 500 personnel in direct support and thousands of troops in indirect support led by the United States. By 2014, ISIS controlled one hundred thousand square kilometers of Iraqi territory and set the conditions for Mosul's capture. ISIS forces chased ill-prepared, ill-equipped Iraqi army units out of Mosul in just five days and secured the city on June 10, 2014. Mosul became ISIS's de facto capital city and principal economic hub. At the operational level, Mosul as a positional defense served as a valuable offset to the military disparity between ISIS and the coalition it faced. ISIS had over two years to prepare its defenses due to the Iraqi government leaving Mosul last in its overall 2014–2016 battle campaign. In those years, Iraqi forces were reorganized, trained, and equipped, and then learned tactics, techniques, and procedures (TTPs) by successfully—albeit slowly—taking Tikrit (April 2015), Ramadi (March 2016), and Fallujah (June 2016). Mosul was the last significant ISIS urban area to be slated for liberation.

Strategically the coalition's objective was to recapture the city from ISIS as a joint, interagency, intergovernmental, and multinational (JIIM) campaign to restore Iraqi sovereignty, degrade ISIS's military capabilities, and ultimately defeat the group as a proto-state. Operational planning for the recapture of Mosul began in early 2016. The coalition's nominal commander was Lieutenant General Abdul Amir Yarallah. He was forced to coordinate the coalition's diverse units without a united command structure or a mutual agreement on what the end state for Mosul would look like. Most groups involved in the operation had different plans for a post-conflict Mosul.

Lt. Gen. Yarallah's three-phase operational plan started with surrounding Mosul by advancing on the open plains around it and converging on several axes. While the ground forces closed in during this initial phase, air attacks were to destroy bridges across the Tigris preventing ISIS fighters from moving easily between eastern and western Mosul. Next there was to be an initial entry and establishment of coalition forces within eastern Mosul. Phase two would liberate the remainder of eastern Mosul. Phase three was intended to liberate western Mosul in general and capture the Old City and the al-Nuri Mosque in particular. Within the city, forces were to use cautious, "bite, clear, and hold" tactics, seizing one neighborhood at a time to reduce exposure to ISIS counterattacks and ambushes and to minimize casualties and collateral damage given the large number of civilians being forced to remain in the city as ISIS's human shields. These systematic tactics would also prevent coalition units from becoming exhausted. Once an experienced spearhead unit cleared fighters, snipers, and improvised explosive devices (IEDs) from a neighborhood, the

unit would hand over responsibility for it to less experienced forces. It was expected that the fighting would take **three months**.

Phase one began on October 16, 2016. The approach to the city's outskirts by the coalition went more or less smoothly, with security forces advancing steadily from the southeast, northeast, and northwest. The Iraqi 15th Infantry Division approached from the south on the west side of the Tigris but had difficulties in the town of Shu'ayrat on October 25, regrouping and reattacking on October 29. They continued crawling toward southern Mosul until November 7. Northwest of the 15th Infantry Division, Shi'a militias continued north toward Tal Afar and linked up with Peshmerga forces on November 1, **cutting the highway** between the two cities and completing Mosul's isolation. During this stage the Iraqi military **transmitted messages** via cell phones and the internet and dropped leaflets throughout Mosul. The messages advised young male residents to rise against ISIS and warned families to leave the city or stay well hidden. Anticipating a large internal displacement, members of the international coalition and other stakeholders allocated **\$2.4 billion** in humanitarian assistance.

As phase one continued, the coalition paused all maneuvers toward western Mosul and concentrated on establishing itself in eastern Mosul. The decision to not attack the city from all directions was driven by politics: Turkey **did not want to see** Tal Afar controlled by either the Shi'a militias or the Kurds and asked if the 15th Infantry Division could be sent to control the city instead.

On November 1, the CTS spearheaded the assault into Mosul's eastern outskirts with the 1st Infantry, 9th Armored, 11th Infantry, and 16th Infantry divisions in support. Under the "bite, clear, and hold" model, a strong perimeter was first established around a neighborhood. Next, a mixture of special operations forces, armor, bulldozers, and engineers would cautiously probe forward. Obstacles and IEDs were reduced and tunnels sealed, as ISIS fighting positions were taken out one by one. Due to the known presence of civilians, narrow escape routes were established to allow them to flee. Once an area was cleared, infantry and federal police **took over security** duties while the fighting forces moved to the next neighborhood to start the process over.

ISIS operated in both offensive and defensive modes with an extremely effective mixture of heavy weapons employment; swift movement and camouflage; commercial, off-the-shelf technology like unmanned aerial vehicles (UAVs); a concentration of force; and brutal suicide attacks. After a month of combat, coalition forces **controlled only 30 percent** of eastern Mosul. In November and December 2016, the tactics, techniques, and procedures employed by both the coalition and ISIS evolved continually, with some changes successful and others not. In early December,

the Iraqi 9th Armored Division maneuvered an armored column west toward the Tigris. The column reached the river, but ISIS fighters exploited its vulnerable flanks and unleashed counterattacks that inflicted over one hundred casualties. The column **had to be rescued** by CTS units and heavy concentrations of coalition airpower. CTS units were often called upon to rescue other Iraqi security forces or to energize stalled attacks. Although receiving lavish American support and training, the CTS was primarily designed for special operations and such consistent use meant that the unit suffered heavily. Its employment as infantry to compensate for the failing of **Iraqi conventional forces** exacted a stiff cost in casualties and exhaustion.

By mid-December Iraqi forces had not yet reached the Tigris and ISIS still held areas around the Salaam Hospital and the University of Mosul, the latter in use by the group as a command and logistical center. Recognizing possible encirclement within eastern Mosul, ISIS increased its attacks, seemingly with a **new goal** of causing enough casualties that the coalition would lose its will to continue fighting. In the face of these attacks and with their units increasingly exhausted, Iraqi senior leaders ordered an operational pause, **allowing units to withdraw**, refit, and retrain, and move reinforcements, while some battalions received American advisors, ending phase one.

Phase two began on December 29, 2016, with Iraqi forces continuing to advance from three directions in eastern Mosul. Over several days into January 2017, the 9th Infantry Division and federal police liberated **southeastern Mosul** and reached the Tigris. CTS units expanded the gains made while Iraqi forces cleared most of the city's southern portion, eliminating several pockets and eventually taking the Salaam Hospital. ISIS continued counterattacking aggressively; however, these attacks were costly as **hundreds of the group's fighters** and **a number of critical leaders** were lost. CTS units, the Iraqi 16th Infantry Division, and Turkish militias concurrently advanced through northeastern Mosul and fought from January 9 to January 12 to take the University of Mosul. Afterward, Iraqi forces moved swiftly toward the Tigris and secured the eastern end of **all five bridges** that had been destroyed by the coalition earlier in the battle. Iraqi forces **announced on January 12** that they controlled approximately 85 percent of eastern Mosul. Small pockets located in a large park and the Rashidiyah neighborhood stubbornly resisted, allowing comrades to escape across the Tigris into western Mosul using watercraft. Coalition forces targeted the boats using air assets to stop the withdrawing fighters. Once the escape boats were destroyed, Iraqi security forces mopped up remaining ISIS fighters and Prime Minister Haider al-Abadi announced that eastern Mosul had been liberated on **January 24**.

The coalition once again paused from January 25 to February 18 in preparation for phase three, the western Mosul attack. The **16th Infantry Division and Sunni militias** were tasked with east bank security to allow pontoon bridges to be erected across the Tigris. For this phase, Iraqi forces would move northward into western Mosul along

three simultaneous axes of advance: the 15th Infantry Division hugging the Tigris to support the taking of the city's airport; next, immediately to the west, the 1st Infantry Division; and the 9th Armored Division maneuvering to take the far western portion of the city.

Phase three began on February 18 with the coalition conducting careful preparatory fires that targeted IED-producing factories, vehicle groupings, and command centers. On February 22 Iraqi forces advanced north up the Tigris's west side toward the airport and over two days attacked it and its neighboring military base. Concurrently the 9th Armored Division, with a 15th Infantry Division brigade in support, took the western outskirts and then pushed northward to cut Highway 1—a main route leading westward out of the city—before turning southeast to approach the city. While doing so, other forces continued advancing from the south at the rate of a quarter of a mile daily. When Iraqi ERD forces reached the Old City and government center close to the river on March 9, ISIS conducted counterattacks, reportedly including the use of chlorine and mustard gas, adding a new level of terror. At this point Lt. Gen. Yarallah halted forces at the Old City and focused efforts on the westernmost portion of Mosul. The 15th Infantry Division and CTS units moved forward to isolate the Old City itself while they also worked to link up with the 9th Armored Division. On March 19, the 9th Armored Division completed the physical encirclement of western Mosul.

Large amounts of coalition precision-guided munitions, artillery, and rocket fire were used and estimates ranged from 2,300 to 3,200 civilians were killed by such fire. A much-publicized tragedy occurred on March 17, when an airstrike targeting buildings containing ISIS snipers killed over two hundred civilians that were trapped within the buildings as human shields. The global backlash from the attack forced the coalition to refocus efforts on minimizing collateral damage and slowed operational tempo. Although western Mosul's clearance continued, an alarming number of coalition casualties, stiffening resistance in Old City, and heavy rains forced an operational suspension on March 24 that lasted for three weeks.

The CTS renewed its assaults on April 11 with one prong moving north to link up with forces around Highway 1 and another moving east along the northern edge of Old City to attempt its physical isolation. The CTS, ERD, and additional police units linked up with the 9th Armored Division and cleared a majority of northwestern Mosul. However, any attempts to fully isolate the Old City were met with fanatical counterattacks.

The fighting on the Old City's perimeter demonstrated that both sides were in dire straits. The CTS was still being employed as regular infantry and, with estimates of 50 percent casualty rates, had arguably become combat ineffective. Other Iraqi units and

militias had lost a large number of their personnel and requested more fire missions from their American advisors to compensate. Some Iraqi recruits were given rudimentary training before being rushed up to fill depleted ranks. Despite government reluctance, Shi'a militias were used in large numbers, arguably to a greater extent than the government would have liked. ISIS was not doing much better: female fighters, child soldiers, and civilians were **being ordered** to use weapons and fight, and numerous senior ISIS leaders were being targeted and killed in the battle.

Both sides considered the Old City and the al-Nuri Mosque the city's **geographic and psychological center** and thus the decisive objective of the operation. With the Old City a warren of twisting, narrow alleys, closely packed houses built using stonework, and sturdy mosques, this was the most dangerous, casualty-inducing fight. Iraqi forces crept in and suffered for every yard. Fighting for the Old City continued from April to June and demonstrated slow progress, met with intense ISIS resistance, and resulted in incredible levels of violence. On June 18, Iraqi forces announced the final objective, the al-Nuri Mosque. Three days later it was destroyed by explosives as ISIS was unwilling to let it be taken. ISIS continued fighting throughout the wreckage when Iraqi security forces finally surrounded and announced its capture on June 29. Prime Minister al-Abadi declared Mosul completely liberated on **July 9, 2017**, although small groups of insurgents continued to fight or attempt breakouts for several weeks afterward. The battle had taken nine months, or **252 days**.

Casualty numbers were extremely difficult to assess, with estimates of ISIS fighters killed in the thousands. Estimated coalition casualties were also high, with Mosul accounting for a **substantial share**, possibly as many as 8,200, of the **estimated ten thousand** Iraqi forces killed fighting ISIS in Iraq. The number of civilian casualties was estimated at **around ten thousand**. The United Nations estimated that over five thousand buildings were damaged and 490 destroyed in the Old City, while **forty thousand buildings** overall were damaged or destroyed, with ten million tons of detritus left in the battle's aftermath. ISIS damaged or destroyed fifteen religious sites; the coalition damaged forty-seven. Immediate assessments noted that the Old City's basic infrastructure repair alone would **cost \$1 billion**, with another \$1 billion for the rest of Mosul. Removing ISIS-planted explosives and rebuilding Mosul over the next five years would cost around \$50 billion.

## LESSONS LEARNED

Given its recent completion and the **number of personnel** involved, lessons abound from this particularly grueling urban battle. Strategically, Mosul demonstrated the paradox that while a city may have no initial military value, it becomes so when political value is assigned to it. The declaration by ISIS leader Abu Bakr al-Baghdadi

that the city signified the restoration of the caliphate and its emergence as ISIS's *de facto* political capital and its principal economic hub gave it value on multiple levels. The coalition was thus forced to act to take this symbolic prize.

There is also the consistent challenge of civilians being present in urban combat and the need to remove them from the environment. In most urban areas a majority of civilians will flee if a battle is forthcoming while a small percentage will remain as they have nowhere to go or want to protect their homes, personal possessions, or families. The challenge for future urban battles will be how to implement a good information operations campaign to persuade civilians to leave a city—disseminating messages via cell phones, the internet, and leaflet drops in Mosul was only considered **partially successful**—helping to remove them safely and swiftly, and then providing shelter, food, and medical support so that they will not become victims of violence from both sides. Mosul proved that this may be impossible.

Operationally, Mosul demonstrated that while the defenders will more often than not lose an urban fight, they will always make it extremely difficult for the attackers to achieve victory. The defenders do initially **have the advantage** because urban terrain can be used for concealment to fight and to maneuver; attacking forces cannot use surveillance, reconnaissance, or aerial assets to full effect; buildings can serve as fortified bunkers; the defender maintains relative freedom of maneuver; and defending forces can use subterranean systems to their advantage. While it has been proven throughout urban warfare history that generally attackers do eventually prevail, winning comes at a cost of much human life lost and extensive collateral damage.

Mosul also demonstrated the large amount of resources fighting forces must have to achieve victory. Almost all doctrinal attacker-to-defender manpower ratios in military operations remain at the 3-to-1 standard. In Mosul the coalition had approximately one hundred thousand personnel and ISIS somewhere between three thousand and twelve thousand fighters. This ratio—between 8-to-1 and 33-to-1—is an incredibly high number that any one nation, even with a large population and strong industrial base, would struggle to put into battle. Another resource challenge is ammunition expenditure. Concrete, steel, brick, and wood means expenditure of increased amounts of ammunition to destroy the enemy. In urban warfare, fighting forces can normally expend up to **four times** the amount of ammunition that they would normally use when fighting in a rural environment. In Mosul the coalition's high and frequent use of **precision-guided munitions** severely and dangerously reduced the United States' strategic stockpile. **Supply chain** availability, utility of munition type, tactical accessibility, and battlefield dynamics also affected tactical decisions to select and deliver munitions. Another operational resource that is familiar to militaries yet is seldom discussed is time. With so many factors in urban warfare—the three-

dimensional, 360-degree reality of urban infrastructure that allows the defenders to hide or establish strongpoints in thousands of locations; the amount of manpower needed to move through and inspect almost every building, tunnel, room, nook and cranny; concerns about civilians and the consequent requirement that firepower application is methodical and precise—militaries and the nations they serve must be prepared to invest a significant amount of time to conduct an urban operation properly. Most Western societies want a swift fight regardless of the environment, and their natural concern that prolonged battle will incur increased casualties is now the prevailing attitude. Initially, the **Iraqi government believed** that Mosul would be a three-month fight. As the battle progressed and timelines were not met the Iraqi government announced again and again that another month was needed before victory was achieved, only to have that date arrive and the battle progressing with still no end. At the operational level, senior political and military leaders and their subordinates must realize—and ensure that the message is broadcast to their population so that all are psychologically and resource ready—that the urban battle they are about to embark on is going to take a lengthy amount of time.

Tactically—and, one could argue, strategically and operationally—Mosul demonstrated the extraordinary effectiveness of weaponized UAVs, a lesson swiftly learned by current under-equipped insurgent and terrorist groups around the world given their ubiquitous present use. Both sides were able to use these platforms extremely effectively for intelligence, surveillance, reconnaissance, and direct fire capabilities. The psychological benefit for ISIS and the impact on coalition forces from the group's use of these platforms was also significant. The United States also recognized its **lack of counter-UAV** capabilities, giving it a jolt on the need to develop and employ effective systems to mitigate future UAV threats.

Another tactical lesson learned—one that arises consistently in urban warfare—is the need to use and protect armor to ensure victory. Those who perpetuate the myth that armor cannot be used in urban operations have clearly not reviewed urban warfare historical examples. It has been proven in multiple battles that without the use of armor in urban operations, victory will be long delayed, if not unachievable. Armor must be used and protected well by the other combat arms so that a symbiotic relationship exists, working together to defeat the enemy. The 9th Armored Division's foolish armored foray toward the Tigris without infantry protection led to the destruction of many tanks and inflicted dozens of casualties. The Iraqi government, seeing the destruction of so many tanks, **decided to** no longer employ them in Mosul for fear that Iraqi forces would lose even more. Many future engagements in the battle would be handicapped as a result of this decision, and without this critical weapons platform the coalition's victory was delayed.

A final tactical lesson comes from the **482 suicide, vehicle-borne IED (SVBIED)** attacks ISIS mounted (later vehicles carried suicide bombers that dismounted from the vehicles and attacked their targets after the vehicle drivers detonated themselves) while simultaneously using UAVs outfitted with wireless cameras. This allowed UAV operators to guide the SVBIED to the target. Future militaries must be prepared to meet this threat. The coalition quickly adapted to defeat SVBIEDs using various kinetic and nonkinetic methods. Many SVBIEDs were destroyed with AT-4 84-millimeter antitank weapons. Both the AT-4 and the LAW (Light Anti-tank Weapon) used high-explosive antitank rounds to effectively achieve mobility kills. The use of precision-guided JDAMs (Joint Direct Attack Munitions) or other terrain denial methods to create craters and ditches along high-speed avenues of approach were also an efficient means to protect forces from the SVBIED threat. These obstacles forced SVBIED drivers to slow down to find **alternate routes**, giving antitank gunners the time needed to engage and destroy the SVBIEDs with their weapon systems.

## CONCLUSION

This Battle of Mosul provided governments and military forces valuable lessons on how future urban warfare will be conducted—and demonstrated many of its challenges. Large-scale combat operations in dense urban environments using diverse forces in **multiple domains** over a long period of time—this will more than likely become the norm in the future. It is only through studying major battles such as Mosul that a window can be opened to provide a picture of the next fight.

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