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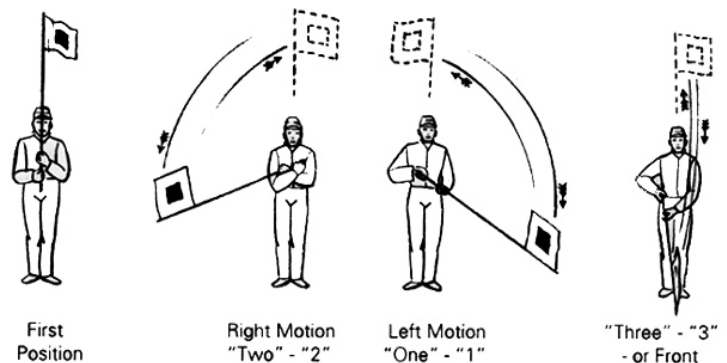
C5ISR Part 1: From the Origins to Now

Part 1 of a Series of Articles on C5ISR

Since the ride of Paul Revere on April 18, 1775, the United States Armed Forces have been pondering the swiftest methods for communicating with soldiers in the field and relaying real-time data to decision makers. At that point in the country's history, that meant drums, signal fires, and word of mouth messages. A major advancement of techniques was pioneered by Army doctor, Albert James Myer, who invented an improved system for line of sight signaling called "wigwag"¹.

The Civil War also demonstrated that war precipitates revolutionary technologies, particularly in the realm of signals intelligence, information collection, and communication. Maj. Myers tested numerous new platforms to give the Union an advantage in the early stages of the conflict, including a failed attempt to fly a reconnaissance balloon over the battle of Bull Run. ^{Error! Bookmark not defined.} This innovation would have helped provide real-time information that could inform strategic military adjustments.

Figure 1: Flag Positions of Myer's Original Two-Element Code



Source: David L. Woods, *A History of Tactical Communication Techniques* (Orlando, Fla.: Martin-Marietta Corp., 1965), plate V-6

Ultimately, these primitive attempts to gain the upper hand were replaced by a truly groundbreaking innovation, electric telegrams. For the first time the command structure's orders could be communicated across great distances in a matter of minutes, rather than days. The Armed Forces took their first steps in professionalizing and institutionalizing these new

¹ US Army – The History of CECOM and C5ISR: <https://cecom.army.mil/PDF/Historian/Feature%201/CECOM%20and%20C5ISR%20History%20-%20AUG2020.pdf>

techniques as well with the introduction of the Army's Signal Corp in June 1860.² With the conclusion of the Civil War, the Signal Corp took the lessons they had learned and began incorporating a full spectrum approach to their vital mission. This included the establishment of the first national weather service under their auspices in 1870.³

Still, what we know today as Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) truly formalized under the pressures of the Second World War (WWII). Many of the technologies the US military depends on today were pioneered during the run up to WWII. These include radar, which was successfully tested in the US for the first time in 1937 under the direction of Col William Blair.⁴ With Maj. Myer's goal of being the Army's "eyes and ears and tongue" in mind, and as technology has advanced, so too have C5ISR's tactics and methodologies.¹

Following WWII, the invention of satellite technology during the Cold War further fundamentally transformed the C5ISR capabilities of the US Military. During this time, pioneering satellites like "CORONA" were integrated with more advanced iterations, like "GAMBIT", to provide high-resolution photographs for reconnaissance and intelligence gathering operations.⁵ Intelligence agencies like the CIA and NSA also began to compliment the work traditionally reserved for the armed services during this period. The advent of the Defense Satellite Communications System (DSCS) in the 1960s enabled secure and reliable transmission of classified and sensitive information globally. Consequently, it afforded the military technological advances unavailable to the enemy.⁶

Technological advancements continued to rapidly shape new C5ISR capabilities after the Vietnam War. The Global Positioning System (GPS), invented in 1973, was a milestone achievement that provided crucial benefits to the US Armed Forces in operations in the Gulf War.⁷ GPS allowed for highly accurate battlefield navigation in the vast desert terrains, better coordinated communications, and synchronized troop movements. The early 21st century wars in Afghanistan and Iraq expanded the use of Unmanned Aerial Vehicles (UAVs) to not only conduct reconnaissance but also to execute real-time combat actions such as target detection and elimination.⁸

At present, rapid advancements in the fields of Cyber Security and Artificial Intelligence (AI) continue to usher in major transformations in C5ISR. Cyber capabilities are being used to disrupt, degrade, and/or spy on vital military Command and Control Systems as shown by the Russo-Ukrainian War.⁹ AI has also started to deliver on its tremendous potential to process large amounts of data, allowing commanders to distill information, predict outcomes, and assist in real-time battlefield decision making.¹⁰

All in all, history has consistently proven that the ability to integrate new technology into C5ISR is pivotal. Those who exhibit foresight, agility, and are equipped with advanced technologies will triumph on the 21st century battlefield. We will dive into McBride's capabilities to support C5ISR initiatives in Part 2 of this series.

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² **US Army – Signal Corp**; https://history.army.mil/html/books/060/60-15-1/CMH_Pub_60-15-1.pdf

³ **National Weather Service**; [https://www.weather.gov/mob/about#:~:text=The%20NWS%20was%20previously%20known,Field%20\(now%20Brookley%20Field\)](https://www.weather.gov/mob/about#:~:text=The%20NWS%20was%20previously%20known,Field%20(now%20Brookley%20Field))

⁴ **U.S. Army Signal Corps Laboratories Inventions and Equipment**; <https://cecom.army.mil/PDF/Historian/Feature%203/Miscellaneous/U.S.%20Army%20Signal%20Corps%20Laboratories%20Inventions%20and%20Equipment.pdf>

⁵ **NGA In History – Defining Moments**; https://www.nga.mil/defining-moments/Gambit_3_KH-8_Reconnaissance_Satellite.html

⁶ **DSCS – Past, Present, and Future**; <https://apps.dtic.mil/sti/tr/pdf/ADA300320.pdf>

⁷ **What on Earth is the Global Positioning System**; <https://www.defense.gov/News/Feature-Stories/story/Article/1674004/what-on-earth-is-the-global-positioning-system/>

⁸ **U.S. Unmanned Aerial Vehicles in Combat, 1991-2003**; <https://www.afhra.af.mil/Portals/16/documents/Studies/AFD-070912-042.pdf>

⁹ **Cyber Operations during the Russo-Ukrainian War**; <https://www.csis.org/analysis/cyber-operations-during-russo-ukrainian-war>

¹⁰ **AI's Power to Transform Command and Control**; <https://www.nationaldefensemagazine.org/articles/2020/11/13/ai-power-to-transform-command-and-control>