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The idea that technology can dominate the battlefield gaining momentum in the modern world. This idea has become an article of faith within American political leadership, reflecting the popularity of the idea that American military strength results from the advanced technology fielded by our armed forces within American society. Yet historical study reveals that this is not true. Without the proper application of human or moral forces, technology has not proven decisive on the battlefield. History affords numerous examples of a technologically inferior force defeating its opponents for a variety of reasons.

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MASTER OF MILITARY STUDIES

The Myth of the Silver Bullet:

Does Technical Superiority Equate to Battlefield Success?

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MILITARY STUDIES

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Tools or weapons, if only the right ones can be discovered, form 99% of victory. Strategy, command, leadership, courage, discipline, supply, organization, and all of the moral and physical paraphernalia of war are nothing to a high superiority of weapons-at most they go to form the one percent which makes the whole possible.

Major General J.C. Fuller[1]

Historically, good men with poor ships are better than poor men with good ships

Captain A.T. Mahan[2]

One of the most contentious debates of the last century is centered upon the importance and influence of technology on the battlefield. Technophiles have long advanced the idea that the army taking the field with more advanced equipment will dominate its opponent. Americans have come to equate a technology advanced and technically focused force structure with modern military supremacy. When examined through the lens of history technologically focused forces suffer disappointing results. While possession of a technical advantage may assist a commander to obtain victory in a conflict, it is by no means the most important building block for victory. For technology to produce battlefield success it requires application of appropriate doctrine and sound leadership. Despite claims to the contrary possession of the technological advantage is not the decisive factor in warfare and will not guarantee future success on the battlefield.

American military officers who served in Afghanistan or Iraq over the last ten years have witnessed the incredible influx of equipment pushed forward in an attempt to counter enemy activities. Equipment was often issued or found on the books after unit turnovers without training or maintenance support, resulting in bemused supply personnel without any indication of what the gadget is of what the gadget does. This is just the latest manifestation of the modern belief in the primacy of technological advantage in battle. While the argument has been around for centuries, it matured and flourished in the post conflict assessments of World War I, gaining momentum in the years since the 1991 Gulf War. Asserting quirky slogans like "There is no substitute for technical superiority"[3] or "a key piece of a credible armed force is its ability to

exploit technology"[4] seem like natural salesmanship from the defense industry. Unfortunately these views are not limited to the defense industry salesmen or politicians with large defense constituencies.

Noted historian Martin van Creveld has argued "war is completely permeated by technology and governed by it."[5] The U.S. Air Force has long embraced technology as the dominant force on the battlefield. Legendary U.S. Army Air Force General Henry Arnold once proclaimed that "engineers that design radical new weapons would shape the air force more than pilots themselves."[6] Even the current U.S. Air Force Chief of Staff, General Norman A. Schwartz, took a stance declaring that "our nations enduring military strength is underwritten by an enduring technological edge."[7] Acceptance of a technologically centered view of warfare permeates American leadership and American society.

Yet the tide is shifting away from this viewpoint. Author Max Boot writes "the extent to which various societies and their armies exploit the possibilities inherent in new tools of war and thereby create an actual military revolution depends on organization, strategy, tactics, leadership, training, moral, and other human factors."[8] The complex interactions that constitute warfare are simply too complex for one all important property to reign as the key to success. Gross simplifications of warfare such as Napoleon's assertion that "God is on the side of the big battalions" have proven false.[9] History is full of visionary leaders, leading organizations, innovative tactics, and state of the art technology that produced failure. Even a broader examination of economic elements of national power fails to isolate one decisive factor. In fact, a "statistical analysis of twentieth century wars, the side with larger GNP, population, armed forces, and defense expenditures won only a little more than half the time."[10] To put it simply warfare is a complex interaction of multiple forces that discount any one from reigning supreme.

The cause of the innumerable influences upon the battlefield is the inherent asymmetry between forces in modern combat. Not since the times of the Greek hoplites have two armies fought each other with the same culture, beliefs, doctrine and equipment.[11] No two states are alike, nor are any two militaries. This means that two opponents each have strengths and weaknesses for an adversary to avoid or exploit. The expanding influence of technology on the battlefield, coupled with the uneven distribution of technology across the globe serves to increase the complexity of modern war exponentially.

Naval and air forces, heavily dependant upon hardware, provide the perfect example of this complexity. The traditional competing influences of culture, doctrine and organization have retained their influence upon the battlefield. But each new warship or aircraft is now a system of systems, with ever increasing complexity. Simple comparison of performance specifications is inappropriate as different doctrines seek to accomplish different missions with these complex weapons systems. A destroyer is typically a ship designed to combine high speed with relatively strong armament. To incorporate these traits the designer must sacrifice endurance (range), defensive protection, spacious crew accommodations, or a litany of other items in order to preserve the space required to achieve the desired performance. For example, destroyers produced by different nations contain a great deal of design variety. The design balance achieved between by can be "viewed as physical manifestations of doctrine."[12] Their construction shows just what the user values most based on how the builders balance the available choices. A current example of this phenomenon can be seen in the large number of damage control lockers spread throughout a US warship, significantly more than on other nation's ships. This demonstrates the US Navy's commitment to damage control and possibly a

continuation of values embedded in the Navy since the war of 1812 when Captain Lawrence uttered “Don’t Give Up the Ship!”.

Perhaps the greatest asymmetry between military forces can be seen in colonial warfare of the 16th thru early 20th centuries. This form of warfare typically pitted small, well equipped European armies against numerically superior but less technologically advanced societies in Africa, Asia, and the Americas. Technophiles and others who adhere to technological determinism point to European military advancements as the main cause for the dominance of Europe in the colonial era.[13] If weapons technology truly represents 99 percent of warfare as General J.C. Fuller asserted, then the colonial era should be an uninterrupted string of victorious battles and campaigns won by the technologically superior European armies. But the history of colonial warfare reveals overwhelming successes mixed with spectacular failure.

Case Study - Isandlwana

While most Americans are familiar with the destruction of a single battalion of the 7th Cavalry at the Battle of the Little Bighorn in 1876 few are aware of the destruction of a much larger British formation in 1878 in what it is now the Republic of South Africa. The British Army, equipped with modern Martini-Henry rifles and light artillery, possessed overwhelming technological advantage over their Zulu opponents. The Zulu’s primary weapon was the *assegai*, essentially a short thrusting spear. Despite his forces advantage in firepower British commander Lieutenant General Lord Chelmsford found his column harassed, outmaneuvered, and defeated in detail by the Zulu army, suffering over 1,200 casualties at Isandlwana. The British were very aware of the capabilities of the Zulu Army; officers were issued diagrams explaining the expected Zulu encirclement tactic similar to a modern doctrinal lay down.[14] The

British leadership maintained faith "that the Martini-Henry would ultimately decide the fate of the battle."[15]

The key component of the Zulu victory was their aggressive doctrine and fighting spirit. Zulu culture emphasized an aggressive warrior ethos enabling an advanced military organization which functioned similar to a modern army of today. Life for a Zulu male revolved around the regiment. At the age of twelve a Zulu boy would become an *udibi* (baggage carrier) for his father or elder brother, providing both the logistical support of the army and serving as introduction to campaigning.[16] The Zulu Army was organized along modern lines, with regiments formed through the conscription of the population of a certain age. These regiments would be grouped into corps to enable battlefield control and would number several thousand warriors.[17] There were approximately twenty regiments documented by British border agents in 1879.[18] The conscription which filled these regiments required two years of full time service and part time duty after that.[19] The Regiment played an important ceremonial role within the society, and the men of the regiment were not allowed to marry until the regiment had earned the right. A further cultural force influencing the Zulu's at Isandlwana was the recent coronation of their King Cetshwayo; Zulu tradition required warriors to "wash their spears" in their enemies blood to confirm their manhood and the king as their legitimate monarch.[20]

Despite their technological superiority the British Army was an imperfect organization. The British Army consisted of volunteers largely from poor and undereducated portions of society. The profession of soldiering in the British Army promised a tough life at this time. British soldiers faced long periods of dangerous overseas duty, poor pay and benefits, severe punishments, and almost non-existent family life. Of the two battalions present at Isandlwana, one was a veteran group that served overseas for the previous 10 years.[21] The Officer Corps was

undergoing a further round of reforms intent on professionalizing the force. Until 1871 Officers purchased their commissions and promotions.[22] This system proved archaic and provided unreliable leadership throughout the British Army. While the British Army was not as aggressive as their Zulu opponent, it had a long experience in colonial warfare which shaped both its doctrine and equipment. Indeed, the Martini-Henry rifle was "specifically designed to halt mass attacks by primitively armed and numerically stronger foes."[23]

Despite its imperfections the British Army was experienced in colonial warfare and Lord Chelmsford drew from this experience when preparing his expedition. The British had learned that logistics were crucial to a successful campaign in the unexplored hinterlands of the world, with many colonial campaigns being decided upon the logistics effort. As a result the supply preparations were well developed and consumed a large portion of Lord Chelmsford's time. Another lesson causing concern for the British was the availability of intelligence from local sources. Lord Chelmsford recruited a large force of friendly Africans as well as European settlers to accompany his force as scouts; these formed the largest group at Isandlwana. Prior to stepping into Zulu Territory Chelmsford hired a border agent to document the size and make-up of the Zulu Army.[24] Chelmsford's intelligence preparations were so thorough that "all of the officers in Chelmsford's army had been issued with a diagram of the Zulu method of attack and encirclement."[25] Using the criteria advocated by Colonel Sir Charles Callwell's *Small Wars*, Lord Chelmsford's Army prepared well for the campaign.

Isandlwana illustrates that a technologically inferior force can attain victory against a better equipped opponent. The Zulu army was able to deceive Lord Chelmsford, forcing him to divide his forces in the face of superior numbers. The Zulu ability to maneuver large formations over land much faster than the British proved critical. The Zulus on foot often outpaced the

British mounted forces who were still encumbered by their logistics trains. When the Zulu General Ntshingwayo was ready to strike, his deployment was "spectacularly efficient if completely conventional in the Zulu tradition of attack."[26] Motivated by their cultural need to "wash their spears," the individual Zulu soldier pressed home an aggressive attack, quickly falling upon their enemy and overwhelming them. The authors of *Zulu Victory* rightly conclude that "in the final analysis, the battle of Isandlwana should deservedly be remembered not as a British defeat, but rather a great Zulu victory in which Chelmsford was out-thought, out-maneuvered, and out-generaled by Ntshingwayo."[27] The Zulu Army goaded Chelmsford to divide his army in the face of a vastly superior army, which precipitated a crippling blow. The Zulu victory at Isandlwana stands out as the clearest example of a technologically weaker army defeating its opponent.

As with many defeats contested facts and analyses remain surrounding this battle. One postulates that the British were unable to maintain their rate of fire due to locked ammunition boxes, but given the dispersed deployment of the British soldiers around the battlefield it is highly unlikely they could check the rapid pace of the Zulu attack. Persistent too are rumors of mechanical malfunction of the Martini-Henry rifles resulting from overheating. A strikingly similar story is still disputed by historians following both battles. The lack of physical evidence in the form of deformed shell casings among the remains on the battlefield completely squashes the notion. The failure of modern rifle technology did not cause the defeat at Isandlwana. The persistence of such mythology in the face of conclusive evidence points to a deep faith in technology within Western Culture.

Isandlwana was neither a mere aberration nor an isolated incident. Colonial warfare included countless defeats and great loss of wealth and human life for both sides. Superior

technology was able to provide an advantage in many situations, but it did not negate the need for quality leadership, solid logistical preparation, quality reconnaissance, and resilient soldiering. Any failure of these resulted in the loss of not only battles but also campaigns and wars. In the Victorian period alone, the British army suffered significant defeats in India and Zululand and strategic defeat in Afghanistan, Sudan, and the Transvaal.[28]

Case Study 2: The Battle of Midway

The Battle of Midway offers an outstanding example of the dangers of asymmetric technological advantage as it was fought between two opponents that had very similar technical foundations that had diverged based on cultural preferences. The cultural values espoused by the Imperial Japanese Navy produced technology, doctrine, and military equipment that excelled at offensive combat but left serious protective deficiencies, resulting in unbalanced capabilities. The technical marvel of June of 1942 was the overwhelming superiority of their carrier fighter aircraft, the Mitsubishi A6M2 Navy Type 0, or commonly known as the Zero to the Allies. Although eclipsed later in the war by better performing Allied aircraft, the Zero was significantly better than the Gruman F4F Wildcat. Yet, despite the qualitative disparity in favor of the Imperial Japanese Navy, Zero's were not able to effectively defend their aircraft carriers during the battle of Midway. Some historians studying Japanese perspectives on the battle now advocate that the Japanese were overwhelmed and destroyed at Midway due to organizational and doctrinal defects that offset the inherent advantage of their superb fighter aircraft.

The Zero was the superb fighter aircraft in June of 1942. First entering active service over China in 1940, the Zero accumulated an impressive combat record by 1942. It combined "extraordinary maneuverability and good firepower… In the hands of an expert pilot, it could

fly rings around any allied fighter."[29] The extremely long range of this aircraft (in excess of 1000 miles) baffled allied commanders early in the war. "The Zero-sen was superior in almost every respect to any British or American naval fighter."[30] Enhancing the effectiveness of this platform at Midway was the extensive experience throughout Japan's First Air Fleet, acquired during combat in China.[31] After the attack on Pearl Harbor the First Air Fleet provided air cover for the invasions of Wake Island, Malaya, and the Indies; struck port facilities in Australia and the island of Ceylon, dispatching any allied forces they encountered.[32] This was a busy and supremely successful opening six months of war, and while there had been little time for the First Air Fleet units to refit or repair prior to departing for the attempted invasion of Midway. There was, however, relatively little attrition to replace. The combat record of the First Air Fleet and the superiority of the Zero as a fighter aircraft were unmatched in June of 1942.

What truly separated the Imperial Japanese Navy from its competitors was its advanced doctrine. Japanese naval doctrine was driven by the strategic reality they faced, namely the necessity to offset the industrial and numerical advantage of the United States. The Japanese Navy viewed coordinated mass firepower as the solution, thus "striking first, at longer range and with more powerful weaponry, was seen as the only possible antidote to American numerical preponderance."[33] This doctrine established the priorities in system acquisition, and "the warships and aircraft of the Japanese navy as a whole represented a fairly congruent implementation of the navy's intended approach to fight a war."[34] That is to say that Japanese warship and aircraft design tended to favor speed, maneuver, and offensive firepower over strength, stability, and protection.[35] These are the items the Japanese Navy believed would provide them the crucial qualitative advantage over their numerically superior foe. These cultural/doctoral preferences for mass firepower influenced those formulating Naval Aviation

doctrine, and resulted in the formation of the First Air Fleet. The idea to group several aircraft carriers together to project massive amounts of airpower was formulated by Commander Minoru Genda, and the Japanese Navy remained the sole navy to operate this way.[36] Operationally, "Japanese doctrine prescribed attacking targets with groups of aircraft containing elements of all three disciplines – fighters, dive-bombers, and carrier attack planes (acting in either a torpedo- or level-bombing capacity)."[37] When operating with multiple carrier divisions (normally two aircraft carriers per division), each division would provide squadrons of the same aircraft type for the strike, and all would contribute some fighter protection. Because of this the Japanese utilized a system of 'deckload spotting,' where the strike would consist of only the aircraft that could be launched in a single deck cycle rather than the US method of launching the whole air group in two deck cycles, the second cycle would be positioned while the first loitered overhead.[38] The Japanese Navy possessed the ability to launch large strikes to deliver massed firepower. The Japanese system, however, lacked speed and flexibility as no launches would take place until all of the fleet's carriers and aircraft were in position.

Japanese combat experience in China served to re-enforce their belief in mass. The Japanese found that "bombers could only achieve results if they employed en mass."[39] The results were impressive. "Japanese carrier theory and practice in no way lagged behind the Americans and was considerably advanced of that of the Royal Navy."[40] Perhaps more importantly, the Japanese Navy mastered skills required to launch mass assaults from multiple carriers. Comparison of the initial morning launches at Midway by both fleets reveal the skill level acquired by the Japanese fleet. The initial attack on Midway Island by the First Air Fleet launched 108 aircraft in 7 minutes.[41] This stands in sharp contrast to the performance of the Americans; it took nearly an hour for the U.S. Carriers *Enterprise* and *Hornet* to launch 117

aircraft against the located Japanese fleet, which almost immediately broke apart into three groups dispersing their power.[42] The Imperial Japanese Navy had mastered the employment of their highly advanced tool.

The Japanese Navy concentrated their efforts on harnessing and concentrating offensive power, relatively little effort was devoted to defending the fleet against air attack. The primary means of air defense was a Combat Air Patrol (CAP), flown by their excellent fighter aircraft, supported by ships anti-aircraft guns. Unlike the U.S. Navy, the Japanese Navy did not steam in a formation that would allow anti-aircraft fire from ships to mutually support each other. [43] Instead doctrinal formations distributed escorts at a distance from the carriers to facilitate scouting. The large spacing between individual ships within the fleet permitted their captains to execute evasive maneuvers as required to avoid attack.[44] Japanese doctrine would rely upon individual unit maneuver as the primary defensive anti-air tactic until very late in the war.[45] Another factor that contributed to the open formation used by the Japanese was the very limited anti-aircraft armament of the Japanese escorts.

The four aircraft carriers of the First Air Fleet at Midway accounted for 60 percent of the anti-aircraft armament of the whole force.[46] The lack of anti-aircraft capability is graphically depicted in the illustration in Appendix 1, which shows the limited ranges of the weapon systems but does not account for their poor fire control. As any astute observe would note, firing is only effective if one can hit the target. Even the most capable of the Japanese anti-aircraft fire control directors was unable to track a dive bomber.[47] The weakness of these secondary defenses increased the importance of maintaining a cohesive CAP.

Command and control of the CAP was perhaps the most glaring problem with Japanese anti-air defenses. When an escort sighted enemy aircraft approaching they would lay a smoke

screen, flash an alert to the flagship via signal lamp, and fire it's main armament in the direction of the enemy to alert the CAP.[48] Radios in the Zero were poor, and often not used by the pilots.[49] Even if they did have the radio on, communications between the ship and all aircraft aloft – the CAP, reconnaissance or strike sorties – were conducted, on one frequency resulting in miscommunication.[50] The lack of effective radio communication between Japanese pilots was endemic in Japanese military aviation, which "greatly hampered the coordination of formations in combat and often prevented Japanese fighters from taking full advantage of favorable tactical situations when they arose."[51] Even if there were a means of communication with the aircraft, there was no methodology for tracking inbound aircraft as no Combat Information Center existed, nor was there a staff trained to coordinate the air defense of the carriers.[52] The small islands of the Japanese carriers, a manifestation of their top heavy design, may have necessitated the ship-air coordination limitations. There was no fleet-wide organization, coordination, or integration of CAP assets. The Air Officer of each individual carrier was responsible for coordinating the ships CAP assets.[53]

The Air Officers' other duties included managing both the flight and hanger decks, and ensuring the ship was ready to arm, launch, and recover aircraft upon direction from the ships captain.[54] Predictably, absent coordination "the CAP pretty much ran itself, attacking anything that came within visual range."[55] The almost non-functional arrangement for basic air to air communication or air-ground coordination seems inconsistent with the Japanese doctrinal obsession for massed air formations. The absence of effective of radio communications between aircraft effectively isolated each tactical formation within the CAP, allowing them awareness only of what they themselves were able to see and preventing the CAP from acting as one unit in defense of the whole fleet rather than isolated defense of their individual ships.

Japanese Navy air defense doctrine, reliant upon their outstanding fighter aircraft, proved disastrous for the aircraft carriers of the First Air Fleet. While the Japanese CAP was able to crush the slow American torpedo bombers, the American dive bombers stuck a decisive blow which led to the rapid destruction of three of the Japanese carriers. Combat results of 4 June 1942 showed that the Japanese CAP struggled to maintain their defensive responsibilities. The first problem was firepower, since the "ability of the Zero to kill American aircraft was proportional to the amount of 20 mm cannon Ammo available."[56] The casualty conscious Americans built aircraft that were heavily armored, the Zeros 7.7 mm machine guns alone struggled to seriously damage the American aircraft.[57] The poor coordination between ship and CAP and the total absence of fleet wide coordination resulted in uneven sector coverage by the CAP. This was exacerbated by the need to replenish 20mm ammunition, forcing each Japanese carrier into a continuous launch and recovery cycle that doomed the CAP to ineffectiveness.[58] The end result was that the CAP aircraft were unevenly distributed or out of position, and anti-aircraft artillery fire and damage control would be relied upon to make up the difference.

But defensive characteristics were not highly valued by the Japanese Navy shipbuilders, so "because of their design philosophies, Imperial Naval vessels were notably less damage resistant than those of their opponents."[59] The design of the aircraft carriers incorporated little fire protection. Even relatively obvious items such as safe ordinance loading procedures, filling aviation fuel lines with inert gas when not operational, or subdivided fire mains were notably absent.[60] Japanese Navy furniture was made of wood; it was simply not cost effective to import iron for naval furniture. The end result, was their ships were unable to defend themselves with anti-aircraft artillery, unable to influence the air battle above them due to poor communications and almost ineffective and control structure, and unable to sustain combat damage and continue

to function. The purpose of these ships was power projection and that is the only mission they could complete.

The results of the Battle of Midway point to a systematic failure by the Japanese. "Taken as a whole… The Japanese defeat was not the result of some solitary, crucial breakdown in Japanese designs… Rather, what appears is a complex, comprehensive web of failures stretching across every level of the battle – strategic, operational and tactical."[61] The Japanese Navy relied on the outstanding performance of the Zero to secure their fleet against air threats. Through a mixture of overconfidence in their fighter and a cultural obsession with offensive action they failed to provide the First Air Fleet with the enablers it desperately needed for success. Without enablers mere possession of the superb fighter aircraft of the day was unable to overcome the glaring deficiencies within the Japanese air defense system. The problem of fleet air defense was the same for all major navies the beginning of World War II, and each struck a different balance in their system. These deficiencies were known to the Japanese Navy, but the organizational and doctrinal philosophies, influenced by greater Japanese culture as well as institutional culture, failed to strike a balance between offensive action and defensive necessities and that allowed for the unexpected actions of a wartime opponent.

Case Study 3: Battle of Savo Island

The Naval Battle of Savo Island, fought in August of 1942, provides an example of a technologically superior force being defeated for failing to exploit their technical advantage. This naval battle was the Japanese response to the American landings at Guadalcanal which began early on the previous day.[62] With Americans unloading supplies for the Marines ashore in preparation for a quick withdrawal a Japanese surface force of cruisers and destroyers executed a

devastating night attack upon a comparably sized Allied surface force guarding the transports. Notionally the Allies should have had the advantage in the night fight with several of their ships equipped with radar, but this key technical advantage proved practically useless. Within an hour combat had ended, four Allied cruisers sank and three more were seriously damaged. Over 1000 Allied sailors died while inflicting almost no damage to the Japanese (58 KIA).[63] The lopsided outcome of Savo Island makes it the worst battle performance of the American Navy. It was the first of several night surface actions fought in the Solomon Island chain that would serve as the proving grounds for the expanding American Navy.

British Rear Admiral Victor Crutchley was in command of the Allied screen of cruisers and destroyers assembled for the operation and faced several serious problems. First he was new to his command, having been appointed two weeks earlier, so he had little familiarity with his ships and his subordinate commanders.[64] His nationality did not help him in this instance, as the majority of his force was American. An American naval officer would have been more likely to have previously served with one or more of his captains, and very likely to have served aboard one of the ships or her sisters. With little preparation time to integrate his force coordinated action would prove difficult. Perhaps more importantly it was unlikely he was familiar with capabilities of the individual American ships. His second major problem was late and poor quality reconnaissance.

Allied reconnaissance patrols spotted the Japanese Task Force at least three times prior to the engagement, but misidentified several of the cruisers as seaplane tenders.[65] This confirmed the planning of the Allied chain of command who were preparing for an air attack.[66] Crutchley aligned his forces in regard to this threat, assuming "Allied reconnaissance aircraft would provide advanced warning, allowing adequate time to mass his forces in the north, south, or

east."[67] A third important factor was the doctrinal disparities between the two navies. The seemingly small disparity in readiness conditions between the two Navies required Crutchley to keep his entire force at readiness condition 1, with 100 percent of the weapons systems manned for two full days.[68] Crutchley chose this because of the slower response time required by American ships to move from condition two (50 percent weapons manned and crew relaxed) to condition one (100 percent weapons manned).[69] This adjustment was made early in the war by the Royal Navy and was yet to adapted by the American Navy. The Allied leadership was keenly aware of this and scheduled an easing of the watch requirements on the night of August eighth and ninth in preparation for Japanese air attack the next day. How fatigue affected the radar operators on board the two American destroyers is undetermined, but recent studies of fatigue within the Naval Aviation community would suggest it was significant.

The Japanese Task Force commander, Admiral Gunichi Mikawa, recognized that the Allied landing force would be pre-occupied defending against air attacks and expected to surprise them in a night surface engagement.[70] Prior to the war, the Japanese Navy identified night torpedo attacks by its cruiser and destroyer force as a means to check American numerical superiority, and trained to this mission almost at the expense of all others.[71] The Japanese Navy also invested heavily in equipment ultimately developing world class torpedoes, and constructing a very hard-hitting cruiser force in order to master this type of operation. In the Solomons they would profit considerably from this investment. Mikawa found the Allied fleet scattered and unaware of his approach. He was able to concentrate overwhelming firepower on each unsupported group of Allied warships as he encountered them. The concentration of force by the Japanese Task Force in the attack was impressive and simply overwhelmed Allied ships before they could mount a defense. The Australian cruiser *Canberra* was struck 20 times within the

first 5 minutes of combat and incapacitated without firing a single shot from her main gun.[72] With little coordination between the scattered Allied ships, Mikawa was able to systematically maneuver close then overwhelm Allied ships with torpedoes and gunfire. Afraid of being caught in the vicinity of the landing beaches by Allied aircraft Mikawa amazingly turned his fleet for home without pressing his attack into the unloading transports.[73] This decision squandered Japan's best chance of decisive victory in the Solomon chain.

As is traditionally the case after such a lopsided defeat, the US Navy conducted a thorough inquiry to determine the causes of defeat. The findings included a litany of problems ranging from the huge risks assumed by the Joint Chiefs in Washington to poor training programs within the fleet. The myriad of command and control problems are interesting but they lay outside of the scope of this work. Of particular relevance was the observation that "Allied commanders were overconfident concerning the capabilities of ship based radar to identify Japanese movements. Senior leaders did not understand how to effectively employ or understand the limitations of this system."[74] This speaks loudly to today's military officer; as the technology of war changes, commanders must maintain their familiarization with it so as to fully understand how to employ their forces.

Failure to maintain currency in the tools of today's evolving battlefield will relegate a leader to irrelevance or failure. A second finding of the inquiry stated "Allied leaders were soundly defeated at Savo for a variety of reasons, one of which was their lack of agility and flexibility in dealing with an adversary who planned and executed the unexpected. They focused on what they believed to be the Japanese intentions, and disregarded their capabilities."[75] While this seems a simple task to place oneself in the opponent's viewpoint, military leadership must be prepared to counter unperceived threats relying on unknown or at least unfamiliar technology.

The Allied leadership was guilty of mirroring its own intentions onto the opponent without fully comprehending the options available to the Japanese. .

Perhaps the most damning finding of all came from Rear Admiral Richmond Turner, Commander of the Landing Task force at Savo Island, who confessed "The Navy was still obsessed with a strong feeling of technical and mental superiority over the enemy... The net result was a fatal lethargy of mind which included a confidence without a readiness. We were not mentally ready for hard battle."[76] The misguided faith that a force possessing superior technology would automatically prevail embedded into the Allied Naval forces present at Savo Island. That faith would soon be tested.

No technology is operator proof, and the Allied under utilization of its radar equipped picket ships rendered them unworkable. Allied leadership was unable to fully utilize the technology at hand because it was unfamiliar to them. Admiral Turner stated, "knowledge possessed by me and the staff concerning radar was practically non-existent."[77] The American Navy was not alone as institutional resistance to radar within the Australian Navy was immense. Mr. John Curtin, Australian Prime Minister also serving as Minister of Defense, refused to allow Navy personnel to be trained in Britain on the new technology claiming "radar would not last."[78] HMAS *Canberra* was equipped with radar, but had no training opportunity to learn to integrate the information provided by these sensors.[79] Author Bruce Loxton, an Australian Naval Officer present at the Savo Island concluded that "*Canberra* was fitted with the answer to the Japanese night fighting capability but had no real idea how to make the best tactical use of it."[80] The failure of Allied leadership to appreciate the capabilities of their forces stands in sharp contrast to the well drilled Imperial Japanese Navy. The central role of a night surface action with coordinated torpedo and gunnery strikes within Japanese Naval doctrine was made obvious by

their success. The Japanese had trained to perfection, and came away from Savo Island with the nearly perfect victory.

The defeat at Savo Island stands in sharp contrast to the success the American Navy achieved at the end of the Solomon's Campaign. During the morning of November 2, 1943 another night surface action was fought by the same protagonists at Empress Augusta Bay with very different results. This time the American task force inflicted a sharp one sided victory over the Japanese. Some keys in this battle included the complete integration of radar into fleet tactics, wide distribution of radar systems, employment of radar directed gunnery, and a high level of operator effectiveness. The American ships gained contact with the enemy at 18 miles, and smothered the lead Japanese cruiser with the first three salvos.[81] IJN *Sendai* sank without ever gaining contact with the American ships.[82]

All of these systems were present at Savo Island, yet at Empress Augusta Bay American commanders understood the capability of their systems and fought the battle in a fashion that maximized their weapons potential. It was, "Through the evolution of technological and human skills, the sailors of the United States Navy's Task Force 39 inflicted a devastating defeat on a foe who only months before had routinely crushed their fellow American sailors."[83] The sharp contrast of results between Empress Augusta Bay and Savo Island illustrates the absolute requirement that technology must be mastered through training and integrated into the battle plan. A commander without a firm understanding of his unit's capabilities is comparable to a chess player who does not understand what moves his pieces can make.

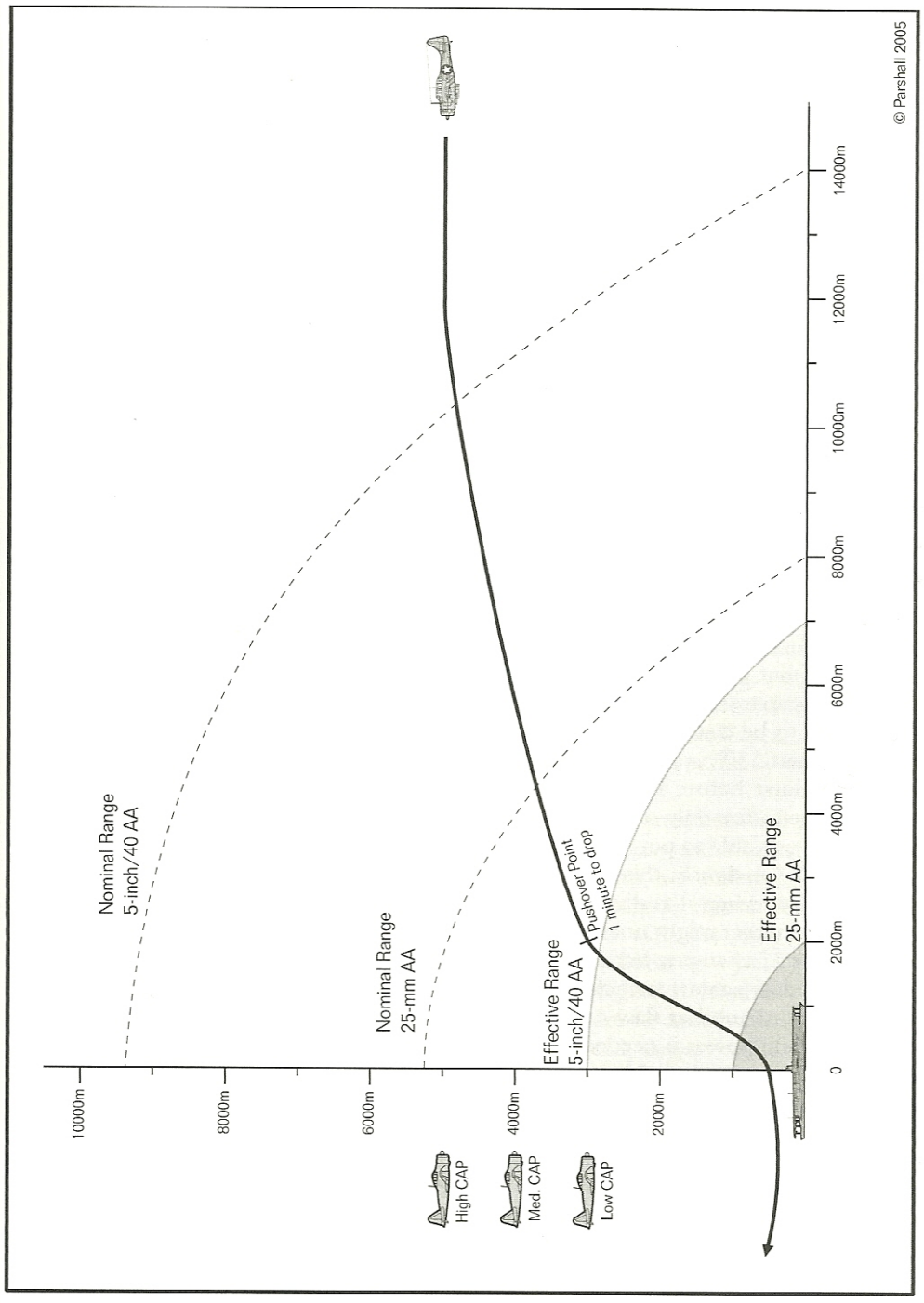
Conclusions

There are several commonalities in these historical case studies: losing commanders typically misapplied their technological advantage due to unfamiliarity or poor judgment; losing commanders underestimated the capabilities of their enemy; and an individual technology was unable to overcome weaknesses in the systems they operated. The commander's role was pivotal in each negative outcome, yet the victorious commanders in these instances displayed no special genius. No wrinkle in doctrine or new approach was taken by the three victorious commanders. Instead, all actions were consistent with the long held doctrines of their respective organizations. These three cases indicate that technology is not a substitute for "Strategy, command, leadership, courage, discipline, supply, [and] organization" as advocated by General Fuller.[84] In fact by examining the Battle of Empress Augusta Bay and contrasting it with the earlier Battle of Savo Island the importance of training and integrating a technology within the doctrinal concepts of the organization become apparent.

American military culture continues to embrace technology as a sign of progress. The technophile lens through which our society evaluates problems has deep roots in American culture. Indeed two of the iconic founders of America, Thomas Jefferson and Benjamin Franklin, have been called prophets of technology as they "looked to the new mechanical technologies of the era as means of achieving the virtuous and prosperous republican society."[85] As one reads American history the dominant theme is that of progress through technological advancement, and "some even claim that Americans came to accept the technological solutions as something akin to gospel."[86] Regardless of the cause future American strategists must recognize and resist our cultural predilection to resolve complex problems through technologic answers. While technological advantage plays a role on the battlefield we must be mindful of a

key maxim of Clauswitzian theory: “Excellence in no single dimension - including the technological one - or even a combination thereof can guarantee success in war.”[87]

Looking through the annals of history it becomes obvious that The United States cannot rely exclusively upon our advanced technology to achieve battlefield success. Technology is merely a tool which can be used to achieve victory but cannot supplant quality leadership, extensive training, or sound doctrine. There is no evidence that technical domination of an opponent is worth the cost associated with acquiring consistently more expensive hardware. Instead the American military should focus on the means by which leadership will wield this tool. Through the expansion of current training structures, coupled with the involvement of designated Joint Task Force commanders in the preparation, execution, and evaluation of exercises we must ensure that any advantage can be fully utilized by future commanders. Commanders must blend together the traditional qualities of strategy, leadership, courage, discipline, supply, and organization in a cohesive formula to achieve success.



8-2. Nominal and effective engagement ranges for the principal Japanese antiaircraft weapons in use at the Battle of Midway. It can be seen that the Japanese antiaircraft weapons did not have the ability to effectively engage a dive-bomber before it reached its pushover point.

Diagram – Jonathan Parshall and Anthony Tuley, *Shattered Sword: the Untold Story of the Battle of Midway* (Dulles, VA: Poole, 2005), 140

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[37] Parshall and Tuley, 86.
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Executive Summary

Title: The Myth of the Silver Bullet: Technical Superiority Doesn't Equate to Battlefield Success

Author: Lieutenant Commander Jonathan Horn

Thesis: Despite numerous claims to the contrary possession of the technological advantage has not proven itself to be the decisive factor in warfare.

Discussion: The idea that technology can dominate the battlefield gaining momentum in the modern world. This idea has become an article of faith within American political leadership, reflecting the popularity of the idea that American military strength results from the advanced technology fielded by our armed forces within American society. Yet historical study reveals that this is not true. A technical advantage may be squandered in battle by poor leadership, incorrect application of doctrine, or by mere cultural predilection. Without the proper application of human or moral forces, technology has not proven decisive on the battlefield. History affords numerous examples of a technologically inferior force defeating its opponents for a variety of reasons. Through examination of three decisive defeats of technologically superior forces in battle (the battles of Isandlwana, Midway, Savo Island) this paper will determine the required conditions for technology to dominate.