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Abstract

In 1945, the world was witness to the “precision bombing” of German cities by Allied Air Forces, where thousands of civilians were killed and damage was measured by the square mile. In 2003, the world was again witness to precision bombing, however this time CNN played out gun camera footage showing a precision-guided munitions (PGM) surgically striking a radar installation in Iraq, while the high school across the street remained untouched. The *raison d’être* of this revolution in precision warfare? Greater lethality and the reduction of collateral damage.

GOVERNMENT, SOCIETY, AND THE REVOLUTION IN PRECISION WARFARE

“There’s only one hope of shortening this war, daylight precision bombing.”
- Twelve O’clock High (1949)

In 1945, Europe was witness to the ‘precision bombing’ of German cities by Allied Air Forces, where thousands of soldiers and civilians were killed and damage was measured by the square mile. In 2003, the world was again witness to precision bombing, however this time the Cable News Network (CNN) played out video footage showing an American precision-guided munition (PGM) surgically striking a radar installation in Iraq, while the high school across the street remained untouched. Without question a revolution in precision warfare occurred and American forces fighting in Afghanistan and Iraq this year took full advantage of it. But what of its impact on government and

society? While we may appear to comprehend the full ramifications of precision warfare on the war fighter, much less consideration is given of its influence on government decision-making and the public at large. In addition to providing a general description of the technology behind the precision, this article seeks to briefly examine how the revolution in precision warfare has intertwined government, society, and the military. As we shall see, the sword of precision has two edges, at times troubling the attacker as much as the target.

The Revolution in Military Precision

Attending the U.S. National Space Symposium in Colorado last April I had the opportunity to listen to General Lance W. Lord, Commander United States Air Force Space Command, talk about the successful union between Global Positioning System (GPS) satellites and modern air-delivered weapons. When discussing in particular the recent successes of employing Joint Direct Attack Munitions (JDAM) in Iraq he simply noted that, “GPS has put the ‘DAM’ in JDAM, as in Damn that’s a good hit.” Though a seemingly smug remark, it emphasises the satisfactory result of decades of effort to create and deploy precision air strike in support of strategic, operational, and tactical level missions. And while we may have become less impressed with the site of a needle taking out a single plane, building, or tank on TV, one cannot ignore the great technological hurdles that were cleared to achieve the capability and rate of success we now see.

Though efforts to achieve precision in navigation and strike date back to the Second World War, modern precision warfare is closely associated with the development and deployment of the Navstar Global Positioning System (GPS) satellite constellation. The United States began research into space-based navigation in the late 1950s, and became operational with the successful launch of the Transit 5C-1 navigation satellite on June 4th, 1964. Employed by the U.S. Navy, Transit was used primarily by its Fleet Ballistic Missile Submarines to accurately determine their location relative to Moscow or other strategic targets. The Transit satellite constellation was later commercialized in 1967, and was followed after by the Nova Program and finally by the Navstar GPS program.

While American military use of GPS navigation began soon after the launch of the constellation’s first satellite in 1978, the employment of laser and satellite guided munitions evolved very slowly throughout the 1980s. Obviously, the realization of precision weapon strike was no small or easy task. Just imagine, if you will, what exactly the Generals and Admirals were asking of the defence scientists – “We want to be able to launch a unmanned satellite guided cruise missile from a submerged submarine somewhere over the horizon, have it loiter until joined by other cruise missiles, then update its inertial guidance system while in flight, then zip undetected at nap-of-the-earth altitudes at supersonic speeds, recognizing and avoiding enemy radar and air defence systems, for hundreds of kilometres, to hit the southeast corner of the third floor of a building in a downtown district without causing significant collateral damage to the hospital next door. How hard can it be?” How hard, indeed.

Yet, there were signs of limited American progress as early as 1986, when American F-

111 Aardvarks participating in Operation El Dorado Canyon (Air raid against Libya, 15-16 April 1986) attacked targets in Tripoli with thirty-six 907kg (2,000 lb.) GBU-10 Paveway II Laser-guided bombs. Though almost all the bombs missed directly hitting their targets due to poorly mensurated waypoints and aim points, the near misses demonstrated that the system was not only on the right path, but had the potential for much greater accuracy than at first imagined. In the end, the Americans came away from the raid on Libya with extremely valuable lessons that allowed them to greatly improve on their system, and achieve the success witnessed half a decade later.

GPS and precision strike came of age during the 1990-91 Gulf War, surpassing all American expectations of being able to deliver munitions so closely on target. The war was unique in that initial strikes against Iraqi targets came from thirty-five conventional air-launched cruise missiles (CALCMs). In the longest air combat mission ever flown, seven B-52G Stratofortresses took off from Barksdale, Louisiana, flew thirty-four hours supported by 57 refuelling sorties, and successfully struck their targets half a world away. It was the beginning of a very successful air campaign that delivered over 4000 laser guided bombs and nearly 13,000 air-to-surface guided munitions. While making up only approximately ten percent of all munitions expended, a decade later the numbers would be reversed in favour of precision strike.

Other aspects of precision were also demonstrated in the Gulf War. While the Iraqis appeared to have little appreciation of the advantages afforded to coalition troops by GPS, the Allies used it to completely outflank and turn Iraqi defenders along the Kuwaiti-Saudi frontier. Iraq had traditionally taken the natural barrier posed by open desert for granted, and obviously assumed that the Americans would be unable to disperse and rejoin for battle in Moltke-like fashion in the middle of nowhere. As such, the Coalition would be forced to use the Wadi al Batin, the natural avenue of advance from Saudi Arabia into Kuwait, and that was where the Iraqi forces concentrated their defences and kill zones. Needless to say perhaps, GPS pre-empted such restrictive movement, and allowed armoured divisions to circumvent the obvious approaches. Iraqis captured later stated they were puzzled at how the Americans were able to navigate through sandstorms without roads or other features to guide them.

Yet with this success also came the first suggestion that the sword of precision was double-edged. Was problem was this: while the U.S. had achieved the technical ability to navigate its weapons directly to their targets, they had also exposed severe limitations in their information and intelligence capabilities to properly locate, identify, and track such targets successfully, so that they could be engaged with precision weapons. Examples of poor targeting were prevalent throughout the Gulf War. Post-war inspection of allegedly successful F-15 strikes against SCUD missile launchers along the Baghdad-Amman Highway in Western Iraq on January 30th, 1991, instead revealed that the pilots had actually hit Jordanian commercial fuel tankers that had been running the coalition blockade. In another incident, poor intelligence and targeting led to the precision strike of the Al-Firdos Bunker on February 13th, 1991. Misidentified by USAF intelligence as a refuge for Iraqi military and political leadership, it was actually an air-raid shelter for the local civilian population. Two 2,000 lb. GBU-27 LGBs hit the

building only nanoseconds apart, the first ripping open a deadly door through which the second bomb could enter into and kill all inside. The precision weapons incinerated or suffocated approximately 300 civilians who had sought protection from coalition air attacks, and the subsequent footage of the disaster on CNN ultimately altered the very prosecution of the strategic air campaign against Iraq.

Technical success in the last Gulf War only increased the attention, funding, and support for precision warfare. By 1995, American warplanes participating in Operations Deny Flight and Deliberate Force over Bosnia were able to successfully strike their targets using laser and GPS guided munitions, as well as employ precision to locate and rescue a downed pilot, Captain Scott O'Grady. Just prior to deployment, O'Grady was issued a brand new PRC-112 two-way survival radio carrying the newly integrated GPS receiver. His rescue was greatly facilitated by the fact he was able to use GPS coordinates to direct incoming XCH-53 helicopters to within a few meters of his own position in the middle of a forest.

In March 1999 during Operation Allied Force, the first targets struck in and around Pristina (one-story barrack blocks and weapon stores), were hit with Tomahawk Land Attack Missiles (TLAM) and CALCMs. What followed, however, was an oddly sterilized war, where the Serbian military and government were tactically successful but strategically beaten, all by the threat of Allied precision strike. The fact that the Allies still had difficulty in locating and destroying Serbian air defence and mobile surface targets did not deter the Serbians from capitulating, and the war was won perhaps with more 'talk' and less 'walk'. Also important to note, Kosovo demonstrated new government and public reactions towards precision warfare that ultimately altered the very nature by which the west would prosecute future conflicts, and I will address these issues momentarily.

Shortly after the conflict ended, General Lester Lyles, USAF Vice Chief of the Air Staff, noted that, "The weapons of choice during the air campaign over Kosovo were the precision, GPS-aided weapons...in the next conflict you will see one hundred percent utilization of these weapons." Needless to say he was not far from the truth. The current wars in Afghanistan and Iraq have clearly demonstrated the incredible advantage that precision navigation and strike has provided, and it is arguable that no other military is currently even close to matching the combat power we see first-hand on CNN.

One last point with respect to the military, many have argued that satellite guided weapons are only good so long as your opponent cannot jam you, and these days, even poor and technologically limited countries can build hundreds or even thousands of pop can size GPS jamming devices to protect critical assets. Richer countries may even buy high-end GPS jamming devices from foreign suppliers, much like Iraq's pre-war purchase of Russian-made GPS jamming devices to protect its own infrastructure. However, while it's one thing to jam a backpacker's handheld Garmin GPS receiver, it's quite another matter altogether to successfully jam rapidly incoming American PGMs; Iraq being a case in point. Most if not all of Iraq's Russian-made GPS jammers were destroyed using satellite guided precision bombs. As General Lance Lord also

commented in Colorado last April, “Think about that. Imagine trying to market that product to the next customer.” For the American military, Precision Guided Munitions (PGM) have achieved such a remarkable accuracy on the battlefield that it is doubtful that any other country can even come close to matching current U.S. lethality and the public and government knows this.

False Expectations? Society and Precision Warfare

Precision warfare is an entirely new paradigm for the western society, and although it has moved past the “shock and awe” of the technological aspects of precision, it remains schizophrenic about its tolerance for modern conflicts fought this way. Consider the following:

One could easily argue that there is likely little likelihood that western societies will ever again allow their militaries to wage wars of destruction like that witnessed during the Second World War and Vietnam. The public has shown very little tolerance for mistakes such as friendly fire or collateral damage, and instead of assuaging public anger over misidentified targets and accidental killings, precision strike I would argue, has only increased further public intolerance towards errors. Again we see the double edge sword of precision. While PGMs were partially designed to demonstrate growing concern for avoiding unnecessary casualties and destruction, they have instead through their success set the bar so high that even completely justifiable mistakes receive little sympathy in the public eye. Never mind the fact that smart bombs can go “stupid” (i.e. technical malfunction or failure to acquire GPS signal), or even be shot down. Missing the target, even when it may be no larger than a door, has become less and less acceptable to the public body.

Also, precision weapons are very much a product of the generation that employs them, and the public has come to expect “shock and awe” and likewise very quick wars. Never mind the fact that the Americans successfully eliminated all cohesive force in Iraq in roughly three weeks. As soon as the momentum slowed around Al Nasirya and Basra, the critics and talking heads came bursting on to the scene questioning the plan and picking it apart. Where are these critics now? Perhaps on the Food Network – my point being that the western public was so spoiled by the “clean” wars in the Gulf and Kosovo that they will instantly question and exaggerate even the tiniest flaw or mistake in any military situation.

However, the schizophrenia lies in this: While the public rarely tolerates mistakes or collateral damage, their belief that precision weapons will do “less harm” has influenced people in the west to become more acceptable to the use of force against other nations. In 1999, a traditionally anti-war Liberal government in Canada was able to convince its public that it could engage in a just and “relatively clean” war in Kosovo, partially due to the fact that its planes would be using precision guided weaponry. As a result there was less concern that the destruction would have been random and mindless. During the current conflict in Iraq, the stroking of the public conscience continues. it is obvious to

even the most sceptical among us that Coalition military forces are making every effort to avoid unnecessary casualties and damage to civilian property. Mistakes made or errant ordnance drops have been openly reported to the public, and the embedding of journalists with military units allowed the public to witness nearly first-hand what its own government is doing on its behalf. All this, plus 24/7 live overview of downtown Baghdad (what I refer to as the Iraqi net-cam, and needless to say goals were scored).

In fact, even the Iraqi population in Baghdad shared a similar confidence. When an AP reporter recently asked an Iraqi man why he had run towards the bank of the Tigris during the bombing of Baghdad, he replied, “to watch the show on the order side!”. The reporter then asked, “Aren’t you afraid to get hurt?”. “No,” the man replied, explaining that he did not live near a military or government installation. Further questioning revealed that he had such confidence in the Americans to accurately hit their targets he felt completely safe to sit outside and watch.

One question not easily answered is, will the public continue to accept the status quo for precision war, which has created very high expectations, or will there be a demand for even more accuracy? Negative public reactions to collateral damage have resulted in strict counter-measures for the military, such as the addition of lawyers to military targeting and coordination boards. Side-by-side with the Generals, lawyers now advise and in some against arbitrate what targets might be struck, when, and with how much force. Undoubtedly a nuisance from time to time, I would argue that they have probably also stopped more than a few disasters waiting to happen.

Fighting ‘Clean’ Wars: Government Decision-Making and Precision Strike

While the military applies precision and public debates its use, governments are left to decide how best to employ precision war and when. Of the three groups I am discussing today, without a doubt the government has suffered the most growing pains with precision warfare.

After Operation Desert Storm, the American precision strike armoury presented the United States government with a new and innovative means of prosecuting foreign policy around the globe. A safe alternative to placing American aircraft and aircrew in harm’s way, cruise missiles were quick and effective, caused little or no collateral damage to non-military or non-strategic targets, and never resulted in a downed pilot being paraded through the streets. For example, when asked by the press why cruise missiles were employed in the attack against the Zafraniyah Nuclear Fabrication Facility in Iraq in 1993, the White House Press Secretary (Marlin Fitzwater) responded, “The main reason is that we wanted to use the missiles because it did not put U.S. personnel in jeopardy. We did not have to suffer the risk of personnel go down.” Safe yet certain, cruise missiles rapidly became the weapon of choice for punitive responses to foreign governments challenging or harming American interests abroad.

Between 1993 and 1998, American President George Bush, Sr. authorized a single

cruise missile strike in the last days of his presidency, while his successor Bill Clinton resorted to launching cruise missiles on no less than seven occasions. Dispatching a total of 864 missiles against Iraq, Serbia, Afghanistan, and the Sudan, Clinton was aptly dubbed, “the Cruise Missile President” by the western media, and certainly received many other less flattering nicknames from those he had targeted. As I will discuss next, however, this strategy was not without its faults.

On more than one occasion during Clinton’s presidency, the sole application cruise missiles to coerce or punish belligerents proved to do more political harm than good. A cruise missile attack on the Iraqi Intelligence Service complex in June 1993 was very successful, but three of the missiles fell wide of the target and landed in a residential area, killing eight civilians and injuring another twelve. Aside from infuriating the Iraqi government, pictures of wounded and dead women and children on CNN while not a single American was even placed in harm’s way during the attack left the western public with a bad taste in their mouths despite the results and success of the attack. The government found itself quickly responding to detailed questions about the planning of the attack, and only managed a reprieve when it demonstrated that it had specifically chosen the time of the attack, 2am local Baghdad time, in order to minimize the potential risks to innocent civilians.

The growing facility with which cruise missiles could be dispatched also presented other political challenges. In the early 1990s, the planning, rehearsing, programming, and execution of a cruise missile attack could take as long as three weeks. By 1998, the same mission could be achieved in as little as six hours. This allowed the White House administration to rapidly respond to attacks on American interests at home and abroad, but as one unnamed cruise missile planner commented, “I am concerned that the Administration is enamoured with the cruise missile and wants to use it on everything”. Case in point of a poor political choice was the August 1998 attack on the El-Shifa pharmaceutical plant in Khartoum, Sudan.

Acting quickly on faulty and incomplete intelligence, President Clinton ordered the attack on the El-Shifa Plant as part of a larger retaliatory strike for the bombings of the U.S. embassies in Kenya and Tanzania. Two U.S. warships over a 1000km away in the Red Sea launched a barrage of missiles that completely annihilated the plant. But months after the hit, senior officials both in the intelligence community and the military conceded unofficially that they had acted in haste and had probably destroyed the wrong target. And there were other concerns as well. The White House was itself selecting the targets, a ghost of Vietnam that the military leadership did not wish to see again. The short mission planning time allowed the chief executive to meddle directly in the targeting process like never before. The Sudan plant was added to the strike list just six days before it was hit, more likely a political act based largely on an inferred rather than real threat to national security.

Further difficulties lied ahead. In 1996, Tariq Aziz, Iraq’s foreign minister, stated in a televised interview in Baghdad, “Iraq knows that a couple of missiles will not win a war. We know their effectiveness, and also their limitations”. In the short term at least, he

was right. During Operation Desert Fox in December 1998, U.S. Forces pounded several targets in Iraq with 420 cruise missiles and over 600 laser-guided bombs, in order to coerce Saddam Hussein back into cooperating with the United Nations weapons inspectors whose efforts to search freely were constantly frustrated. However, the attack had almost entirely the opposite effect. Iraq completely barred UNSCOM from returning to their country, and continued to block any UN inspections until the very last days of the Hussein regime. And while Desert Fox also had the objective of arms control and the degradation of Iraq's ability to manufacture weapons of mass destruction and threaten its neighbours, that majority of targets destroyed had little to do with that objective, the Americans hitting primarily buildings and other static targets.

Ironically, the successful terrorist attacks against the United States on September 11th, 2001, were largely dependent on American government decisions regarding the general use of GPS. On September 1st, 1983, Korean Airlines Flight 007, on the second leg of its New York-Anchorage-Seoul flight, strayed off course into Soviet airspace as a result of time-dependent position degradation of their initial navigation system (INS) and was subsequently shot down by Russian SU-15 Flagon interceptors. As a result of this tragedy, President Ronald Reagan directed that previously classified GPS signals be released to the civilian commercial sector so that future long range flights could avoid similar fates. Today, all airliners carry sophisticated GPS systems integrated with other plane controls such as the autopilot. Thus, on September 11th, 2001, terrorists were able to strike with pinpoint accuracy targets only half a city-block wide. Though it seems horribly spectacular on television, technically this precision equates to striking a hardened aircraft shelter with a PGM during a complicated attack run. Though we never wish to provide accolades to these terrorists, one cannot help but be morbidly impressed by what was achieved.

The asymmetric warfare currently underway in Southwest Asia would likely have been impossible to support without precision guided munitions. Unable or unwilling to occupy the entire countries of Afghanistan and Iraq, the coalition governments increasingly rely on PGM as technical capabilities improve (CEP down to about 20 feet) and the overall cost continues to drop (e.g. JDAM kits for conventional bombs cost approximately \$21,000 each). At the same time, more assets are also being devoted towards improving the intelligence planning and targeting process, as well as the mitigation of collateral damage. For those governments who have it, PGM will undoubtedly become the weapon of choice in future conflicts.

Conclusion

In concluding this paper, I must state that I have only touched the surface of this subject - there remain many issues that still need debate, discussion, and further analysis. While precision warfare has demonstrated a degree of advanced capability, like all revolutionary military technologies it is only as good as the intelligence and decisions that support it. Will western governments continue to employ precision strike as a form of diplomacy, or does the current air and ground actions in Southwest Asia signal a return to more conventional and persuasive form of foreign policy? Will the public

remain receptive to these types of engagements, or will there be a demand to return to cruise missile diplomacy in the future? Will the public continue to tolerate collateral damage in precision strike, and if so, how much? Finally, what will the military do next? The Unmanned Combat Aerial Vehicle (UCAV) is essentially a cruise missile with a brain in it. Can, and would we, put precision strike in autonomous hands?

