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“Smart Weapons Systems”: Are we being Misguided about “Precision Strikes”?

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Theme: Militarization and WMD
Global Research, December 05, 2015
Drone Wars UK 4 December 2015

In the run up to the UK House of Commons vote on air strikes against ISIS in Syria, there has been much hype in the media about ‘precision strikes’. In particular a new British missile, the Brimstone, has been lauded by the press and politicians with Defence Secretary Michael Fallon going so far as to suggest that it “eliminates civilian casualties.”

The perception of ‘precision’ also underlies much of the support for drones targeted killing, with the phrase ‘pinpoint accuracy’ being deployed by the media almost as often as the weapons themselves. However the details and claims of such ‘precision’ deserve scrutiny. It is important to ask whether we are not in fact being misguided about ‘precision’. Not only in terms of the actual impact on the ground, but also in the permissiveness it engenders for further war.

What is a precision strike?

While most people would understand ‘precision’ to mean ‘accuracy’, it is very important to be aware that when the military use the term ‘precision strike’ they are not referring overall to the accuracy of a strike. Rather, they are pointing to the fact that a wide system of assets have been brought to bear to enable the strike to take place. According to the US Joint Chiefs of Staff for example, precision engagement refers to

> “the ability of joint forces to locate, survey, discern, and track objectives or targets; select, organize, and use the correct systems; generate desired effects; assess results; and re-engage with decisive speed and overwhelming operational tempo as required, throughout the full range of military operations.”

Lt. Colonel Jill Long of the USAF writes “the term ‘precision’ does not imply, as one might assume, accuracy. Instead, the word precision exclusively pertains to a discriminate targeting process”. She goes on, “By using a word that has such specific meaning in the mind of most civilians, it is easy to see how a gap in understanding and expectations has been fostered.” Indeed. When military spokespeople describe an aircraft or drone as undertaking a ‘precision strike’ it tends to get reinterpreted both in the media and in the minds of the public as being an ‘accurate’ strike, a misunderstanding that the military seem to have little interest in correcting.

Precision-Guided Munitions

While airstrikes using precision-guided (sometimes called ‘smart’) munitions are

undoubtedly much more accurate than ‘dumb’ or unguided weapons, the idea that such weapons hit their target accurately every time unless there is a human induced error is merely the stuff of Hollywood.

At a basic level, precision-guided munitions (PGM) have the ability to alter direction after launch in order to hit a designated target. There are two basic types of PGM; one relies on the Global Positing System (GPS) to find its target, while the other follows (or seeks) the centre point of a laser that is ‘painting’ a target. While both have the potential to be accurate, in reality both have inherent problems which can and do impact on their accuracy.

GPS munitions, for example, are vulnerable to electronic jamming and ‘spoofing’ through electronic warfare, while laser-guided munitions can be disrupted by weather conditions as well as smoke and dust (often present in areas of bombing due to other explosions). In addition, and very importantly, both rely on the actual information and intelligence about a target being accurate and up-to-date in the first place. Infamously, US GPS-guided bombs mistakenly hit the Chinese Embassy in Belgrade during the Kosovo war in 1999 due to the wrong co-ordinates being programmed into the missile. More recently human rights organisation Reprieve has argued that flawed intelligence has led to the deaths of more than a thousand people in the drone targeted killing of 41 named individuals in Pakistan.

Laser-guided

The vast majority of weapons launched from US and UK drones have been Hellfire missiles which use, like other laser-guided munitions, semi-active radar homing. An invisible laser beam which is pulsing at a specific rate of microseconds is aimed at a target. The laser can come either from the drone itself or from someone operating on the ground. The laser beam scatters off the target in many directions, pulsing at a pre-set specific rate. Once launched, the missile seeks out the beam pulsing at the specific rate it is set to find, and then steers itself towards the centre of that signal, thereby homing in on the target.

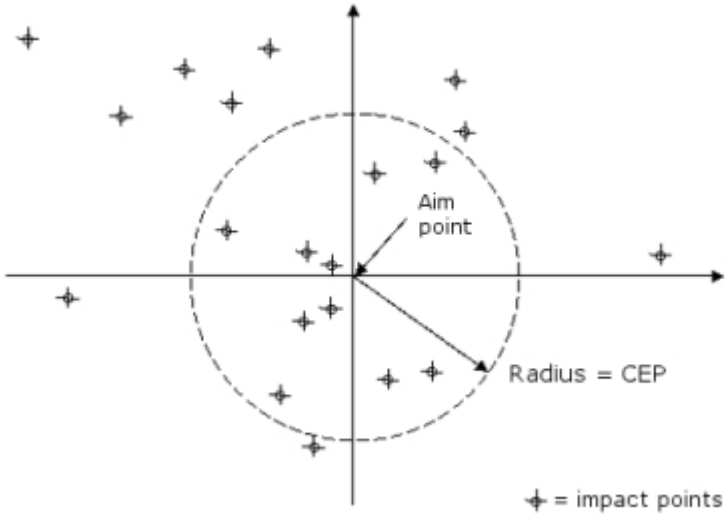
AGM-114 Hellfire missile

However, numerous technical reports and articles detail how dust, smoke and water (in the form of rain or vapour) impacts both on the laser beam itself and the ability of the missile seeker in such weapons to detect that laser beam. Captain Adam Lange, for example, writes in his article “Hellfire: Getting the Most from a Lethal Missile System’ that dust and water vapour particles “absorb or diffract laser energy along the way to the intended target … [and] may result in severe attenuation and cause the seeker not to detect… the target.”

He also details how the laser beam can simply be reflected back off smoke or dust in between the target and the missile and "consequently a missile may lock on to a smoke or dust cloud between the target and the designator."

Much more recently, the authors of the authoritative 'Introduction to UAV Systems' detail how water in the atmosphere will impact on laser energy. They document how rain scatters the energy while water vapour in the form of haze and humidity will absorb the laser energy and thereby impact on the weapon's ability to seek the target.

Circular Error Probability



Weapons accuracy is generally measured using the term 'Circular Error Probability' or CEP. In tests, a number of weapons are launched at a target and then an imaginary circle is draw around the 50% of strikes closest to the aim point (see diagram). The radius of that circle becomes the CEP (or accuracy) of that weapon. Rather unbelievably, the 50% of the strikes that fall outside this circle are simply ignored (I have yet to find an explanation for this). Importantly then, official statements about the accuracy of particular weapons are not based on any empirical surveys of actual use in warfare, but instead based on manufacturers' claims about performance under test conditions.

Although publicly available data on the actual accuracy of precision weapons in use on the battlefield is almost non-existent (such details are routinely refused by the military) some indications can be found. An Australian military study published in 2003 found that 45.5% of laser-guided weapons used by US forces in the opening days of Operation Desert Storm missed their target due to poor weather, technical malfunction or pilot error. The report goes on to criticise arms company claims regarding the accuracy of their munitions stating "manufacturers claims of 'one target, one bomb' proved false in the combat conditions of Operation Desert Storm."

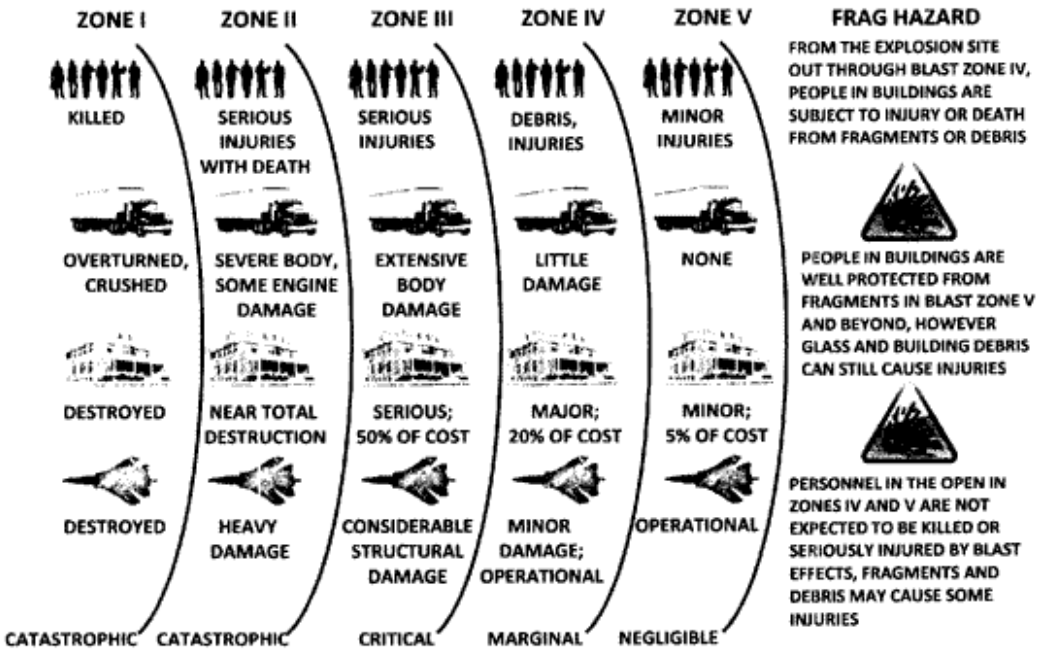
Hitting a moving target from a moving aircraft, whether that be from a drone or anything else, is incredible difficult. While we know that it can be done as there are occasional self-selected releases of short videos showing such targets being hit, we do not know how often these direct hits actually occur. Every time? Every second time? Three out of five? Without actual data it is not possible to be sure.

'Precise' Blast and Fragmentation?

Another aspect is how the phrase 'precision strike' underplays the impact of blast and fragmentation. Bombs create deadly blast waves as well as sending out lethal fragments and shrapnel which can travel great distances. Indeed, it is what bombs are designed to do. Predator pilot Matt Martin, in an account of the early operations of US drones over Iraq, wrote about the technical changes made to Hellfire missiles to enable them to be fired from drones:

> "We called [this new type] of Hellfire 'Special K', a regular K model with an even nastier antipersonnel bonus. When the two charges, wrapped in a sleeve of scored steel detonated, the sleeve shatter along its scored lines and blasted out razor-sharp shrapnel in all directions to slice and dice anyone within a twenty-foot radius (depending on the surface). Even those out to fifty feet might not escape its wrath."

According to weaponneering expert Morris Driels, approximately 30% of the energy released by a high explosive detonation will fragment the case and impart kinetic energy to the fragments: "The fragments are propelled at high velocity, and after a short distance they overtake and pass through the shock wave [... and therefore] the radius of effective fragment damage, although target dependent, exceeds considerably the radius of effective blast damage." He goes on: "Even very small fragments of the order of a few grains (1lb = 7,000 grains) will cause severe injury to personnel targets."



US army diagram detailing impact of blast and fragmentation

An understanding of the danger that such an explosion can create can perhaps be gained from the safe distance that the US military mandates for its own troops to be away from explosions. To be safe, unprotected troops are required to be 1,000m (1km) away from a 2,000 lb bomb explosion and 500 metres away from a 500lb bombs.

British drones are launching 500lb bombs, but mainly the 100lb Hellfire missile. The US Counter Terrorism Center mandates that safe distance from even a 50lb bomb is 50 metres. When proponents of aerial bombing talk of striking precisely within a 2-3 metres radius,

such a narrative simply ignores the much wider lethal radius that the blast will create.

The Problem of Precision

The constant presentation of air strikes as 'precise' and 'pinpoint accurate' has serious implications for our understanding of the actual impact of war. Due to the nature of today's military interventions, few people have access to first-hand accounts of the impact on the ground, creating in the minds of many the idea that air strikes are clean, safe and even bloodless. Even fewer have access to the data surrounding such military operations enabling proper oversight. The MoD, for example, claim that "in the hundreds of air strikes that the RAF has carried out in Iraq, we have had absolutely no civilian casualties reported" (note of course that 'reported'). At the very same time, there is no doubt that there have been hundreds of civilian casualties from Coalition bombing in Iraq.

Captain Steinar Sanderød of the Norwegian Air Force writes "politicians and public opinion in the West seem to be convinced that air power is less 'messy' than the use of ground forces." Quoting arguments that "air forces proclaiming their ability to strike with precision [is] fuelling expectations of near-bloodless campaigns where enemy civilians are successfully avoided" Sanderød argues that "such a perception of air power has greatly contributed to lowering the threshold for using force among western politicians."

In other words, the narrative that such air strikes do not cause civilian casualties helps to create public permission for the expansion of air campaigns. Perhaps nowhere has this expansion been more visible than in the US (and now British) use of armed drones to undertake targeted killings. Civilian areas, where bombing would not previously have taken place, now come under the shadow of drones and this in turn will no doubt lead to more casualties. As Professor Michael Schmitt writes in his important review of international law in relation to precision strike for the International Red Cross

> "Greater precision enables targets to be attacked that previously were off-limits due to likely excessive collateral damage or incidental injury. This is particularly true with regard to urban and dual-use targets. To the extent that such attacks are seldom free of collateral damage and incidental injury, opening additional targets to attack results in a net increase in potential harm to the civilian population."

Over the past few years, and in particular over the past few weeks, 'precision' has been presented as something of a panacea to the problems of aerial bombing. While it is beyond question that precision weapons are more accurate than their unguided predecessors, in the way that 'precision strike' is both opening up previous off-limits civilian areas to aerial bombing and at the same time lowering the threshold for war, 'precision strike' may in fact lead to an increase in civilian casualties.

To summarise Professor Maja Zehfuss in her excellent essay on this issue, Targeting: Precision and the Production of Ethics, faith in precision bombing requires not only an under-examination of the technology itself, but a redefining of the very word 'precision'.

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