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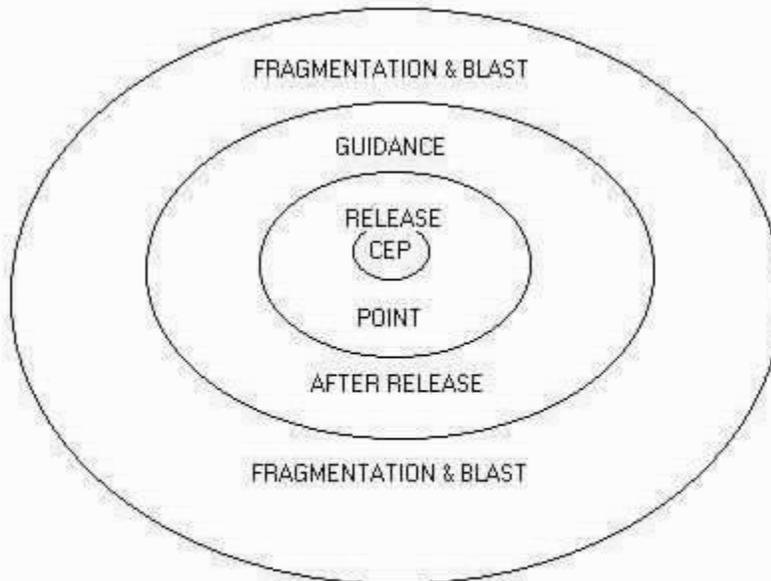
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***The Surgical¹ Precision Myth: After the Bomb Explodes --
Cumulative Collateral Damage Probability
(CCDP)***

by

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$$CCDP = TLE + CR$$

where

CCDP is Cumulative Collateral Damage Probability

TLE is Target Location Error

CR is Casualty Radius

Modern military aerial bombardment is often characterized by the press as "surgical" and "precise". In this way, it is claimed, civilian casualties -- euphemistically referred to as collateral damage -- are minimized.

To back up these claims, military public affairs officers often refer to the Circular Error Probability (CEP)² of various precision ordnance.³ They claim that 50% of their "smart" bombs fall within 25 feet of the target. Under test conditions, this is a true statement.

Military briefers show slides and videos always with direct hits. They even show "before and after" slides with the "before" slide depicting arrows to a target which is invariably hit precisely in the "after" slide. Briefers never show misses, not even near misses.

They leave the impression that the ordnance is so accurate that it can literally fly in through a window to hit a target. Yet, in the 19 March 2003 S-hour "decapitation" strike on the Iraqi leadership in Baghdad, the US may have seen fit to fire not one but over 40 cruise missiles.

The U. S. military also claims that newer, more modern, hi-tech weapons are less likely to cause collateral damage. A single, precise figure for bombing accuracy is misleading.

Precision bombing is far less "precise" than CEP optimal test figures or highly-selective, simplistic video bomb camera shots played for gullible newsmen would suggest. While, if there are no errors, half the bombs may fall within the claimed CEP. This totally disregards what happens after the bomb explodes.

Figure 1 shows that the damage radius is far, far greater than CEP.

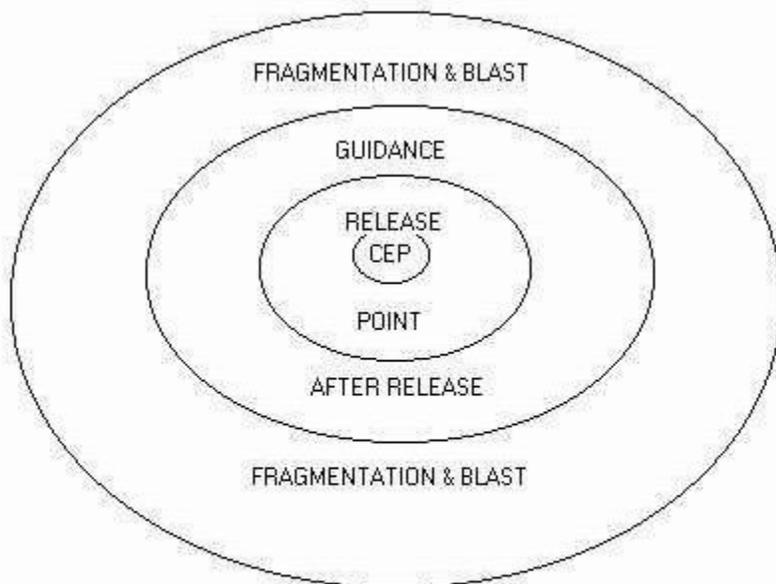


Figure 1- Cumulative Collateral Damage Probability (CCDP)

For example, the Cumulative Collateral Damage Probability for a 2,000 pound Global Positioning System (GPS) bomb would be -- GPS 40 feet, Blast and Heat 110 feet, Fragmentation 3000 feet. ⁴ So anyone within a half mile of such a perfectly delivered munition would be at risk! This assumes that all goes well and does not even allow for errors such as target location, pilot, GPS, mapping, intelligence errors.

The USAF Intelligence Targeting Guide admits that the "total overall error is a statistical combination of " Target Location Error and other weapon errors such as Inertial Navigation System, Global Position System, aircraft, and operator".⁵

Let us call this Total Overall Error (TLE) plus the Casualty Radius (CR), Cumulative Collateral Damage Probability (CCDP).

$$CCDP = TLE + CR$$

where

CCDP is Cumulative Collateral Damage Probability

TLE is Target Location Error

CR is Casualty Radius

No doubt aerial bombing precision has improved since World War II.

Improvements in Accuracy Since World War II ⁶

The following chart shows a 90 % probability of hitting a target measuring 60 x 100 feet using 2,000 pound unguided bombs dropped from medium altitude.⁷ It should be noted that strategic bombers generally drop from high altitude. ⁸

War	Unguided Bombs	Number of Aircraft	CEP (in feet)
World War II	9,070	3,024	3,300
Korea	1,100	550	1,000
Vietnam	176	44	400
	Precision Guided Munitions (PGM)		
Kosovo, Iraq, Afghanistan	GPS/JDAM		40
Kosovo, Iraq, Afghanistan	Laser-guided		25

Even if this errorless accuracy is true for a specific target, it fails to consider the effects of fragmentation and blast. Once the bomb hits, it explodes sending shrapnel and blast for an additional given radius. "Fragmentation is effective against troops, vehicles, aircraft and other soft targets. The fragmentation effects generated from the detonation of a high-explosive bomb have greater effective range than blast, usually up to approximately 3,000 feet regardless of bomb size."⁹

Note that this 3,000 foot figure is consistent with Admiral Stufflebeem's 4000 foot "pull up" comment vis-a-vis the B-52 friendly fire accident in Afghanistan in December 2001.

"Stufflebeem: As a pilot, when I would drop a 2,000-pound weapon, I wanted at least 4,000 feet of separation from that weapon when it went off."¹⁰

So, the laser-guided bomb that lands within 25 feet of the target, half the time, sends lethal shrapnel out 3,000 feet! Furthermore, the target itself may catch fire, collapse, and explode. This may affect other structures in the area not to mention people in the vicinity of those structures.

ABOUT THE AUTHOR:

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He served for fourteen years in the United States Air Force and attained the rank of Major. He was awarded the Air Medal (2 oak leaf clusters), Combat Readiness Medal, National Defense Service Medal, Vietnam Campaign (5 oak leaf clusters), Korean Expeditionary Medal, Air Reserve Forces Medal, Vietnam Service Medal. A 1966 USAF ROTC Distinguished Military Graduate (Georgetown University), he received his pilot's wings in 1967 at Moody AFB GA class 68-A. He flew the KC 135 Stratotanker and EC135 Flying Command Post for the Strategic Air Command at Westover AFB MA until his separation from active duty in 1971. During this time he served two 189 day tours of duty in Southeast Asia, flew over 100 combat missions from Guam, Okinawa, Taiwan, and Thailand. After separation from active duty, he flew the O2A Cessna Skymaster as a Forward Air Controller (FAC) for the Maryland Air National Guard during 1971 and 1972.

Moving to England to pursue his doctorate at Manchester University, he joined the USAF Reserves. He served as an International Military Politico Affairs Officer at the US Embassy, Grosvenor Square, London and then as an Air Intelligence Officer at HQ USAFE, Ramstein AB, Germany and RAF Alconbury, England..

¹ In addition to being grossly inaccurate, "surgical" must be highly offensive, even obscene, to the medical profession. No surgeon uses an exploding scalpel. No surgeon seeks to kill.

² Circular Error Probability (CEP) = Fifty percent of bombs fall within a target radius. These published data are based on ideal test conditions. Note that this is not a mean average level of precision. Rather it is a median measurement. Thus, there is no outer bound as in a normal distribution.

³ They fail to mention the Spherical Error Probability (SEP) which is a three-dimensional combination of horizontal and vertical errors at 50% probability. Failing to consider this added vertical dimension overstates the CEP accuracy.

⁴ "Fragmentation is effective against troops, vehicles, aircraft and other soft targets. The fragmentation effects generated from the detonation of a high-explosive bomb have greater effective range than blast, usually up to approximately 3,000 feet regardless of bomb size." USAF Intelligence Targeting Guide, AIR FORCE PAMPHLET 14- 210 Intelligence 1 FEBRUARY 1998, page 99

⁵ USAF Intelligence Targeting Guide, AIR FORCE PAMPHLET 14- 210 Intelligence 1 FEBRUARY 1998, page 99

⁶ HQ USAF/XOX, 'Air Power Lethality and Precision: Then and Now', Fall 1990.

⁷ Medium altitude = above 10,000 feet (2 miles) above ground level (AGL)

⁸ High altitude = above 15,000 feet (3 miles) above ground level (AGL)

⁹ Federation of American Scientists. <http://www.fas.org/man/dod-101/sys/dumb/bombs.htm> download 22 March, 2003

¹⁰ http://www.defenselink.mil/news/Dec2001/t12052001_t1205asd.html.

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