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## The Nuclear Game (Two) - Targeting Weapons

One of the interesting aspects of a nuclear war is planning how its going to be done. Most fictional accounts of this process seem to assume that cities will be the primary targets and there will be one device allocated per city. This is very far from the truth. In fact, nuclear attack plans are very complicated things and, in a quite real sense, they don't exist. What does exist is a whole series of strategies aimed at achieving specific results. Which of those strategies are adopted and in what combinations is determined by the specific events taking place. Very often we'll hear of people talking about "The SIOPI" as the Holy Grail of the US nuclear war plans. A good touchstone because there is no such thing - if people claim to have worked on the SIOPI, they are being economical with the truth. What does exist are a very large number of plans and options that are put together on a mix-and-match basis.

Unfortunately planning a nuclear strike isn't just a matter of working out which cities to destroy. In fact it isn't even a matter of working out which cities to destroy. In fact, we don't target cities at all per se. We target things, some of which happen to be in cities. Its necessary to remember the key; nuclear weapons are a tool, no more, no less. We don't blow up cities just because they are there any more than we fix a TV antenna on the roof by digging a hole in the back garden.

Since we are using a tool to do a job, the first stage is to work out a series of objectives (ie decide what that job is). Normally discussions of such things rotate around strategies being either counter-force or counter-city but its a lot more complex than that. At the last count there were about 30 distinct targeting strategies that could be adopted. As an example, there could be:-

Counter-military - aimed at destroying a country's armed forces. Such a strike would be aimed at things like arsenals, ports, airbases, military training sites etc

Counter-strategic - aimed at taking out a country's strategic weapons force. This would hit the ICBM silos, SSBN ports and bases, the SSBNs themselves, bomber bases, nuclear storage depots etc.

Counter-industrial - aimed at destroying key industrial assets and breaking the target country's industrial infrastructure

Counter-energy - aimed at destroying a country's energy supplies and resources plus the means for distributing them.

Counter-communications - aimed at disrupting and eliminating the target country's communications (radio, TV, landline, satellite etc)communications systems.

Counter-political - aimed at erasing the target country's political leadership - note this is MUCH more difficult than it seems and is very dangerous. Killing the only people who can surrender is not terribly bright

Counter-population - aimed at simply killing as much of the enemy population as possible. A very rare strategy.

There are plenty of others. One of the things that gets done at this level is to think up targeting strategies, work out the target sets associated with that strategy and the resources needed to eliminate that target set. Based on that we can then work out if that particular target strategy is an effective use of resources. Note also that adopting one particular target strategy does not preclude simultaneously putting another into play. Mix and match again.

So lets look at a typical targeting problem in an average sort of strike. We are going to give the capital of Outer Loonyistan a really thorough seeing-to. Now we don't just explode a bomb in the center of the city and say bye-bye. Believe it or not that won't do any real good. Initiate a 1 megaton device over the center of London and 95 percent of the cities assets and 80 percent of the population will survive (this means that, proportionally speaking, Londoners will be better off after a nuclear attack than they were before it took place. This was the basis of at least one Get Rich Quick scheme proposed in The Business).

So we start by selecting a specific targeting strategy. Now we have to estimate the weight of attack Asylumville is likely to come under if that strategy is adopted. To do this we first work out how high Asylumville stands with regard to other potential target areas for that particular strategy. This is usually done by a careful assessment of what targets are in that area as opposed to similar target areas in other parts of the country and assuming the available warheads are distributed according to the target density in that area. Then we assess how many warheads are likely to be inbound and crank that into the priorities we've established to see how many are likely to be fired at Asylumville. It'll be a lot fewer than you think. This means is that we have to look very carefully at the city, its geography and the distribution of its assets in order to work out how to take it down.

To do this we need some maps. We need a standard topographical map, demographic maps and asset/resource maps. Take the targeting strategy and the likely target set associated with it and plot them on that map. Now think out how hard that target set is going to be to destroy. The problems now become apparent. Some targets are best attacked by surface bursts, others by high airbursts. Some, very hard targets need almost direct hits to destroy them; others are so small (and so hard) that hitting them is very difficult. The sort of things we might look at hitting, depending how we do things, are communication facilities, railway marshalling yards, factories, oil refineries, government offices, military bases. For example, if the target strategy is anti-communications, amongst the primary targets will be airfields and railway marshalling yards. They are notoriously difficult to destroy, the attacker needs big warheads and needs to ground burst them so the target is physically scoured from the ground. There is a lot of thought needed here; you'll find there are far more potential targets than real warheads so you'll have to allocate the warheads one way, then try to work out the effects. To give you some idea of how that list grows, there are something like 50,000 priority nuclear targets in Russia. Some of them are weird and tucked right out of the way (one of the most critical non-military targets in the USA is where you would least expect it). Now many of that 50,000 target list will be virtually on top of each other. One initiation will get several of them. That pulls the list down immensely, probably to around 3,000 - 5,000 targets.

OK back to working over Asylumville, the capital of Outer Loonyistan. If its like most other capitals, it'll probably merit a total of between five and ten devices to take out all the things we want to. One of the key tools used here is a thing called a pie-cutter. Its a circular hand-held computer. You set the verniers on it to the specifics of the weapon used (altitude of burst, yield etc) and it gives you a series of rings that show the various lethal effects of the bomb to certain distances. Put it down on the planned impact point and you'll get what the bomb will do. You won't get a pie cutter (they are classified equipment) but you can make your own from publically available data using tracing paper and compasses. . We end up with a map of the city after being worked over. Normally, at this point somebody says. Dammit we didn't get [insert some key assets] and we start again. The first shot at targeting will be stunningly disappointing so you play games with warhead types and yields and with burst locations until you get as many of target set as you can. Take that marshalling yard; sounds easy doesn't it? Believe me railway marshalling yards are a whirling son of a bitch to take down. They are virtually invulnerable to airbursts; we have to groundburst a blast directly on the yard. 800 yards outside and you might as well not have bothered. The problem is those yards are not that big. So now we have a problem called CEP. This stands for Circle of Equal Probability (NOT Circular Error Probable which is a totally meaningless term invented by those of the intrepid birdmen). This is a measure of the accuracy of the missile and is the radius of the circle that will contain half the missiles aimed at the center of the circle. That means that half the inbounds will fall outside that circle. Now we have a second concept; the radius of total destruction, the radius within which everything is destroyed. Its astonishingly small; for a 100 kt groundburst its about 800 yards (now see where the marshalling yard came from).. Now if the RTD exceeds the CEP we're probably OK, if it doesn't (and in most cases it doesn't) we've got problems.

What all this ends up with is we have to fire multiple warheads at single targets in order to be sure of getting them. This is a complex calculation since the optimum number of warheads for Asylumville will depend on the attack pattern and priorities. But we'll eventually end up with number that represents the best compromise between destructive effects and warhead use. To estimate the effects on the area as a whole, take the demographic map, plot the event points, altitudes and yields on that map and apply the pie-cutter set for overpressure. The overpressure needed to destroy various types of building are public record (US houses are very very soft and vulnerable) so you know roughly what will be destroyed up to a given distance. Note that the blast circles will overlap in some places. Blast also isn't logical; ground irregularities will funnel it in some directions so that an area close in may be unscathed while others much further away will be flattened.

Now we have to get them there. Missiles are not terribly reliable and a lot can go wrong. A Rectal Extraction figure suggests that only about 60 percent of them will work when the blue touchpaper is ignited. So we have to add extra warheads to allow for the duds. To give a feel for the sort of numbers that we're talking about, the

British calculated that they needed 32 warheads to give Moscow a terminal dose of instant sunrise. In other words, the British nuclear deterrent took down Moscow and that was it.

Key point here on the efficiency of defenses. In the 1950s, the UK V-bomber fleet was assigned to hit over 200 targets in the Western USSR. As the 50's turned into the 60's the ability of the V-bombers to penetrate Soviet airspace came under increasing doubt. The UK shifted to Polaris - one submarine at sea, 16 missiles, three warheads per. Total of 48 targets assigned. But the USSR started to install an anti-missile system that was reasonably capable against the early Polaris-type missiles. So the UK modified Polaris in a thing called Chevaline. this took one warhead from each missile and replaced the load with decoys - then targeted all 16 missiles onto Moscow. ONE target. In effect, the Soviet defenses had reduced the UK attack plan from 200 targets to one. In other words, it was 99.5 percent effective without firing a single shot (bad news for Moscow but great news for the other 199 cities with targets in them)

That's why so many devices are needed - the inventory evaporates very fast. That's also why defenses like ABM are so important (and the urgency behind deploying the new US Missile Defense System). The defenses don't have to be very effective to work (although the new US system is looking good), it's the complexity they throw into the planning process. As long as we can assume that if we get a warhead on its way to its target, that target is going to be hit, then planning is relatively easy and the results predictable. If, however, we can't make that guarantee; if we have to factor in a possibility - perhaps a good one - that the outbound warhead will be shot down, then planning becomes very uncertain. Now put yourself in the position of somebody planning a strike - do you wish to gamble your nation's change of survival on something that MIGHT work. Of course not. So Strategic Paralysis strikes again. A defense system doesn't have to work against an attack to be effective because it works on the minds of the people who make the decisions.