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STRATEGIC DETERRENCE AND NORTH AMERICAN DEFENCE

by

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STRATEGIC DETERRENCE AND NORTH AMERICAN DEFENCE

Successful Avoidance of Nuclear War

In the early nineteen-fifties, with the Superpowers developing thermonuclear bombs and intercontinental bombers, a war in Korea, and extreme tension in Europe, the outlook for the world appeared extremely ominous. The larger Western countries were spending over 10% of their Gross National Product on defence (US 14.8%, UK 11.3%, Canada 9.0% in 1953) and exhorting one another to raise ninety-six divisions for NATO. If a "solution" had been offered that would guarantee existing frontiers and prevent the use of nuclear weapons, at an annual cost of 10% of the GNP in perpetuity, it would have been seized with gratitude and alacrity.

In fact, a solution has been found. It is called mutual stable deterrence. It has preserved the frontiers and prevented the use of nuclear weapons for fifteen years. The Cold War is not nearly as cold as it was, and defence budgets are a much smaller fraction of GNP than they were (US 8.6%, UK 5.1%, Canada 2.5% in 1969). The world owes a lot to mutual stable deterrence, and will abandon it only at a terrible risk.

Mutual Stable Deterrence

Deterrence began with the American atomic bombs. It did not become mutual until the Soviets also acquired the weapons and aircraft of intercontinental range. When a successful surprise attack might permit one bomber in the air to destroy an entire wing on the ground, there was the possibility that the attacker could effectively disarm his opponent and avoid unbearable retaliation. This situation

was made worse with the advent of the first Intercontinental Ballistic Missiles, since they were very vulnerable on the ground and required a long preparation time before they could be fired. Consequently, their owners had a strong incentive to fire them quickly, before they were destroyed.

Both Superpowers were well aware of this dangerous instability, and took urgent steps to correct it. By building early warning radar lines, establishing short readiness times for bombers on the ground, and maintaining a proportion of bombers in the air at all times, the fear abated that almost all the bombers could be lost in a surprise attack. The ICBMs were buried in dispersed and hardened underground silos, and had their preparation time before launching reduced to a few minutes, and the number of ICBMs was increased to the point that there was no fear of losing almost all of them to a surprise first strike. And ballistic missiles were installed in nuclear-powered submarines which could remain submerged for weeks and launch their missiles without coming to the surface.

At this point, the US could feel sure that, no matter what the Soviets could do to the US nuclear weapons in a first strike, enough of them would survive that an unbearable retaliation could be delivered in a second strike against Soviet cities. Because the same thing was true in the other direction, the deterrence was mutual. And, because the deterrence did not depend on a "hair trigger response" and would not be upset by a small change in the numbers of weapons, it was stable. Either would be dooming his own cities to destruction if he struck the other, and each knew that the other realized the situation. Hence, neither would strike. And neither has struck. We can say that a "strategic balance" has been reached. Its basis rests in the power of the offensive weapons to destroy cities and their impotence to destroy the opposing weapons. It rests on "Assured Destruction".

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ASSURED DESTRUCTION AND DAMAGE LIMITING

Assured destruction depends on strong offensive systems able to withstand a counter-force attack by the opponent and able to destroy cities in spite of any opposing defences.

Another objective for strategic systems is "Damage Limiting", which signifies the reduction of the damage that could be done to one's cities and other strategic assets (other than one's offensive weapons) by the enemy's offensive systems.

Effective and invulnerable offensive systems are the main requirements for assured destruction, but defence of the offensive systems can make a contribution.

The main contributions to damage limiting come from defensive systems able to protect cities. However, offensive weapons used in the counter-force role contribute to damage limiting.

Deterrence, which is intended to prevent the outbreak of war, depends on assured destruction. Damage limiting is needed only if war does break out, in other words if deterrence has failed.

A strategic choice of considerable importance needs to be made regarding the relative assets to be invested in assured destruction and in damage limiting. This is equivalent to fixing the relative priorities of (a) preventing war and (b) surviving war if prevention fails.

These two activities are not independent. In fact, as seen by a third party with no preference between the two Superpowers, but a desire to avoid a nuclear exchange between

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them, damage limiting works against assured destruction, and therefore against mutual stable deterrence. For there to be mutual stable deterrence, the cities of both Superpowers should be vulnerable to a retaliatory second strike. A capability for damage limiting reduces this vulnerability.

The Interactions between Offence and Defence

Three strategic offensive systems have been mentioned; bomber aircraft, ICBMs, and ballistic missile firing submarines. All three are capable of delivering hydrogen bombs on cities, or on airfields. None can destroy submarines submerged at sea. 1000 ICBMs fired at 1000 enemy ICBM silos today would destroy at most a few hundred. The warning is likely to be longest for attack by bombers, shortest for attack by SLBMs.

Opposing the three offensive systems there are four strategic defensive systems: anti-bomber (or air) defence, anti-ballistic missile (ABM) defence(or BMD), anti-submarine defence, and civil (or passive) defence. Air defence opposes bombers only. BMD opposes ICBMs or submarine-launched ballistic missiles (SLBMs) in flight. Anti-submarine defence opposes the submarine, but not the SLBM in flight. Civil defence offers a measure of protection to people from the effects of all of the offensive weapons.

A further interaction is that air defence or BMD installations or submarines in port can be destroyed by any of the three offensive systems.

These interactions are illustrated on Figure 1.

The Situation in 1971

In 1971 the Soviets possess about 140 long range bombers, 1400 ICBMs, and 50 ballistic missile submarines (of which 25 are nuclear powered). If they were to use all of these in a

surprise first strike against the US offensive weapons, it is probable that many of the 450 US bombers, most of the 1054 US ICBMs, and all of the 41 US missile firing submarines which were at sea would survive. If most of these surviving US weapons were launched against Soviet cities in a retaliatory second strike, there is no doubt at all that, in spite of the Soviet air defence, BMD, anti-submarine defence, and civil defence, nearly all of the main Soviet cities would be destroyed.

Similarly, a counterforce first strike by the US would not succeed in disarming the Soviet ability to retaliate against American cities to an altogether unbearable degree. The situation in 1971 is illustrated in Figure 2.

Anti-Bomber Defence

Before the appearance of ICBMs and SLBMs, deterrence depended on bombers, and the threat to their safety came from the opposing bombers. The main objective of anti-bomber defence was to provide the early warning which would enable most of the friendly bombers to get off the ground before they were attacked. In addition, interceptor aircraft and surface-to-air missiles were intended to shoot down as many bombers as possible en route to their targets.

Three important weaknesses in present day air defence are the vulnerability of fixed radars and air bases to missile attack, the limited ability to detect and intercept bombers at very low altitude, and the fact that neither interceptors nor surface-to-air missiles can intercept the air-to-surface missiles which can be launched by bombers some hundreds of miles from their targets.

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One new development which promises to strenghten the defence against all three weaknesses is the Airborne Control and Warning System (AWACS). This is a large aircraft which flies high, carries a large radar, and surveys a large area of space below it. A special electronic technique identifies echoes from low flying aircraft against the large background of echoes from the ground. The communications, computers, and controllers needed to direct interceptors are all carried in the AWACS aircraft, which avoids the vulnerability of a fixed ground radar station and can place itself farther from the target than the range of the bomber's air-to-surface missile.

The limit to the range of a normal radar is set by the horizon, with the electromagnetic energy passing directly from radar transmitter to target aircraft and back to the radar receiver. If the direct line of sight is interrupted by trees, hills, or any other solid object, then the aircraft cannot be detected. If the radar is raised several miles above the earth, as with AWACS, the horizon is moved far away. Another method of avoiding the horizon limitation is to reflect the electromagnetic energy off the layers of ionized gas in the upper atmosphere, thus employing an indirect path to pass over the horizon, as is done with long distance radio communication. A system to employ this method, known as Over-The-Horizon (OTH) radar, should allow detection of aircraft at any altitude out to very long ranges.

In the past, radar stations and airbases in Canada and the use of Canadian airspace for interception has been a very important part of the air defence of North America. If the AWACS is supplied to the armed forces of the USA or Canada, its normal area of patrol will be off the Atlantic and Pacific coasts and over Canada. Bases in Canada would shorten the time taken to reach the patrol areas. If fighter aircraft are to intercept before attacking bombers can release air-to-surface missiles at North American targets, they should be based on the coasts or to the north of the targets. And, in addition,

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the vulnerability of military aircraft on the ground can be reduced by dispersing them to as many bases as possible scattered throughout the USA and Canada.

Developments in Ballistic Missiles

In order to propel a warhead to a given range by the least expenditure of energy there is a certain path known as the "minimum energy trajectory". If more than this minimum energy is available (as could be the case with large propulsion rockets), if it is acceptable to deliver a lighter warhead, or if a shorter range is sufficient, then the designer can use trajectories other than the "minimum energy trajectory". A "Depressed Trajectory ICBM" employs a low flight path, which could delay entry into the detection beam of radar, and thus shorten warning and make interception difficult. The payload can be made to change course (manoeuvre) instead of following a ballistic path. A "Fractional Orbital Bombardment System" (FOBS) puts the pay-load into a low earth orbit, and then uses a retro-rocket to deboost it out of orbit on its first approach to its target. This will also delay radar detection, and make interception difficult, and it is possible to approach the target from an unexpected direction by coming around the earth the long way instead of directly. A "Multiple Orbital Bombardment System" (MOBS) leaves the payload in orbit around the earth for several rotations before being deboosted onto its target. The orbiting bodies would be detected, (although their purpose might not be identified) but the location of the target and time of attack would not be known.

If it were necessary to penetrate sophisticated ABM defences, these complicated trajectories could be useful. However, a much greater increase to the effectiveness of ballistic missiles is being made by the development of multiple

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warheads, propelled to intercontinental velocity by a single ICBM launching rocket, but separating into individual re-entry vehicles in flight. If it is only the general position of the group of warheads which is aimed, the weapon is called the "Multiple Re-Entry Vehicle" (MRV), but if each warhead is individually aimed at its own target, it is called the "Multiple Individually Targetted Re-entry Vehicle" (MIRV). If this last weapon, MIRV, had sufficient accuracy to enable one ICBM to destroy several enemy ICBMs in their silos, it would represent a very significant change in counter-force capability.

Ballistic Missile Defence

Like anti-bomber defence, ballistic missile defence has one component concerned with detection, tracking, and warning, and another with interception and destruction.

The oldest component is the "Ballistic Missile Early Warning System" (BMEWS), consisting of very large radars located in Alaska, Greenland, and Britain. These can detect missiles or space vehicles as soon as they come above the horizon, and predict their subsequent paths. Newer systems, some of which are still under development, employ ionospheric reflections to make their detections beyond the horizon, or put the detectors in orbiting earth satellites. It is virtually certain that a large ICBM attack would be detected soon after the first few rockets had been launched. It is also very unlikely that anything other than a real attack will be mistakenly interpreted and result in a false alarm. The novelists' war by computer malfunction is not really a serious hazard today.

Active defence against ballistic missiles was believed to be impossible until a few years ago. The prospect of hitting a bullet with a bullet did not seem very good, especially if the bullet was travelling at 16,000 miles per hour. However,

the solution lay in putting a nuclear warhead into the anti-missile missile. The size of the defensive warhead was sufficient to enable it to destroy the ICBM at a considerable distance, and by making the interception at high altitude, danger to persons or property on the ground could be minimized.

Several models of BMD have gone through the design process. The one currently planned for the USA is called "Safeguard". It uses large Perimeter Acquisition Radars (PAR) to detect and track the approaching ICBMs, and Missile Site Radars (MSR) to control the interceptions. There are two types of anti-missile missiles, called "Spartan" and "Sprint". Spartan has a range of hundreds of miles, and intercepts at very high altitude. Its large nuclear warhead would vaporize light decoys, and could destroy several warheads if they were close together. Sprint has a shorter range and a smaller warhead, and would be fired at ICBMs which had escaped Spartan.

Because Spartan has a long range, one battery can protect a large area and a dozen batteries properly sited could intercept any missile trajectory impacting in the United States. But Sprint can only defend targets in the immediate vicinity of the battery.

The present plan for the deployment of "Safeguard" has been the subject of acrimonious debate in the US Congress, and its future is by no means assured. However, as explained by the Secretary of Defence, there are several phases in the plan. Phase 1 consists of two sites to defend two of the main complexes of Minuteman ICBMs in Montana and North Dakota. All components - PAR, MSR, Spartan, and Sprint, would be represented. Considerable progress has already been made in the installation of phase 1. There are several alternate phases 2's.

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If there is felt to be an increased threat to Minuteman, two more sites would be added at Minuteman complexes, and one for the National Command Authority in Washington. If the Soviet threat to bomber bases by submarine-launches missiles increases, radar cover and anti-missile batteries would be deployed looking to seaward as well as to the north. If it were desired to counter the Chinese threat to US cities, a full area cover of the USA would be needed. The extension currently favoured is to increase protection of Minuteman, and therefore to support Assured Destruction. Protection of cities would support damage limiting.

The scale of the full Phase 2 deployment of Safeguard is described as "light". It could not prevent virtually complete destruction of US cities in a full scale attack by the Soviet Union. But it could protect a significant number of Minutemen. And, in the event of an attack by China, or if an accidental launching of one or a few missiles by anyone, it could provide significant protection to US cities.

If ballistic missile defence should become sufficiently effective, the offense will add penetration aids of various types, such as decoys, manoeuvring trajectories, or precursor bursts to blind the radar. But the most effective penetration aids are likely to be multiple warheads, arriving simultaneously so as to saturate the defence.

The Implications of Ballistic Missile Defence for Canada

Missile trajectories originating in the Soviet Union or China and impacting in the United States all pass over Canada or very close to our coasts. They pass over us going north to south.

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If the targets were the Minuteman silos in Montana or North Dakota, and they were defended by Phase 1 Safeguard installations located near the missile sites, the interceptions of incoming ICBMs by Spartan missiles, and the explosion of Spartan nuclear warheads, would occur at a high altitude (probably 50-100 miles) above Canadian territory, including the city of Winnipeg. If Phase 2 Safeguard were installed, and used to defend Seattle, defensive Spartan bursts would be over British Columbia, possibly above Vancouver or Victoria. Protection of Detroit, Buffalo, or other US cities near the Ontario boarder would require defensive bursts above populated regions of Ontario. However, the damage caused on the ground would be very slight, and truly negligible in comparison with the effects of an ICBM burst at its intended target. Radioactive fallout from a high altitude burst is distributed through the upper atmosphere, whereas an ICBM burst on the ground well to the south of the US border could produce lethal fallout over a wide area extending well into Canada. And, because the Minuteman sites are underground, it is probable that they would be attacked by ground-burst weapons.

If Phase 2 Safeguard were sited for the defence of US cities, it could probably provide a small degree of protection to certain of the most southerly Canadian cities. Moving the sites further north might improve defence of US cities and would offer considerably better protection for Canadian cities.

It should be re-emphasized that Safeguard is a "light defence" and could not prevent the wholesale destruction of North American cities in the event of an all-out attack by the USSR.

Defence Against Submarine-Launched Missiles

Submarine-launched ballistic missiles have shorter ranges than ICBMs: 1750 miles is estimated for the latest Soviet SLBM. Likely targets for SLBMs in a first strike would

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be airfields near the coast, with the attacker hoping to catch the bombers on the ground. If the submarines closed in to a distance far less than the maximum range of his missiles, he could use a depressed trajectory to delay radar detection and also make interception more difficult.

Defence against the SLBM has two distinct aspects. Anti-submarine defence includes the detection, identification, and tracking of the submarine in peace or war, and its destruction in war. A very serious difficulty in defending against a first strike by SLBMs is that the submarines can wait in their firing positions in international waters, quite legally, until the moment of the attack. Once the missiles have been launches, their detection, tracking, and interception is a part of Ballistic Missile Defence, and may be attempted with the same system that defends against the ICBM. Alternatively, it is possible that an anti-SLBM interception system will be based on shipborne or airborne platforms.

The waters near the Canadian costs include likely transit routes from the Soviet Union to launching positions, and Canadian ports and airfields are well placed to serve as bases for surveillance.

Possible Changes by 1975

It was stated earlier that the strategic forces present in 1971 produce a stable balance of mutual deterrence. But potential improvements to offensive and defensive systems have been described, and one must ask whether they are likely to give a stable balance a few years hence.

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The American Secretary of Defence has expressed the fear that an increased number of Soviet ICBMs fitted with MIRV could pose a serious threat to the US Minutemen, whose numbers are not to be increased. A strong Soviet BMD could weaken the power of a retaliatory strike by US SLBMs and surviving Minutemen. Soviet SLBMs and ICBMs could decimate US bomber aircraft on the ground, and strong Soviet air defences would protect their cities against retaliation by those bombers which did survive. This possibility is illustrated on Figure 3 which shows North America without BMD or air defence in 1975. It is for this reason that the US Government is pressing on with Safeguard, to provide defence for Minuteman, in spite of determined opposition, and is installing MIRV in its own missiles.

In fact, in spite of the opposition to arms spending and the hopes for Strategic Arms Limitation Talks, it is virtually certain that the Superpowers will not agree to any limitations which threaten the state of mutual stable deterrence.

The Place of Civil Defence in the Strategic Balance

Civil defence contributes to damage limiting. Indeed, in terms of lives saved per dollar spent, if war does occur, it is a very cost-effective form of damage limiting. From the point of view of the Superpower installing civil defence, it contributes nothing to assured destruction. From the point of view of the opposing Superpower, or of a third party, it reduces the margin of assured destruction of the opponent, and hence can be considered to jeopardize mutual stable deterrence.

The degree to which civil defence could be considered as "provocative" would depend on its design. If, for example, evacuation of cities were planned, there could be a presumption that this would be done in conjunction with the initiation of a first strike. Or, if an extended period of tension occurred,

the order to evacuate cities would be an escalatory step analogous to mobilization.

The possible influence of Canadian civil defence on the strategic balance can be assessed from several different viewpoints. The Soviet Union may consider Canada as no more than a part of the North American enemy. In this case they would believe that their ability to deter North America would be slightly reduced by a strong civil defence in Canada, to the extent that it would take more weapons to inflict a given degree of punishment in a retaliatory second strike. However, public statements and writings by Soviet authorities indicate that they consider "purely defensive" systems as legitimate and non-provocative. And the Soviets may consider Canada as a separate unit from the USA, but recognize that our population would be seriously endangered by radioactive fallout in a counter-force attack against offensive weapon systems based in the USA.

From the point of view of Canada, the vulnerability of our population to radioactive fallout if the ICBM silos in the Northern USA are attacked by groundburst weapons is a very real and important danger. It is difficult to see how anybody could interpret protection against this threat as being provocative to anyone. And, despite certain individual opinions to the contrary, Canada cannot be a disinterested Third Party with no preference for either Superpower. We are very anxious that a nuclear exchange between the Superpowers be prevented, and therefore we wish to see mutual stable deterrence preserved. But quite apart from alliance and friendship, pure self-preservation makes deterrence of the Soviet Union more vital to us than deterrence of our neighbour.

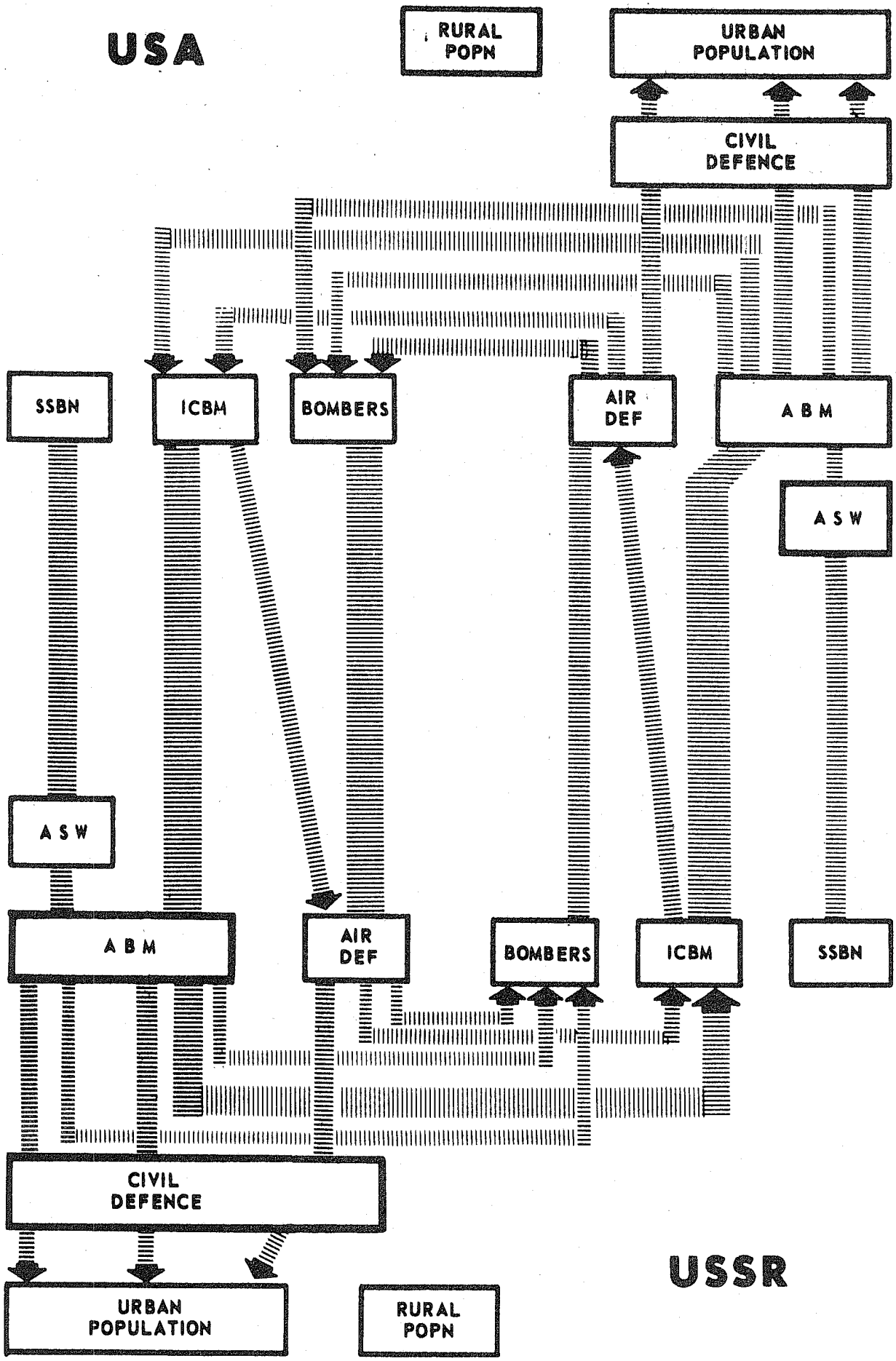
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FIGURE 1

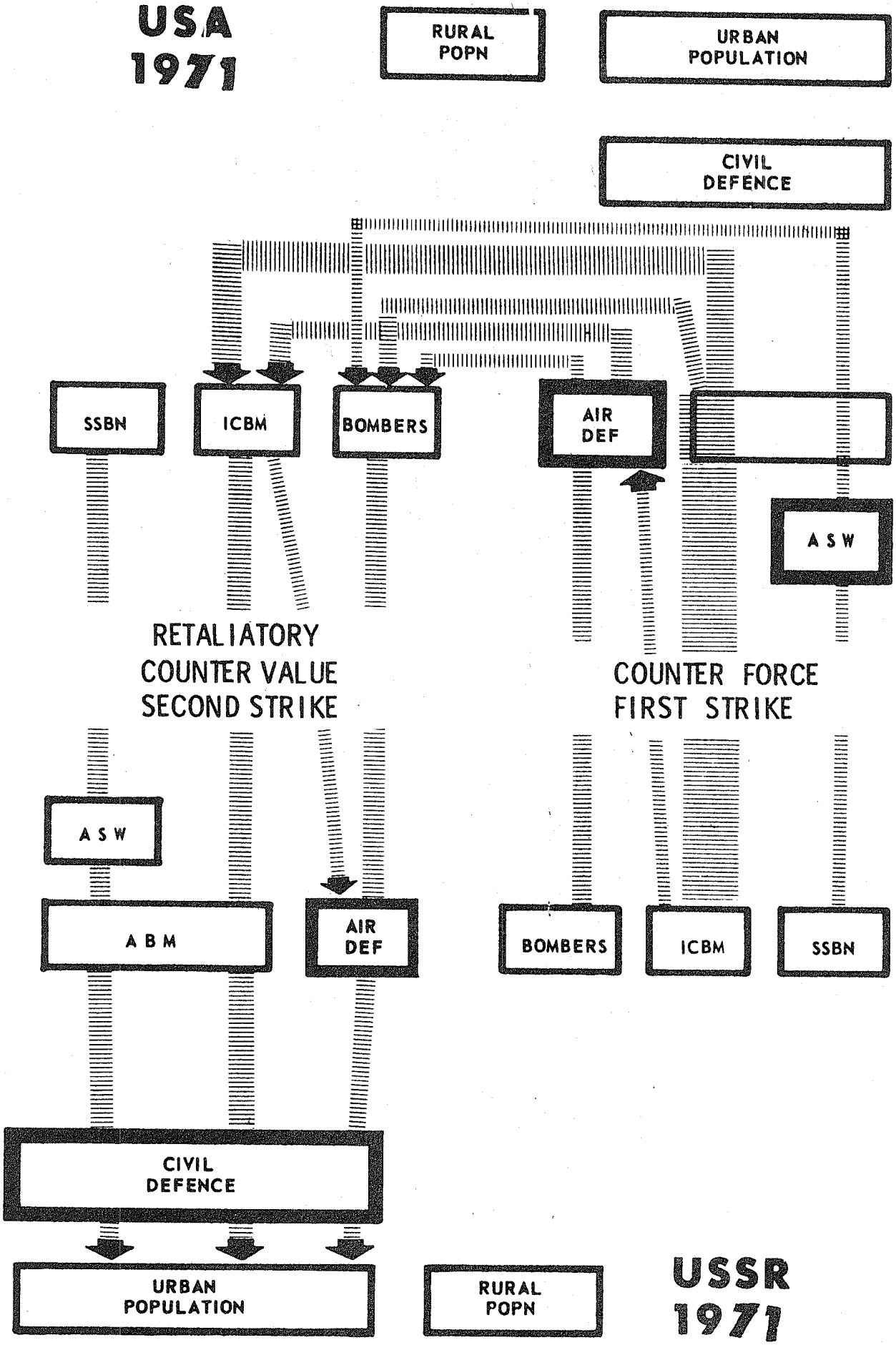
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FIGURE 2

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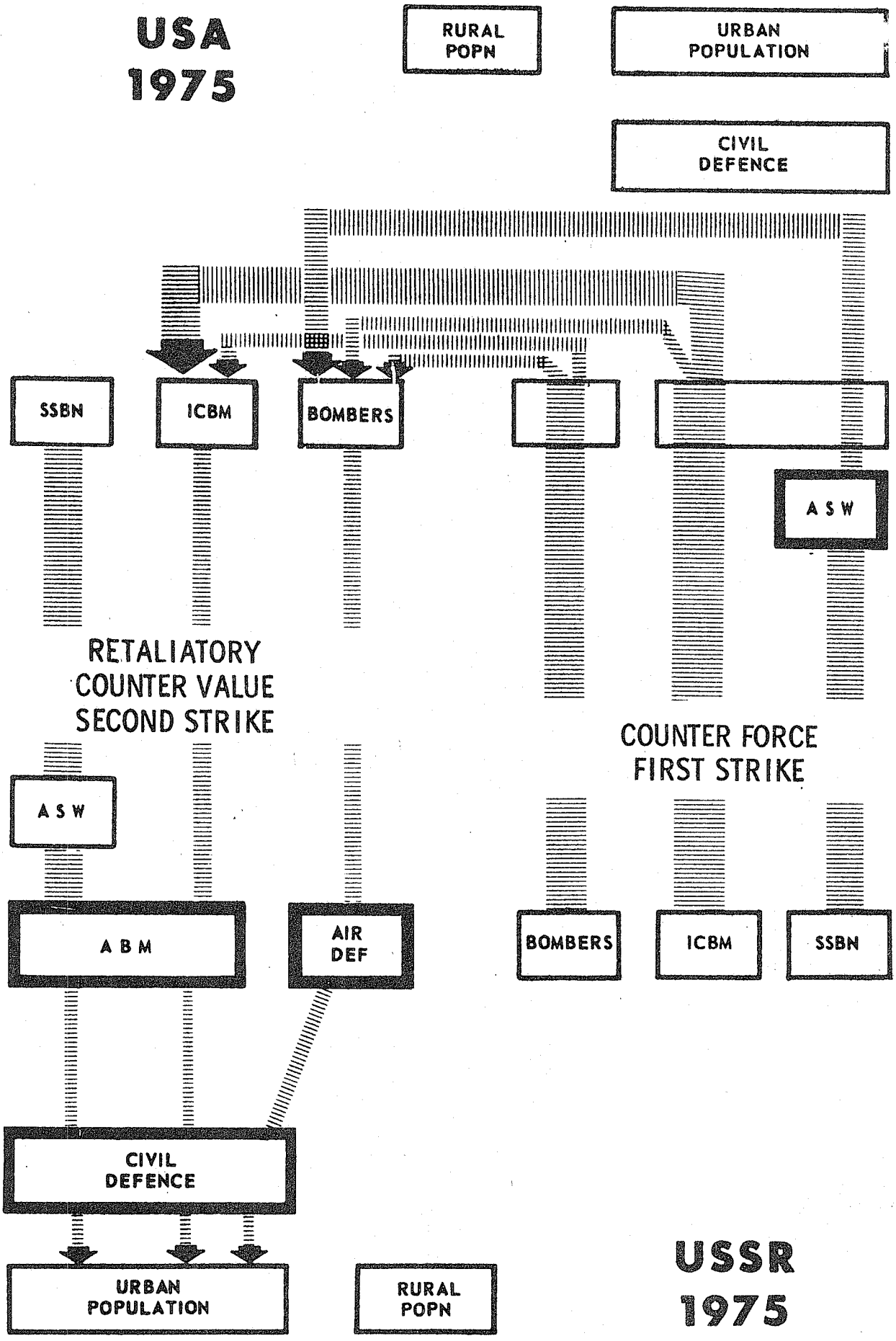
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FIGURE 3