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THE SIGNIFICANCE OF DIFFERENT WEAPON SYSTEMS FOR THE STABILITY OF DETERRENCE

by

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THE SIGNIFICANCE OF DIFFERENT WEAPON SYSTEMS FOR THE STABILITY OF DETERRENCE

I. INTRODUCTION

1. There have been interesting debates about the sequence of events preceding the appearance of a new weapon system, or of a new strategic posture. Which comes first? Does a perceived strategic need generate a program of research and development, culminating in a new weapon system designed to fulfil the strategic need? Or are new weapons spawned from laboratories motivated by technical curiosity and ambition, with doctrines for this employment and a changed strategic posture following in the wake of the opportunities offered by the newly-discovered technical capability? The question has been posed by asking whether R & D is moved by "requirements pull or technology push".

2. A similar question could be asked about the selection of weapons systems for arms control. Are existing weapons offered up for removal because they are no longer wanted, or because they appear to fit into a pattern of negotiations? Are weapons which do not yet exist foregone simply because they are not wanted? Or is the selection of weapons (whether existing or only planned) for arms control made on the basis of strategic reasons, possibly to enhance deterrence or to promote stability?

3. It would be the contention of this author that opportunism has been the driving factor in most cases, both for weapons procurement and weapons abandonment. There have been notable exceptions, such as the conversion of ICBMs to solid propellants and their burying in hardened underground sites, changes reducing the vulnerability to surprise attack and the incentive to launch on warning. Another was the rapid design and construction of strategic submarines armed with submarine-launched ballistic missiles and able to provide a secure second-strike retaliatory force for strategic deterrence. These were examples of technology produced on the demand of urgent

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strategic requirements. But there are innumerable cases in which technology has offered improvements in firepower, mobility, surveillance, communication, or some other capability, the system has been built and deployed, and the strategic significance only realized and exploited later on, after experience has been accumulated.

4. In the case of arms control, very little has been achieved in the form of actual reductions, and many of the agreements (such as demilitarization of the Antarctic, outer space, or the seabed) probably amounted to undertakings not to do what nobody had ever had any intention of doing anyway. However, the agreements to control proliferation of nuclear weapons, to limit ballistic missile defence, and to set limits on numbers and types of offensive strategic weapons have very real and valid justification on strategic grounds.

5. Although opportunities offered by technical developments or by openings for progress in arms control negotiations should not be disregarded when they occur, it would be more systematic if it were possible to establish an agreed set of strategic needs and dangers, and to categorize types of weapons which contributed positively or negatively to the provision of deterrence and of stability. This could be used to direct research, development, and procurement, and to channel the pressures for arms control in directions most likely to improve deterrence and stability. In the past two decades strategic deterrence has been kept stable by a combination of unilateral and of negotiated measures. International security would be improved by comparable trends in theatre nuclear and in conventional weapon systems.

6. The approach followed in the reasoning below is that the objective is increased security, to be achieved through strengthened deterrence and stability. This may be achieved by deploying sometimes more, sometimes less, weapons, or by accelerating or by

renouncing the development of a new type of weapon. Neither rearmament nor arms control are ends in themselves, but security is. Different weapon systems influence deterrence and stability in different ways, and attention should be paid to this factor as well as to cost and technical performance.

II. WEAPON SYSTEMS AND CENTRAL STRATEGIC DETERRENCE

7. For strategic deterrence to be stable in a crisis situation, each opponent must feel certain that a counter-force first strike against him could not succeed in destroying most of his retaliatory weapons. If he depends on mobility and concealment for the survivability of his ICBMs, this must be adequate to defeat the opponent's surveillance and reporting system. SSBNs deployed at sea must be invisible to the opponent's sensor systems. A surveillance system good enough to track mobile ICBMs and submerged SSBNs could destabilize strategic deterrence in a crisis. However, it does not seem likely that current technology has reached this level of accomplishment. Any measures enabling retaliatory systems, including their facilities for command, control, and communications, to survive a surprise attack reduce the motivation to adopt the extremely destabilizing posture of "launch on warning".[1,2]

8. A warning system giving bombers and other components of the retaliatory system time to increase their survivability would be stabilizing in a crisis, as would be surveillance giving reliable indications whether certain steps likely to be associated with the preparation of a surprise attack were or were not being taken by the adversary in a time of confrontation.

9. The concept of stability can be applied to arms control as well as to deterrence in time of crisis.[3] In this case the time scale is one of years rather than minutes, hours, or days. A situation would be stable if neither opponent felt a compelling need to acquire greater military strength in the future. Such might be the case because of an arms control agreement. Surveillance

capable of verifying compliance with agreements (or detecting violations) would be stabilizing from the point of view of arms control.[4,5]

10. Assuming that satellite surveillance systems are not capable of tracking mobile ICBM launchers or submerged submarines, but are able to give early warning of missile launch, preparations for surprise attack, and indications of arms control violations, then surveillance and warning satellites contribute to the stability of central strategic deterrence, and the activation of antisatellite operations would be highly destabilizing.

11. The increasing accuracy of long range missiles, coupled with the deployment of multiple independently targeted re-entry vehicles (MIRVs) is a destabilizing development, since it improves the chances of success of a counterforce strike against fixed targets. However, once the probability of target kill approaches 100% per warhead, further increase in accuracy will have little added effect, except that as the miss distance approaches zero, smaller warheads can be used, the amount of unwanted collateral damage will be decreased, and the escalatory effect of highly selective use of nuclear missiles could be reduced. Since multiple warheads of small yield and inferior accuracy, especially on SLBMs, are adapted to retaliation against cities, even if defended by BMD, rather than counterforce use, they can be categorized as stabilizing.

12. Ballistic Missile Defence was considered as destabilizing when it was intended for the protection of cities. This could be argued for crisis stability, since the cities of an attacker might be defended from retaliation, and also for arms control stability, since the existence of BMD could motivate the opponent to add MIRVs, MARVs,or more missiles to his inventory. However, a form of BMD intended for the defence of hardened weapons or command centres could be stabilizing. Such an option could prove more cost-effective than the combination of mobility and concealment planned for the MX.

13. Since their time of flight is very slow as compared to that of ballistic missiles, long range cruise missiles are better adapted to a retaliatory mission than to a surprise nuclear first strike. ALCMs will prolong the useful life of heavy bombers, which are unlikely to be seen as first strike systems. Thus cruise missiles do not work against the crisis stability of strategic deterrence.

14. Although the chief purpose of the strategic weapons systems, at least for the West, is to deter the outbreak of war, a further purpose is to deter unwanted escalation (whether from conventional to nuclear, or from very limited nuclear upwards), for deliberate escalation to avoid defeat, or for damage limitation. Actual employment for intra-war deterrence would probably take the form of highly selective attack of carefully chosen military targets, dependent on the best possible reconnaissance and weapon accuracy.

15. Once nuclear weapons had been used by either side, reliable command and control would be absolutely vital. All or nearly all of the least vulnerable forces (such as SSBNs) would probably be withheld to retain the ultimate deterrent of attack on population. To the extend that antisatellite operations and electronic warfare disrupted intelligence gathering and command and control, and communications, the danger of unintended use (or failure to use) strategic weapons would be increased.

16. Intercontinental sorties by heavy bombers are unlikely except for the delivery of nuclear weapons, or possibly for reconnaissance of the results of nuclear attack. Once strategic nuclear weapons have been employed, warning and defence against intercontinental bombers will acquire augmented significance, with consequent enhanced importance for the role of AWACS.

III. WEAPON SYSTEMS AND THEATRE DETERRENCE

17. Many of the relationships between weapon technology and central strategic deterrence apply as well to nuclear deterrence at the theatre level. The new longer range theatre nuclear weapons (both ballistic and cruise missile) will probably rely on concealment under natural foliage rather than in prepared shelters. Nevertheless, while their mobility makes them more likely to survive, they may still be detectable by advanced techniques of surveillance. Since long range cruise missiles fly at subsonic speed, they are not well suited for a counter-force first strike.

18. Aircraft located on large bases in a theatre of war are extremely vulnerable to attack by nuclear weapons, and are unlikely to be able to save themselves by flying off on receipt of warning. Shelters enhance survivability under conventional attack, and VSTOL aircraft may be dispersed away from bases. It could be argued that the placing of nuclear-armed strike aircraft on large bases offers an incentive for the opponent to deliver a pre-emptive nuclear attack, so that such deterrence as they provide is unstable.

19. Deterrence at the theatre level is concerned not only with prevention of the outbreak of war (pre-hostilities deterrence), but also with the prevention of uncontrolled escalation through increasing levels of intensity from conventional up to theatre nuclear conflict or higher (post-outbreak or intra-war deterrence). For this purpose it is important that systems such as aircraft and artillery capable of both conventional and nuclear attack should not suffer severe attrition during the early (conventional) phase of operations. Their probability of surviving a period of conventional operations will be enhanced if highly accurate ordnance and the prevailing conditions of battle allow them to carry out their missions with a minimum of exposure. Conversely, very effective air defence weapons are

likely to exact heavy attrition during the early conventional operations, decimating the number of dual-capable aircraft before they are called on for nuclear sorties.

20. If nuclear weapons are used in limited numbers against selected military targets only, with high accuracy and low energy yield, there may be some possibility of avoiding escalation up to the level of intentional destruction of population centres. In this regard, weapons such as the Soviet SS-4 IRBM, first deployed in 1959, with a megaton-sized warhead and poor accuracy, are very likely to inflict a great deal of collateral damage, whether intended or not, quite possibly interpreted by the recipients as a counter-value attack representing a higher degree of escalation than called for by the military situation. Such weapons should be early candidates for removal.

21. Pre-hostilities theatre deterrence will be improved by surveillance systems able to give warning of attack, including AWACs. On the other hand, effective reconnaissance by non-intrusive means such as satellites could aid in the preparation of a surprise attack, as would the possession of weapons capable of highly accurate indirect fire.

22. The ability to deter a theatre attack is closely related to the ability to fight a theatre war. At the conventional level, technology which favours defence over attack will enhance both pre-hostilities and post-outbreak deterrence. However, it is by no means clear whether the appearance of Precision Guided Munitions will produce an overall net benefit to the defence.[6] Improved night vision equipment, VSTOL aircraft, Remotely Piloted Vehicles, cruise missiles, AWACS, and look-down shoot-down fire control will contribute to both sides of the ledger.

23. Since the aggressor is likely to depend heavily on armoured units for breakthrough and exploitation, deterrence of attack will be greatly enhanced by effective anti-tank defences. Precision-Guided Munitions, launched from aircraft, helicopters, land vehicles, and sites on the ground, together with remotely

delivered mines, may provide such effective anti-tank defence. On the other hand, good reconnaissance, air superiority, electronic warfare, improved tank armour, and the accurate delivery of improved conventional munitions by aircraft and artillery may be enough to neutralize the defences and permit the armour and infantry to advance. In this latter eventuality, the only way to halt the armour could be by escalation to use of low-yield nuclear battlefield weapons such as Reduced Blast/Enhanced Radiation Warheads.

24. If one side used chemical weapons against which the other had no effective defence, the former would derive a tremendous advantage whether he was attacked or defending territory. To have weak chemical defences against an adversary with strong CW capabilities is destabilizing, since the opponent is provided with a strong motivation to initiate use of CW.

25. If one or more of the new systems proves to be particularly effective, adequate resupply of the key items could be decisive. And if the new weapons prove capable of inflicting severe destruction, the results of the battle could turn on attrition, reinforcement, and heavy continuing resupply. In this event, added significance will be given to maintenance and to interdiction of the lines of supply, across the seas as well as on land, with increased motivation to employ nuclear weapons, perhaps especially at sea. Good reconnaissance, accurate navigation and weapon guidance, and cruise missiles (possibly armed with conventional rather than nuclear warheads) will be important for interdiction of the LOC behind the front, while effective air defence, including SAMs, AWACS, and look-down shoot-down interceptors will be the main elements in maintaining the LOC.

IV. WEAPON SYSTEMS AND MARITIME STRATEGY

26. The three main functions of naval power are to deny the use of the seas to enemies, to defend the use of the seas by friends,

and to project military power ashore. Some new technologies, especially in the field of antisubmarine warfare, are likely to affect all three functions, but particularly those of defence of the Sea Lines of Communications and assurance of, or operations against, the deterrent function of SSBNs.

27. It is sometimes argued that antisubmarine warfare is a destabilizing activity for the reason that it endangers the SSBN, probably the most effective system for assured strategic retaliation. However, a nation or an alliance which depended on the seas for its wartime supplies could not afford to neglect defence against antishipping submarines. The significance of ASW for stability and deterrence is more likely to turn on the possibility of protecting merchant shipping than on the possibility of being able to destroy SSBNs deployed on patrol.

28. For the defence of merchant ships, the most difficult task for escort vessels is the detection of submarines at a distance sufficient to permit engagement (or evasion) before the submarine is able to complete the attack. For this purpose, towed sonar may prove to be of great assistance. Surface ships are unlikely to be effective against strategic submarines, so that towed sonar can be characterized as stabilizing.

29. Accurate weapons guidance is likely to aid aircraft, ships, submarines, and coastal defences in their attack on surface ships more than it will aid surface ships to defend themselves against these threats. Electronic warfare may prove to be the most valuable countermeasure for defeat of antiship cruise missiles. Thus, for the purpose of defence of the sea lines of communication, precision guidance is destabilizing while ECM is stabilizing. This situation could be reversed in the event that merchant ships are fitted with anti-aircraft and anti-missile self-defence weapons, perhaps in the form of modules that could be transferred from ship to ship, rather than counting on warships to defend the merchant ships by use of area air defence weapons.

30. Marine mines can be used in an offensive mode against merchant shipping, usually in waters where mine countermeasures are possible. They can also be employed for defence against naval vessels, including amphibious craft and submarines, often in circumstances where mine countermeasures by the attacking forces are not possible.

31. The striking power of the large aircraft carrier depends on its attack aircraft, while its survivability against enemy air depends on its airborne early warning radar and high performance fighter aircraft, supplemented by antiair and antisubmarine escort ships. It is unlikely that VSTOL aircraft can be designed to accomplish these missions, at least in the next few years, so that power projection and to some extent sea denial will depend on carrier battle groups. However, the very important embarked airborne component of the antisubmarine function can be executed by aircraft with modest speed and payload. If VSTOL aircraft could be designed for missions intermediate between those of large land-based maritime patrol aircraft and embarked antisubmarine helicopters, they could be placed with helicopters on small antisubmarine carriers or on antisubmarine cruisers no more than a quarter the size of the modern attack carriers. Following recent Soviet practice, air defence could be provided by surface-to-air missiles mounted on the forward end of the ship, while land-based AWACS could supply early warning of air attack. Thus, defence of shipping against submarines may be aided by VSTOL aircraft.

32. Surveillance has special significance for operations against surface ships, which are unable to hide from radar-equipped satellites. It follows that antisatellite measures, including electronic warfare, could have a major role in the protection of surface shipping.

V. THE NEW TECHNOLOGIES AS SUBJECTS FOR ARMS CONTROL

33. The first four sections of this paper have discussed the probable impact of certain military technologies on deterrence

and warfighting. Particular attention has been paid to their impact on the stability of the strategic and theatre balances, and for this a distinction has been made between crisis stability, concerned primarily with pre-hostilities deterrence of the outbreak of violence, and with post-outbreak deterrence against escalation in the level of violence, as contrasted to arms control stability, concerned with motivation to deploy more weapons systems, whether in response to a perceived new threat posed by the opponent or to exploit an opportunity afforded by new technology.

34. Presumably, the objectives of arms control include the strengthening of both types of stability. While arms control may have inherent virtue in itself, based on economic or moral grounds, it would be an ironic application of general principles if steps were taken in the name of arms control that rendered the strategic balance unstable against either type of escalation - violence in a crisis or increased stimulations to build large new weapons systems. Hence, when considering the desirability of attempting to control various forms of military technology, in addition to criteria such as "how much money would it save?", "will it be practical?" and "to what extent could agreements be verified?" we need to ask "will it promote or damage crisis stability?" and "will it stimulate the creation of new weapons systems?"[14]

35. Arms control has had little success in discouraging research on military technology. None of the new technologies discussed in this paper are prohibited by arms control agreements. Some new devices such as low-powered lasers, millimetre-wave radars, and infrared carrying equipment are being put to new military applications currently. Others, such as high-powered lasers and charged particle beams, may have important military applications following a period of research and development. There seems little prospect of agreement to restrict research, largely for the reason that no one can foresee what applications may be forthcoming. It is

instructive to note the provision of the SALT I ABM Treaty, which allowed modernization and replacement of permitted systems or components, prohibited development, testing, and deployment of forbidden types of ABM systems or components, and agreed that in the event that ABM systems based on other physical principles are created in the future, then specific limitations on such systems and their components would be subject to discussion. The concentration on intention or function rather than on qualitative design is more likely to lead to meaningful agreement.[15]

36. While the existence of highly capable reconnaissance and surveillance systems adds to arms control stability, it has both stabilizing and destabilizing aspects for crisis stability. Accurate weapon guidance is destabilizing for strategic deterrence, especially when coupled with multiple warheads and precise reconnaissance. Effective anti-tank guided missiles and shipborne SAMs are stabilizing factors for conventional deterrence. With the technology as advanced as it is, there would seem to be little possibility for reversing these developments.

37. Weapon mobility, VSTOL, cruise missiles, and tailored nuclear weapon effects tend to support crisis stability. AWACS and look-down, shoot-down capability also support crisis stability, but could help either offence or defence in warfighting.

38. Improved conventional munitions probably aid offence more than defence, although this will depend on circumstances. Development would be difficult to control, agreements to desist hard to verify.

39. Electronic countermeasures could nullify surveillance and warning systems, which would be destabilizing, but could be used to defend ships against detection by satellites and attack by missiles, which would be stabilizing. ECM is likely

to help air attack more than air defence over land, and more likely to help armoured attack than anti-tank defence. Except at sea, electronic warfare is probably on balance a destabilizing aid to the offence. For purposes of arms control, electronic warfare stimulates a contest of measure, countermeasure, and counter-countermeasure.

40. Inasmuch as early warning and communications satellites promote crisis stability, and reconnaissance satellites arms control stability, an anti-satellite system would be destabilizing. On the other hand, reconnaissance satellites could help to prepare an attack, especially against surface shipping, in which case their destruction would be stabilizing. Removal of navigation satellites would interfere with the accurate guidance of certain missiles, which could be stabilizing.

VI CONCLUSION

41. It is not possible to identify any of the existing weapon systems or new technologies as totally offensive or completely destabilizing. It is possible to label some as definitely favouring deterrence, defence, crisis stability, and arms control stability. But for most, there is potential for use in both offence and defence, and influences that could be either stabilizing or destabilizing.

42. The accompanying tables show some systems which can be listed on one or the other side of the ledger. Table I compares strategic nuclear systems better suited for counterforce first strike or countervalue retaliation. Table II shows conventional systems contributing more to offence or defence. In Table III systems are characterized as stabilizing or destabilizing, with a distinction being made between crisis stability and armament stability.

WEAPON SYSTEMS	COUNTERFORCE FIRST STRIKE	COUNTERVALUE RETALIATION
Fixed ICBMs with very accurate MIRV	X	
Mobile ICBMs with small warheads and no more than intermediate accuracy		X
SLBMs with small warheads and no more than intermediate accuracy		X
Strategic Bomber Aircraft		X
Nuclear-Armed Cruise Missiles		X

TABLE I

SUITABILITY OF CERTAIN WEAPONS SYSTEMS FOR FIRST OR FOR SECOND STRIKE

WEAPON OR TECHNOLOGY	OFFENCE	DEFENCE
Electronic Warfare	X	
Anti Tank Mines		X
Anti Tank Precision Guided Missiles		X
Precision Guided Surface-to-Air Missiles		X
Modular SAMs for Merchant Ships		X
Towed Sonar		X

TABLE II

WEAPONS OR TECHNOLOGIES ADAPTED FOR OFFENCE OR FOR DEFENCE

SYSTEM	STABILIZING		DESTABILIZING	
	CRISIS	ARMAMENT	CRISIS	ARMAMENT
Missile Warning Satellites	X			
Communication Satellites	X			
Reconnaissance Satellites		X		
Mobile Ballistic or Cruise Missiles	X			X
BMD of Retaliatory Weapons	X			X
BMD of Cities			X	X
Navigation Satellites			X	
Antisatellite Systems			X	X

TABLE III

SYSTEMS WITH STABILIZING AND/OR DESTABILIZING TENDENCIES

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McGeorge Bundy. Maintaining Stable Deterrence. International Security 3, 3, 1978/79, p. 13.

2. "We should avoid all systems that require a hair-trigger decision from the President for their effectiveness". Ibid p. 14.

3. These two aspects of strategic stability have a fair degree of acceptance in the West. However, according to Richard Burt, "The most conspicuous aspect of the SALT enterprise is the absence of any shared consensus between the two sides over the meaning of strategic stability".
Richard Burt. The Future of Arms Control (2): A Glass Half Empty. Foreign Policy 36, Fall 1979, pp. 33-48.

4. Ted Greenwood. Reconnaissance and Arms Control. Scientific American, February 1973.

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defence, and thus enhance deterrence, with that from Refs 11, 12, 13, and others, which thought that PGMs could be used effectively by both sides and might weaken deterrence. Mearsheimer's own judgement was that the destabilizing capability to successfully engineer a blitzkrieg attack would be reduced by the presence of PGMs.

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