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Mitchell McGuire
Bond University

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China's Nuclear Environment and the US Theatre Missile Defence Initiative

by Mitchell McGuire

ABSTRACT

This paper examines the various factors that have shaped, and continue to mould, the contemporary nuclear environment of the People's Republic of China. First and foremost, the discussion confronts, and attempts to clarify, some persistent obstacles that confound analyses of China's nuclear posture, while specifically, it addresses those indigenous and external dynamics that determine, constrain and threaten China's nuclear capabilities and its likely posture. It emerges that China's nuclear posture is most credible at a regional level, particularly in northeast Asia. However, such credibility has come under scrutiny because the United States recently decided to hasten the development of Ballistic Missile Defence (BMD) within the northeast Asian theatre. The possible deployment of BMD, combined with other political factors, suggests that the time is ripe to reassess nuclear, missile and BMD strategies in the region.

Introduction

It was widely assumed in the few years preceding and following the end of the Cold War, that the utility of massive nuclear arsenals, which pillared the superpowers' foreign policies during the bi-polar era, would diminish and retreat into the geo-strategic background. It was hoped that the international landscape would be transformed into some yet-to-be defined, 'New World Order'. There was some promising evidence to justify this sentiment. Witness, for example, both the Strategic Arms Reduction Talks (START) treaties and the Intermediate Nuclear Forces (INF) treaty that sought to significantly reduce and disarm nuclear weapons from the inventories of the United States (US), the Soviet Union and then its successor states. Witness French and British initiatives that have similarly reduced their former Cold War arsenals. Witness, furthermore, the type of human conflict that has transpired in the post-Cold War era without recourse to nuclear force, via humanitarian and peacekeeping means in Somalia and Rwanda for example, or the more orthodox, conventional military means in the Persian Gulf, Bosnia and, now, Kosovo. The utility of nuclear arsenals has receded and, it seems, has no applicability in contemporary modes of war.

The role of nuclear weapons in Asia, however, defies this western aversion to nuclear force, a fact graphically illustrated recently when Pakistan exploded several nuclear weapons in response to India's nuclear tests in May 1998. (1) Furthermore, recent trends in nuclear environment of the People's Republic of China (PRC) provoke the impression that there is a growing affinity for nuclear power as it enters the third millennium. China's consistently pursued policy of major power status and its global economic clout combine to place China in a pivotal position in the future conduct of world affairs. Indeed, China is modernising its ballistic missile (BM) technology, as well as upgrading and expanding its existing nuclear capabilities. (2) China's nuclear environment, then, makes for interesting analysis not only because it seemingly defies an emerging western trend that de-emphasises and devalues nuclear force, but also because the Chinese case is itself a unique and unorthodox phenomenon for many reasons. The following discussion examines the multiple aspects of the nuclear issue as it applies in China today.

From the outset it specifically addresses two underlying issues that rarely receive detailed treatment in scholarly work on China's nuclear posture: the margin of error between the lower-bound and higher-bound assessments of nuclear warhead numbers, and the qualitative and quantitative inferiority of its nuclear capabilities. The discussion explores the links among the 'warhead quantity dilemma', quantitative and qualitative limitations, and the strategy China may subsequently pursue. In that connection, there is a general consensus that China pursues 'minimum deterrence', a posture apparently limited by capabilities, but encouraged by a tendency to cloak nuclear objectives and goals in ambiguity and obscurity. It is argued that China cannot pursue the typical posture of 'strategic' deterrence, but that its capability to deter nuclear war is most credible, and achievable, at a regional level. While China's nuclear posture successfully defies orthodox deterrence principles, its credibility to inflict nuclear damage at a regional level has come under renewed threat by the US. These capabilities may be, in theory, neutralised via US Ballistic Missile Defence (BMD) programs in northeast Asia. The analysis concludes that in all practical likelihood China's current regional nuclear deterrent will remain valid. Nevertheless, the alternatives China could pursue if its regional deterrent posture is undermined by US BMD are discussed, as is the impact on China and the international arena if these alternatives are indeed developed.

China's Nuclear Environment

From the outset it must be acknowledged that an examination of China's nuclear environment faces several daunting problems. The most significant being that China has never elucidated a coherent policy that would explain the utility of nuclear force. Tied to this notion is the fact that Beijing's military decision-making process is particularly opaque to external observers. It seems unlikely the West can change this dynamic, and it is furthermore improbable that China would voluntarily remove this obstacle. It is likely, then, that this phenomenon will persist. Nevertheless, western analysts have argued that China's 'no declared doctrine' *is* China's nuclear policy where emphasis lies in ambiguity, deception and secrecy.(3) Despite the absence of a declared nuclear policy, western strategists have over the years inferred and extrapolated potential postures for the utility of nuclear weapons based on certain known constants in China's nuclear environment.

For example, the West knows that China possesses strategic and theatre-level nuclear weapons, deployed on Intercontinental Ballistic Missiles (ICBMs), Intermediate Range Ballistic Missiles (IRBMs), Submarine Launched Ballistic Missiles (SLBMs) and Short Range Ballistic Missiles (SRBMs).(4) Subsequently, the West is aware of their basing modes with the majority of China's nuclear forces land-based and apparently quite mobile.(5) It is also a known fact that China has the indigenous natural resources, technological facilities and technical expertise to harness nuclear energy and 'make' nuclear weapons,(6) and possesses a stockpile of weapons-grade material to enlarge

them.(7) Furthermore, China's nuclear technological levels, comparatively, are known to be significantly inferior to the West,(8) and it seems that Beijing has only a token appreciation for nuclear arms control.(9) Notably absent from these known constants however, is the specific number of deployed nuclear warheads, a critical factor in any assessment of nuclear doctrine.

Warhead Quantity: The Unknown Variable

Western analysts and sources have, from time to time, speculated on the number of warheads at China's disposal, but marked differences in opinion appear to leave the problem as an essentially contested issue. Such a conclusion however, does little to assist a comprehensive study of China's nuclear strategy. Consequently, what has emerged over the years is a quantitative spectrum of nuclear warheads and their delivery systems. This does not deny or exclude the importance of other factors, but if all these elements in China's nuclear equation were ranked in an apex of analytical importance, the quantity of nuclear warheads in its arsenal is perhaps the paramount variable. Indeed, warhead numbers are a crucial issue in any nuclear environment, but in China's case it assumes a position of much greater importance because it is simply not known for certain how many warheads it possesses. How, then, does one attempt to postulate a role for Chinese nuclear forces within the ambit of a so-called strategy of 'no declared doctrine', based on capabilities yet to be quantified accurately? Warhead quantity becomes an ideal frame of reference, the foundation from which to examine China's nuclear strategy.

A Conservative Perspective

Representing the lower number of the quantity spectrum are those that can be termed the conservative estimates, the most recent of which is the annual publication by the International Institute of Strategic Studies (IISS). *The Military Balance* estimates are based on weapon delivery systems alone, not a forecast of how many nuclear warheads are in China's inventory. However, it is reasonable to argue that China has at least one nuclear warhead per ballistic missile. The ICBMs comprise the DF-5, DF-5A and the DF-4. (10) The DF-5 and the DF-5A have ranges of 12000 and 13000 kilometres (km) respectively, while the DF-4 can reach a distance of 4750km.(11) The IISS in 1998 reported that together there are seven deployable DF-5 and DF-5As, and the DF-4 numbers more than ten.(12) The IRBM class is represented by the DF-3 with a range of 2800km, the DF-21 and DF-21A that can travel distances of 1700km and 1800km respectively.(13) Apparently the DF-21 and DF-21A together amount to about eight deployable missiles, while there are more than thirty-eight DF-3s.(14)

There is but one type of missile currently deployed in China's SLBM category, the JL-1, which is a sea-based variant of the land-mobile DF-21A IRBM.(15) Its range, therefore, is 1800km and China is believed to deploy only one ballistic-missile submarine equipped with twelve JL-1s.(16) Lastly, China's SRBM category is made up of the DF-15 which has a range of 600km and the DF-11 which can reach a distance of 300km.(17) According to the IISS, China deploys only four DF-15s and is curiously silent on a figure for the DF-11.(18) Based on the IISS estimates for 1998 China has about eighty Ballistic Missiles (BMs) of strategic and regional ranges which quite reasonably implies that it also has at least an identical number of nuclear warheads. The IISS estimates represent the minimum of *all* speculated assessments of warheads in China's nuclear inventory.

The next two conservative assessments again rely on missile delivery systems. Godwin's 1996 ICBM numbers are identical to current IISS estimates.(19) However, it is asserted that China's IRBMs, the DF-3 and DF-21s number more than sixty and ten respectively. (20) Godwin's JL-1 SLBM numbers are also the same as those claimed by the IISS.(21) Tow, in 1991, puts the ICBM figure at less than fifteen, but asserts that China's DF-3

IRBM numbers more than one hundred.(22) While neither mention China's SRBMs, let alone an estimate of their quantity, Godwin believes China's BMs total approximately one hundred (23) while Tow, writing five years earlier, put the number, in the very least, at about a hundred and fifteen.(24) Importantly, Godwin and Tow's figures augment the current IISS estimates even though they were postulated two and seven years earlier and do not even factor China's SRBMs into the equation. The omission is important because the DF-11 and DF-15 were deployed in 1988.(25) Therefore, at a minimum, based on Godwin and Tow's estimates, China's possession of more than one hundred BMs suggests that China may have at the least an identical number of deployable nuclear warheads.

Bold Assessments

On the other hand, representing the higher-bound BM numbers of the warhead quantity spectrum are those that can be termed the bolder assessments. Some observers have preferred to offer total figures, dispensing with the need to consecutively attach numbers to weapon systems. Mohan Malik, in 1990, believed China possessed between 500 and 650 nuclear warheads,(26) while Sutter, four years later, preferred a lower estimate of 200-300.(27) The most extreme of all estimates used here is Hahn's 1987 assessment that China's warheads numbered 1245 and delivery systems amounted to 700.(28) Of the estimates that attach warhead numbers to delivery systems, Anselmo's is the most recent. Accordingly, there are seven DF-5s, between ten and twenty DF-4s, fifty to sixty DF-3s, thirty-six DF-21s and twelve JL-1s.(29) There is, however, no estimate of China's SRBMs, apart from the observation that they exist and are nuclear capable. Furthermore, Anselmo introduces the often ignored factor of air-borne delivery systems, estimating that China has 150 warheads in stockpile for its 120 H-6 Bombers.(30) In total, according to Anselmo, China possesses between 270 and 300 deployed nuclear warheads, a number which would increase if China's SRBMs were included.

Three years earlier, Gronlund *et al.* proposed a similar figure. They assert China deploys only four nuclear DF-5s and twenty DF-4s. The rest, some 270 warheads, are deployed on "other missiles, submarines and aircraft".(31) Furthermore, they believed another 150 nuclear warheads exist but on undeployed tactical missiles.(32) If this was in fact the case, China's arsenal of nuclear warheads would increase to 450. Moreover, Prados, writing in 1989, proposed the slightly lower figure of 350 in total, arguing that China's DF-3 accounted for sixty warheads and the DF-21 fifty.(33) China's DF-5 and DF-4 together accounted for twenty warheads, while the JL-1 amounted to thirty. The remainder, some 160 warheads, were believed to be air-capable, deployed on the H-6 Bomber.(34) If the approximate figure of 300 warheads is accurate then it seems the size of China's nuclear forces has not altered much since the late 1980s, given Prados' 1989 estimate and Anselmo's similar assessment eight years later.

At this juncture, some preliminary conclusions can be made. The first and most transparent, is that warhead quantity for China remains an unsettled issue. From the outset, there was no contention that this debate could be resolved, or that the issue is at all resolvable. In part, the purpose behind the 'warhead quantity dilemma' as posited here, was to highlight the intractable problem confronting observers and analysts of China's nuclear forces. However, among the seemingly disparate and often opposing postulates of warhead and delivery system quantity, one consistent pattern does emerge. Based on the great majority of quantity assessments discussed, conservative and bold alike, there exists a consensus, whether explicit or otherwise, that China's nuclear arsenal is dominated in number by regional, or theatre-level, capabilities. That is to say, that across the entire quantity spectrum, regardless of the conservative and bold categorisations, it is believed that of China's total nuclear arsenal, between roughly seventy-five (35) and ninety-five percent (36) is composed of the DF-21s and DF-3 IRBMs, the JL-1 SLBMs

and the DF-11 and DF-15 SRBMs, plus the aircraft delivery component. Specifically, based on all sources discussed, the spectrum suggests that approximately eighty-five percent of China's nuclear forces can be regarded as having a regional or theatre-level utility. This fact prompts several interesting questions. How might China emphasise its regional nuclear prevalence in a doctrinal context? Indeed, what would this suggest about China's long-range strategic nuclear capabilities, their utility and relevance in broader notions of nuclear deterrence? These and other issues must be addressed at length to establish what posture China pursues not only within the scope of its nuclear environment, but also as it interacts with other nuclear adversaries and its non-nuclear neighbours.

Chinese Nuclear Thinking: The Technological Determinants

One analyst has argued that for China's nuclear deterrent posture "very few nuclear missiles, anywhere from a handful to several tens, are sufficient." (37) Johnston continues the western trend to categorise China's posture as a 'minimum deterrent' and suggests that "a state that employs minimum deterrence requires qualitative and quantitative inferiority". (38)

However, the presumption that China's deterrent posture was determined solely by doctrinal requirements is fundamentally incorrect. In China's instance, Johnston's causation must be reversed since it is more accurate to characterise its deterrent as one where qualitative and quantitative inferiority determined, or more aptly, delimited and constrained China's nuclear choices. Put another way, indigenous technological levels and capabilities dictated China's nuclear establishment, not a rigorous and detailed study of its strategic environment, nor a serious assessment of the perceived benefits that may accrue to China by virtue of its nuclear arsenal.(39) There are several reasons that explain this qualitative and quantitative inferiority, a constant dynamic in China's nuclear forces.

Qualitative Inferiority

From the outset, it must be noted that inferiority as described in most sources is *comparative*. That is, compared to western standards of technology and development in nuclear BM capabilities, China's progress is slow and technologically mediocre, producing small numbers of limited quality. Broadly, of the fifteen or so missile programs undertaken in China since the 1950s only six were successful. (40) It took an average of ten years for China's first-generation BMs to move from research and development (R&D) stages to operational deployment.(41) This somewhat lumbered progress can be attributed to several specific factors, though these elements must be viewed within a wider perspective.

China began its missile development programs solely within the ambit of a Sino-Soviet alliance. When Soviet aid dissipated the Chinese were left with piecemeal scraps of foreign technology and only a rudimentary technical understanding of their application. (42) Military self-reliance was forced upon a China that possessed a barely noticeable science and technology base and fledgling industries - existing within a principally agrarian economy.(43) Unlike the West, China's defence industry did not evolve through various epochs of military advancement but, it seems, progressed in a pendulous fashion, selectively superimposed by the most persuasive political forces of the day. China began its various indigenous programs from scratch, at a time when in the West the technology was already harnessed, deployed and rapidly gaining sophistication. China's BM programs were handicapped before they began, a critical weakness that has permeated through to contemporary times. Put differently, and risking over-simplification, the majority of China's current BMs in the late 1990s are of a technological standard similar to those deployed in the West during the 1950s and 1960s.

Inevitably, western analysts have compared the current status of China's BMs against those currently deployed in the West. It is these comparative analyses that highlight the deficiencies in China's current missile capabilities and although there are several characteristics that validate their claims of inferiority, two are worthy of note: vulnerability and inaccuracy. In China's case vulnerability refers to the threatened survivability of its strategic nuclear BMs against a nuclear attack.(44) There are two related aspects of China's BMs that heighten their vulnerability: dependence on liquid-fuel propellant for the majority of its missiles and their basing modes.(45)

According to one analyst the process involved in launching an ICBM is an extremely time-consuming effort. The time expended to get a missile fuelled, aligned and ranges set apparently took between a maximum of more than four hours, and a minimum of two and a half, not including transport time from storage to launch site.(46) The majority of pre-launch time however, was consumed by the fuelling process: DF-4 ICBMs have to be assembled then erected first; both the DF-4 and DF-5 are then fuelled very slowly because of the hypergolic (spontaneously igniting) nature of the chemicals in the oxidiser and fuel.(47) The net effect of this launching process means that the missile is, first and foremost, exposed and secondly, the pre-launch preparation process was far too time-consuming, virtually guaranteeing detection by foreign satellites. China's ICBMs, due to pre-launch exposure, therefore, have become easy targets and may invite a pre-emptive attack from an adversary.

Furthermore, China's ICBM vulnerability is heightened by their basing modes and deployment techniques. While the DF-4 ICBM is semi-mobile (stored in caves but exposed when launched) and apparently widely dispersed in the northeast and northwestern parts of China, sufficiently camouflaged and concealed to avoid detection, (48) the DF-5 ICBM is permanently based in underground silos, located in central and western China. (49) Their vulnerability has been partially overcome by the construction of fake silos throughout China's central territory designed to distract and deceive foreign satellites, and through the hardening of real silos to withstand the force of at least a lower-yield nuclear blast. (50) From one perspective, if viewed in isolation, China's strategic missiles seem quite secure. However, when the element of a numerically superior adversary is factored into the equation, the missiles' physical survivability is questionable.

If land-based strategic missiles failed to preserve deterrence, China's ability to retaliate is borne by its sea-based BM capability. China's SLBMs are much more survivable compared to their land-based brethren because of the intrinsic nature of submarine technology. They can travel virtually undetected, "using the surface of the sea to protect and cover themselves." (51) Despite the efforts to enhance survivability through sea-based diversification, China's current SLBM force is too few in quantity to significantly alter the outcome of a nuclear conflict.(52) While China may possess a 'proto' triad, its SLBM effectiveness is questionable and its nuclear-capable aircraft are considered far too obsolete to be a viable leg (53) in the strategic deterrent equation. These realities simply draw China's land-based strategic BMs squarely into focus, along with those original weaknesses in vulnerability and survivability that encouraged China to diversify in the first instance.

The second claim of inaccuracy is relatively self-explanatory. When determining accuracy for BMs the measure used is called Circular Error Probability (CEP). "The CEP of a missile is the radius of a circle within which fifty percent of all warheads fired at the same target will fall."(54) The lower the CEP the more accurate the missile, and vice-versa. The CEP of China's DF-3 and DF-4 ICBMs are greater than 1000 metres (m).(55) Thus according to the CEP, if ten of China's ICBMs were fired at the same point, at least half of them would fall within a cluster where they are not more than 2000m apart.

However, for one comparative example, the CEP of the American MX Peacemaker, the backbone of United States ICBM forces, is less than 100m.(56) If ten of these missiles were fired at the same point half of them would fall within a cluster where they are no more than 200m apart. Contrasted to the US ICBM, the DF-4 and DF-5, China's mainstay strategic BM, are extremely inaccurate. Indeed, this example of inaccuracy is but one of several weaknesses that underscore the general western trend that perceives China's BM capabilities as inferior. This western interpretation is ostensibly based on the confidence in their own BM technology.

A general but indicative example of western superiority is the fact that the US and its allies rely on third-generation BMs, whereas China in the late 1990s primarily depends on first-generation technology. Furthermore, Chinese missile survivability is threatened while western survivability is virtually assured. As seen, China's strategic missiles are vulnerable due to dependence on liquid-fuels, spawning other weaknesses like pre-launch exposure which can invite pre-emption. US missiles, on the other hand, use solid-fuel propellant which permits launching at moments' notice and allows missiles to be held at a permanent state of readiness for indefinite periods.(57)

Furthermore, Chinese BM vulnerability is further diminished by its underdeveloped deployment and basing techniques, while the West's deployment of forces is considerably mature and survivable. China's nuclear triad is currently ineffective. Comparatively, the SLBMs are, at this stage, unreliable due to few numbers and the air leg is virtually redundant. These factors redirect an adversary's focus upon land-based deployed forces and reduces commensurately their general survivability. Conversely, US diversification is complete and effective with over 330 deployed SLBMs, eighty-six advanced nuclear capable air bombers and about 500 deployed land-based warheads.(58) The unlikely destruction of one leg of its triad is sufficiently compensated by the survivability of the other two. Attempting to neutralise one leg of its triad, while improbable, is an untenable course of action since both remaining legs are structured in such a way as to assure a credible retaliatory posture. China clearly does not have the luxury of such an assurance.

Quantitative Inferiority

It would be accurate to assert that China's nuclear BM capabilities are indeed inferior to western technology. What is unclear however are the rationales for asserting quantitative inferiority. It is argued here that the prevailing index is indeed the technological factor. The quantum effect of a meagre technological base, the subsequent lumbered pace of BM R&D and deployment, and the comparative weaknesses of its existing capabilities have determined the limited pace of missile production and their deployment. It may be that production is simply a slow process, perhaps due to industrial inefficiencies or diseconomies of scale but, put colloquially, it is possible the 'wheels of production simply can not turn any faster'.

This may partially explain why China has not produced several thousands of missiles of inferior quality. While producing missiles is probably a slow process, and certainly China's past record indicates this, (59) however, it may be that production of first-generation BMs has halted altogether. Knowing that its second-generation technology is undergoing R&D, and that it is possible new BMs will emerge in the next decade or so, it could well be that China has discontinued the expansion of existing BMs based on first-generation technology since that technology will soon be superseded. It is reasonable to assert that Beijing would much prefer to devote as much fiscal resources as possible to new technology rather than fund older, soon to be indigenously inferior, technology. In China, it seems qualitative inferiority has directly influenced, if not determined, quantitative inferiority. This is particularly so in the late 1990s because it is likely existing nuclear BMs will not expand in number as China awaits the transition to second-

generation technology.

Deterrence Theory Applied: China's 'Minimum Deterrent'?

Is it correct, then, to argue that China pursues the unstated strategy of 'minimum deterrence', based on these qualitative and quantitative indices? What follows is an application of the appropriate characteristics in China's nuclear environment to the hallmarks of minimum deterrence. Buzan has outlined, theoretically at least, three inter-linked tenets crucial to the posture of minimum deterrence. First, and fundamentally, the deterrer must impose and maintain a threat of very high costs to the deterred; second, the deterrer must possess a secure force large enough to provide retaliation, or a second-strike; and third, possess a force that can account for potential target misses.(60)

Imposing a Costly Threat of Unacceptable damage: The Strategic and Regional Dimension

There are several aspects of China's ability to impose and maintain a threat of very high costs. Fundamentally, Beijing must be able to convince a potential adversary that it has the capability and the will to use nuclear force. How an adversary perceives China's nuclear forces and the political machinations that direct them ultimately determine what level of threat perception exists.(61) These two separate elements deserve further comment. China's forces, it has been illustrated, are considered inferior by one potential adversary, the US, in several aspects. China's current nuclear arsenal is generally dwarfed by American and Russian forces.

However, the operational utility of China's nuclear forces cannot be dismissed out of hand, for it is quite feasible to employ a so-called dwarfed and inferior nuclear arsenal as it is a superior one. The difference, it is argued, is essentially one of application and effectiveness. How would China attempt to maximise each strategic missile's potential given their inaccuracy, partial mobility and vulnerability? These forces are eminently suited to targets of a static, permanent and widely dispersed character, ideally the industrial and demographic concentrations of an adversary's cities, because these targets do not require pin-point, surgical accuracy of the type required for fortified military assets. Indeed, the indiscriminate countervalue utility of China's strategic forces may even increase the effectiveness of its deterrent and commensurately heighten an adversary's threat perception.

There are several countervalue targets within China's current reach, not only on US and Russian territory via its ICBMs, but also in India, Taiwan, South Korea and Japan via its regional capabilities. Despite the indigenous non-nuclear status of the latter three countries, they cannot be omitted from the nuclear equation because, as US allies and friends, they are subsumed under explicit and implicit American extended deterrence guarantees. If that protection dissipates there may be a political motivation to 'go nuclear' themselves.(62) For the time being however, China has a myriad of potential countervalue targets, but really has to contend with only one nuclear adversary. Theoretically, China has essentially its entire nuclear arsenal at its disposal, not just ICBMs, multiplying the diversity of its retaliatory capability. Not only are the nuclear adversary's "people and social wealth held hostage",(63) but so too, by association, are its allies in northeast Asia.

In terms of damage following a nuclear strike, how effective are China's current forces? Clearly, China cannot currently apply them to emulate mutually assured destruction (MAD), nor pursue massive retaliation of the kinds postulated during the Cold War. China neither possesses the quantity nor the force-diversity to credibly impose those

threats. However, China's nuclear forces can conceivably threaten unacceptable damage. The term itself is inherently relative because what Beijing perceives as unacceptable damage may be viewed as tolerable in, for instance, Tokyo or Moscow, or vice-versa. However, this belies the destructive force of nuclear power, in not only the initial explosion which can decimate millions of people and their cities almost immediately, but create follow-on effects like the 'nuclear winter' thesis, radiation damage to agriculture, and damage to economic viability, to name a few. The prospect of a few, or even one, nuclear infliction on a state's territory is a scenario repulsive enough to encourage them to not challenge the deterrent. China's current capabilities could deliver such nuclear force because it only requires a handful of successful countervalue deployments on an adversary's territory.(64) If the scenario of even one Chinese nuclear warhead exploding on another state's territory is too costly to bear, then not only has China facilitated the imposition of a threat, but that threat can translate into damage deemed unacceptable. China's nuclear forces, on this basis, can be seen as quite effective. While China can be seen to have imposed a costly threat, what dynamics exist that maintain it?

Ambiguously Maintaining the Threat

Johnson has argued that while "the threat perception of an adversary is crucial in any deterrent scheme, to be plausible a nuclear strategy must be understood by the nations against which it is oriented."(65) It is argued here that adversarial misunderstanding, or simply not knowing China's nuclear strategy, has been more effective for its deterrent. This is largely because the threshold of intent, or political determination that describes how, where and when Beijing decides to use its nuclear missiles is an unknown variable in western interpretations of China's nuclear calculus. While this is a direct manifestation of its stance of 'no declared doctrine', that is, Chinese elite's apparent preference for ambiguity over transparency, it is perhaps the key factor that sustains China's nuclear threat. Nevertheless, this has not stopped some analysts attempting to rationalise China's ambiguity. For example, Whiting believes Beijing practices a form of "calculated irrationality" *vis.* nuclear weapons by creating the impression that China does not fear nuclear war.(66) Furthermore, Chong-Pin Lin argues Beijing pursues "selective revelation" designed to confuse and confound adversary's perceptions of how China merges its nuclear doctrine with it capabilities.(67) While these rationalisations may begin to explain the *form* of Chinese posture, their interpretations seemingly reinforce the *effect* of China's ambiguous posture that the writers were probably trying to mitigate. That is, they highlight rather than overcome the uncertainty that consistently clouds Beijing's nuclear decision-making process.

Provoking uncertainty in a potential adversary's calculations encourages perceptual caution in regard to China's nuclear threat. US and Russian strategists appear uncertain about what type of Chinese response would follow a nuclear attack against China, or even an invasion of China supported by battlefield nuclear weapons.(68) Would Beijing direct a retaliation of a limited scale, or an all-out countervalue strike against the adversary's cities? Furthermore, when China might respond is just as vague because it could counterattack "at any uncertain time... perhaps hours, days, weeks, months or even years later." (69) Moreover, this obscurity could permit China to over-represent the lethality of its nuclear forces,(70) and perhaps benefit in some way from the psychologically imposed stress of enemy demoralisation.(71) "Paradoxically", concludes Johnson, "these uncertainties inhibit the use of nuclear weapons against China."(72) It seems then, that the physical element of China's threat is accentuated by a psychological dynamic. By provoking uncertainty throughout its nuclear history, China, via an ambiguous posture, has arguably raised the costs of nuclear aggression to an unacceptable level for an adversary.

Retaliation: Part 1

Buzan's second tenet of minimum deterrence focuses on a secure capability to provide retaliation, a second-strike in response to a nuclear attack. From one perspective it is possible that China's forces may be inherently designed only to achieve second-strike by virtue of its official principle of 'No First Use' (NFU), which states that under no circumstances will China be the first to use nuclear weapons in a nuclear duel.(73) While NFU could be viewed as a nuanced source of guidance in Chinese nuclear planning, which appears inconsistent with the technology-driven thesis as argued, the pledge as constituted probably has more a political utility than doctrinal one.

Some history is relevant here. When the Chinese exploded their first nuclear bomb in 1964 it was perceived to provide an invitation to the 'major power club', a symbolic tool designed to improve international status and power.(74) Furthermore, it may also be that NFU, when enunciated, was more likely intended to appease Soviet and American surprise (which may have provoked pre-emption),(75) and portray its nuclear forces in a defensive, non-provocative light.(76) This was a fortuitous political manoeuvre since, with hindsight, China's embryonic nuclear forces could not achieve anything more.(77) Nevertheless, there is sufficient evidence which indicates that China's symbolic regard for nuclear power has perpetuated, albeit in varying degrees, through to the present day, (78) while the compensatory political rationales of NFU do not. Even without NFU, however, China's nuclear BM capabilities developed into a modestly defensive force that could realistically only provide retaliation anyway.(79) The probable difference between China's forces then and now is not only the expansion in delivery system numbers, but the apparent growing confidence in their ability to retaliate at several levels.

Perhaps the critical component for a minimum deterrent force, an inherently defensive or reactive posture, is the ability to retaliate. To do so effectively China's nuclear forces must be, and perceived by an adversary to be, credible. The most appropriate measure of second-strike credibility is the security or survivability of China's nuclear arsenal *after* a first-strike from an adversary. This requires postulating a scenario which hypothetically presumes China's deterrent has failed and that a nuclear adversary is not dissuaded by the potential costs of aggression posed by China's nuclear counter-strike capabilities. While this is necessarily speculative it provides a useful framework for analysis. What, then, would be the likely targets in China for a first-strike? How, or with what, could China retaliate, and what would be the level of success?

There are a host of locations in China that could conceivably become targets in a nuclear strike, but the most relevant here are those that are both the most threatening to the adversary and those that China values the most. Inevitably, the most threatening to the US is China's nuclear BM capabilities that can hit targets of immense value to the US. These locations are diverse for they range from American sovereign territory, its offshore assets and interests, through to its northeast Asian allies and friends, such as Japan, South Korea and Taiwan. China's DF-5 and DF-5A land-based ICBMs pose a direct threat to the continental US, and its DF-4 ICBM can hit Guam in the Western Pacific.(80) China's DF-3, DF-3A, DF-21 and DF-21A IRBMs could hit targets in Japan and South Korea, (81) while its DF-15 and DF-11 SRBMs could easily hit targets in Taiwan.(82)

Naturally, these missile capabilities would feature in an American list of targets, and ironically, these same capabilities would be the most valued by China in a potential nuclear exchange with the US. China's ICBMs would be the first targets, and arguably the easiest since they are the most vulnerable. Coupled with indigenous ICBM vulnerability is the fact that their destruction is virtually assured due to American numerical ICBM superiority. The US can easily shower all possible Chinese ICBM targets to ensure that Chinese retaliation via ICBMs is almost impossible. Therefore, a direct threat to the continental US would be virtually neutralised.

Retaliation: Part 2

What option is China left with to retaliate if its ICBMs are virtually destroyed? First and foremost, there can be no absolute certainty that every single Chinese ICBM can be destroyed in a first strike, because there is no telling how an adversary would employ a first strike strategy.(83) Would the US attempt to deploy enough missiles to hit every possible Chinese ICBM target at once, or would it pursue a graduated launching pattern over a period of time to, *inter alia*, assess damage, monitor accuracy or even pursue some sort of intra-war bargaining process? These uncertainties prohibit sweeping and generalised scenarios that posit China's ICBM forces as totally destroyed. Nevertheless, for argument's sake, if China's ICBMs were omitted from the retaliation equation, there are other reliable avenues for its forces to achieve a second-strike, except that the targets could not be within the continental US.

Theatre-level Credibility

China's SLBMs, IRBMs and SRBMs have distinct advantages over ICBMs because they are mobile, concealable and accurate, thus less vulnerable to a first strike.(84) Firstly, China's current sea-based nuclear force, one *Xia* class submarine equipped with twelve SLBMs, theoretically provide a capacity to retaliate not only by using the ocean for camouflage, stealth and surprise, but because they are much less vulnerable to a nuclear first strike, and thus more secure. However, the maximum range of China's JL-1 SLBMs is 1700km, which would require the submarine to travel thousands of kilometres to enable the JL-1 to impact the continental US. China's current naval capabilities, however, have only a regional role. That is, operational ranges are limited mostly to the waters of the South and East China Seas, and only very infrequently do they extend beyond them, to say, the approaches of the Western Pacific Ocean.(85) Therefore, China's premier second-strike capability is restricted to northeast Asian maritime geography. Similarly, China's DF-21 IRBMs as well as the DF-11 and DF-15 SRBMs all have shorter ranges providing a regional capability. They too are secure from a first strike for several reasons.

Firstly, these weapon systems are totally mobile. For example, the DF-21s are designed to launch from "transporter-erector-launcher" trucks (86) that can randomly travel throughout virtually all of China. Likewise, the DF-15 can be launched from these triple-purpose trucks (87) and is apparently deployed at the army brigade level.(88) Second, since the DF-21 category of IRBMs and SRBMs represent the genesis of China's second-generation BM technology, their flexibility is enhanced. The missiles can be launched at moments' notice because they use both solid-fuel propellant, and computer-based automation.(89) The vagaries of pre-launch exposure and time-consuming preparation inherent in China's older strategic missiles have been overcome. Thirdly, due to computer-based technology the DF-21s and DF-15s can achieve greater target accuracy. The DF-15 utilises a digitised miniature propulsion system on the warhead to correct terminal velocity and re-entry altitude; it can also change flight trajectory and range in mid-flight.(90) Apparently, the latest version of the DF-21, tentatively called the DF-21X by the Japanese, uses the Global Positioning System technology ensuring target accuracy within a few metres.(91) In sum, at the theatre-level of nuclear forces, the factors of mobility (a dispersement capacity that creates difficulty for an adversary to locate and target), flexibility (an efficient launching capability) and accuracy (an ability to enhance lethality), have the net effect of diminishing the vulnerability of China's DF-21 class IRBMs and the SRBMs to an adversary's first strike.

These assessments presume that a nuclear adversary would not attempt to target China's IRBMs and SRBMs in a first strike. According to classical strategic deterrence principles these missiles do not figure highly as primary targets in a nuclear strike simply because their ranges do not directly threaten an adversary such as the US. Therefore, short-term

security from a first strike is virtually guaranteed because those capabilities would not be immediately challenged. However, their ranges threaten northeast Asian states as does China's fairly secure SLBM capability. It is entirely conceivable China's strategic weaknesses can be compensated by the strengths in its SLBMs, IRBMs and SRBMs to retaliate in response to a first strike against US interests, allies and friends in northeast Asia. There are several potential targets from which to choose. China's more versatile DF-11 could target and credibly destroy US military assets on the Korean border. Similarly, the DF-21 and JL-1 could accurately hit US military bases in Okinawa, Japan. Furthermore, the DF-15 could seriously undermine the viability of the Taiwanese government, perceived as a recalcitrant, anti-PRC and pro-American regime.

China's current ability to retaliate, therefore, seems most credible at the theatre level. That China's capability to retaliate directly against continental US is less credible, compared to its regional forces, should not detract from its ability to counterattack. China's theatre forces are often categorised in the West as tactical missiles, which is a misleading term because it tends to imply only a battlefield, war-fighting utility. To be sure, Chinese theatre forces may be tactical in *distance* but the *outcome* they could produce is very much strategic in the commonly understood sense of the word. That is, the ability to respond credibly to a US first strike by advancing the conflict to its neighbours has every likelihood of changing the course not only of a nuclear war itself, but the strategic relationships among northeast Asian states and their US nuclear guarantor. Seemingly, then, China's somewhat unorthodox retaliatory capability is most effective at the theatre level for three reasons. There are several more targets within China's nuclear forces' reach; the costs of inviting retaliation against those targets are exponentially multiplied; and, therefore, arguably too high a price to pay if the US inflicted a first strike against the Chinese. If these outcomes are considered plausible calculations of China's retaliatory capability, its ability to deter is all the more maintained.

Accounting For Missile Failure

The final requirement for a minimum deterrence posture is China's ability to deploy a force that can account for target misses. This requisite is problematic because it involves speculative assessments of a nuclear capability that can only ever really be qualified in practice. This poses two problems for China: first, a nuclear war would have to transpire to ascertain BM failure, and second, by that stage it is too late. However, some points can be made. The predominantly countervalue nature of China's strategic nuclear forces arguably reduces the need for target-specific accuracy. For example, the explosion in an enemy city's northern suburbs of a nuclear device that was intended to impact the central business district is arguably just as effective. Put differently, missing a desired impact area does not really diminish the benefit of a countervalue response. However, it has been established that China's ICBMs may not even survive a first strike to thoroughly enjoy this capability, and even if one or two did retaliate successfully, the mere impact of a nuclear warhead under those conditions is probably more crucial that its precise form. China's SLBMs, IRBMs and SRBMs, on the other hand, suggest a different scenario.

Because the credibility of China's deterrent is largely reliant on theatre level retaliatory capability, accounting for target misses may be an acute consideration. This would be especially so for its second-generation IRBMs and SRBMs which allow China's nuclear forces greater mobility, survivability and accuracy. These technological developments have imbued China's theatre forces with a certain level of counterforce capabilities, a capacity to target an enemy's military-specific assets with greater confidence. These capabilities are currently underdeveloped, and those existing BMs are a finite resource highly regarded for their utility. Therefore, it could be assumed that China would do all it can to ensure these missiles are not lost to malfunction or misadventure. However, until

such time as China either provides indications that it is actively undertaking such pursuits, or deploys them in nuclear war, there can be no certainty. Nevertheless, even if China could guarantee its BMs could hit every desired target in northeast Asia, it appears there may be external dynamics emerging to ensure Chinese missiles not only miss their target, but could be made redundant altogether. The foremost threat to China's theatre second-strike capacity, and hence its general deterrent, is the deployment of theatre missile defence (TMD) by the US within northeast Asia.

TMD: Definitions, US Strategy and Capabilities

Theatre Missile Defence (TMD) refers to a military platform designed to fulfil ballistic missile defence (BMD) in a particular geographic locale. BMD systems are employed to destroy the ballistic missiles, or the warheads,(92) of an enemy's missile forces. BMD systems can be deployed in point defence to protect, for example, missile silos, troop formations and similar military assets, or in area or theatre defence to protect cities, states or regions.(93) The current decision to hasten TMD development in South Korea and Japan was encouraged largely by the recent tests of North Korea's *No-dong 1* BM near the Japanese coast. Although the US justified its TMD reprioritisation predominantly in response to this North Korean threat, by potentially earmarking BMD forces for deployment in Taiwan (94) there is an implicit admission that China's BM capabilities have similar threatening potential. China's current theatre BM capabilities, therefore, will be closely scrutinised, whether implicitly or otherwise, and must come under the purview of a northeast Asian TMD strategy.

The US packaged a TMD program and an accompanying military strategy for its future employment only a few years ago. Broadly, American TMD planners envisage a two-tier defensive layer concept, with the first consisting of long-range, exo-atmospheric interceptors. The second layer consists of a network of short-range endo-atmospheric interceptors (95) as a back up if the first tier did not totally succeed. The military strategy for countering the BM threat in a regional theatre has several stages. Initially, military forces would seek to destroy the adversary's BMs and their infrastructure on the ground. Second, once a missile was launched, early warning and surveillance assets, such as Airborne Early Warning and Control Systems, would alert ground units and direct their radars to the approximate location of the incoming missile.(96) Thirdly, the upper-tier of the TMD defence layer is engaged where exo-atmospheric missiles are deployed to intercept the target at the longest possible range and above the earth's atmosphere. Currently, the US is testing two platforms that could potentially achieve this task: the army's Theatre High-Altitude Area Defence (THAAD) and the navy's Naval Theatre-Wide (NTW) system.(97) Both systems are designed to fly missiles out to intercept an enemy's missile in its boost and/or mid-course phases. Given the altitude and distances involved these systems will rely on space-based sensor systems to acquire, track and discriminate (from debris or decoys) their targets at a range and within time sufficient for interdiction.(98) However, both THAAD and NTW are still in the final developmental stages since effective space-based sensors have yet to be refined, (99) but a recent decision to inject massive funds (100) to overcome this technological obstruction suggests the US is motivated to have both functioning in the near future.

Once deployed both systems will provide formidable defensive capabilities, but even if they failed to intercept one or several BMs in their boost or mid-course phases, current military strategy relies on the TMD's second-tier function of terminal defence. This stage focuses on the final phase of the BM, or more accurately by this stage in its trajectory, an armed warhead, as it re-enters the atmosphere and approaches its target.(101) The fundamental principle of missile interception remains, but target tracking relies on traditional sea-borne and ground-based radar facilities since the warhead is declining in altitude as it rapidly acquires speed and the projected impact area is commensurately

narrowed so that it can be pin-pointed to within a several kilometre radius. The US already possesses terminal defence capabilities and employed one such system during the Gulf War in 1991.

While the *Patriot* missile system achieved some success during that conflict, the US is currently upgrading and improving this system, along with its navy relative, the *Standard* missile system, to coincide with the TMD's 'upper-tier' eventual deployment.(102) By implication, TMD requires the support of sophisticated 'cutting-edge' technology in engineering, computation and software, particularly in "high-speed propulsion, precision guidance, long-range space-based sensing and exceptionally reliable and fast data processing."(103) Indeed, there is a shared view that the viability of any BMD system is explicitly contingent on the military adaptation of these technologies,(104) and an inability to develop or innovate them accordingly amounts to a fundamental incapacity to deploy such a system. Since such innovation has not been ruled out, focus must shift to an analysis of the implications a successfully deployed TMD would have on China's theatre nuclear forces.

TMD vs. China: Theory and Application

Following the recent US announcement to deploy TMD in northeast Asia, China responded critically, warning that it "would negate the self-destruction principle that has deterred nuclear war for decades." (105) Specifically, TMD has the potential to impose two interlinked threats to China: firstly, it can erode the credibility and effectiveness of its theatre nuclear forces, and second, consequently neutralise their contribution to deterrence.(106) These two threats deserve further comment. Firstly, if THAAD or NTW prove operable it seems China's BMs can be intercepted well above and beyond their intended targets. Even if they fail to destroy all the missiles, the 'lower tier' *Patriot* and *Standard* systems can do so but at closer heights and ranges. China's regional forces can be made impotent, thus diminishing theatre BMs crucial to a second strike capability. If China's theatre level retaliatory capacity is omitted from the deterrence equation, predictably China's overall deterrent is significantly undermined. In principle, TMD seems to ensure that deterrence for the Chinese would be incredibly difficult to achieve. However, this scenario may be overstated, because realistically TMD has inherent limitations upon which China can capitalise.

The paramount concern for TMD advocates is devising a BMD capability that can guarantee a totally 'leak proof' weapon system. This involves deploying a TMD that can successfully intercept every single warhead it is designed to counter. There exists uncertainty in this regard among US BMD planners since they cannot extend such a guarantee, largely because the capability has never been tested in nuclear war. Nevertheless, BMD postulates have speculated that US TMD can achieve at least a ninety percent success rate (107) which means they are prepared to concede that, at the most, ten percent of the enemy's missiles will 'leak' through and find their targets. The lethality of China's nuclear weapons is so significant that the leakage of even a single DF-3 warhead against a population centre will still result in hundreds of thousands of deaths. Similarly, credibly defending US regional military assets suffers from the same leakage problem, especially since China's DF-21s and DF-15s are quite accurate. If the attacker's missiles are accurate enough for precision strikes against high-value assets, then they are probably sophisticated enough to penetrate TMD.(108) This issue is acute in northeast Asia because it is believed China will soon have enough theatre BM capabilities to completely overwhelm a regional TMD.(109)

It seems therefore that by the time a TMD is deployed in northeast Asia, the US may not only be unable to protect its own assets, it will certainly be unable to assure its South Korean, Japanese and Taiwanese TMD recipients that their cities can be totally shielded

against Chinese nuclear forces. If China can still conceivably strike an assortment of targets in northeast Asia, its retaliatory capability is credible and thus deterrence will be preserved. Despite the threatening nature of TMD in principle, the reality is quite different. However, if for some reason China finds TMD a fundamental constraint on its regional nuclear forces, there are several methods it could develop to defeat it. China could circumvent TMD via military countermeasures such as technologically advancing current capabilities using multiple independently targeted re-entry vehicles (MIRVs) or manoeuvrable re-entry vehicles (MARVs). MIRVs are essentially several warheads contained on the one BM designed to hit several different targets, whereas MARV warheads are designed to zigzag to avoid interception.(110) There is evidence that suggests China is capable of deploying such demanding technology, particularly since it is believed China's DF-5 was tested under MIRV configuration.(111)

Another counter-measure is quantitative proliferation. By deploying more BMs China can attempt to attain a level sufficient enough to overwhelm a TMD system completely. Accordingly, this requires building more missiles and their warheads. It has been argued here that China would probably not expand its existing capabilities as it awaits transition to second-generation technology. However, once new capabilities appear there is no reason why China should not retain its older missiles to give its forces some numerical weight, especially at the theatre-level in the face of TMD. Ultimately, whether China expands existing capabilities or awaits newer technology will probably be determined by the speed, scope and capability of TMD deployment in northeast Asia.

Consequently, a call for more BMs is also a request for more nuclear warheads. If China is forced to deploy more BMs and warheads than intended there will probably be an attendant reluctance to pursue or observe nuclear arms control measures.(112) For example, to facilitate an increase in warheads China would probably have to resume testing to improve current technology. This would totally diminish China's capacity to adhere to the Comprehensive Test Ban Treaty.(113) Furthermore, an increase in warheads would also mean that hopes of compelling China to join a fissile material production cut-off convention is all the more unlikely, since China would have to continue producing weapons-grade material for its warheads.(114) It would seem, then, that even in the unlikely event of China's regional nuclear capability being undermined by TMD, there are several viable methods available to counteract the prospect.

While the US via TMD is obviously attempting to protect and secure its northeast Asian allies and interests, there is some doubt that the US has weighed the advantages of such a deployment against the likely costs it would incur and compel on other states. The American quest for nuclear pre-eminence may encourage a reversal of the non-proliferation trend in Russia and other peripheral nuclear hosts like North Korea, India and Pakistan. This would be the case in China if the perceived need to violate or withdraw from international norms and agreements is motivated by the threatening activities of another state. Furthermore, this may even encourage the defiance of broader global norms underpinning international security and stability, especially those associated with US politico-strategic interests. Therefore, parochial justifications and rationales for TMD would come with several significant costs for the US, and for its regional and global authority.

Some Conclusions

China's regional deterrent capability has been illustrated in several ways. Firstly, PRC's current ICBM forces have, at best, a marginal utility because they preclude China from playing the classical long-range, strategic role of orthodox deterrence. The PRC cannot pursue a credible deterrent posture at this level. Secondly, and subsequently, despite the confusing array and often contradictory sources of China's warhead quantity, there exists

a visible pattern suggesting the weight of China's nuclear force is dominated by regional, theatre-level capabilities. Third, these regional forces seal China's deterrent posture because of their indigenous pre-eminence. Of China's nuclear forces, these regional capabilities are the most credible to achieve retaliation due to several technological indices, the most significant of which is China's ability to threaten US interests and allies in northeast Asia. Lastly, the American attempt to deploy BMD can be perceived as vindicating China's often questioned nuclear capability. That is, if China's regional nuclear capabilities are so doubted, or fundamentally ineffective, why would the US pursue TMD and put at risk its allies, its own interests, global credibility and authority in order to extinguish a threat China apparently cannot impose?

Broadly, it can be confidently concluded that to assess nuclear issues in China one must do so within the ambit of a complex and often obscured environment. The task is not, however, impossible, for even without the luxuries of doctrinal guidance and warhead quantity, important factors can be isolated. Even with the added impediments of vague, ambiguous decision-making procedures and accusations of technological inferiority, a likely Chinese position on nuclear force is visible. Furthermore, it is apparent that China pursues an unorthodox and unique nuclear-deterrent posture. Whether under the western guise of 'minimum deterrence', or viewed entirely in its own right, China's security via nuclear force is the most efficacious at a regional, theatre level. Attempts to counter this regional capability through Theatre Missile Defence (TMD) initiatives have been found to be problematic, and could force China down several avenues that would undermine, rather than enhance, security in northeast Asia. China, in any case, is unlikely to allow this regional deterrence to be seriously eroded.

Footnotes

**General Editor: R. James Ferguson. Guest Editor: Rosita Dellios.*

1. Delpech, T., "Nuclear weapons and the 'New World Order': Early warning from Asia?", *Survival*, vol. 40, no. 4, Winter 1998-99, pp. 61 - 62.

2. See, for example, Caldwell, J. & Lennon, A., "China's nuclear modernisation program", *Strategic Review*, vol. 23, no. 4, Fall 1995, pp. 27- 37; Beaver, P., "China prepares to field new missile", *Jane's Defence Weekly*, vol. 31, no. 8, 24 Feb. 1999, p. 3.

3. Dellios, R., *Modern Chinese defence strategy: Present developments, future directions,* Macmillan, London, 1989, p. 85.

4. See for example Lewis, J. & Hua Di, "China's ballistic missile programs: Technologies, strategies, goals", *International Security*, vol. 17, no. 2, Fall 1992, pp. 7- 38.

5. Dellios, *op.cit*., pp. 85, 90.

6. See Lewis, J. & Xue Litai, *China builds the bomb*, Stanford University Press, California, 1988.

7. Gronlund, L., Wright, D., & Yong Liu, "China and a fissile material production cut-off", *Survival*, vol. 37, no. 4, Winter 1995-96, pp. 150-151, 159.

8. Johnston, A., "China's new 'Old thinking': The concept of limited deterrence", *International Security*, vol. 20, no. 3, Winter 1995-96, p. 18.

9. Garrett, B. & Glaser, B., "Chinese perspectives on nuclear arms control", *International Security*, vol. 20, no. 3, Winter 1995-96, pp. 44, 47.

10. Lewis *et al.* 1992, *op.cit*., p.10.

11. *Ibid*.

12. International Institute of Strategic Studies(IISS), *The Military Balance 1998/1999*, Oxford University Press, London, 1998, p. 178.

13. Lewis *et al.* 1992*, op.cit.,* p. 10.

14. IISS, *op.cit*., p. 178.

15. Lewis *et al., ibid*.

16. IISS, *ibid*.

17. Lewis *et al., ibid*.

18. IISS, *ibid*.

19. Godwin, P., "From continent to periphery: PLA doctrine, strategy and capabilities towards 2000", *The China Quarterly*, vol. 146, June 1996, p. 484.

20. *Ibid*.

21. *Ibid*.

22. Tow, W., *Encountering the dominant player: US extended deterrence strategy in the Asia-Pacific*, Columbia University Press, New York, 1991, p. 231.

23. Godwin, *op.cit*., p. 484.

24. Tow, *ibid*.

25. Lewis *et al.* 1992*, op.cit*., pp. 35 - 37.

26. Mohan Malik, J., "Chinese debate on military strategy: Trends and portents", *Journal of Northeast Asian Studies*, vol. 9, no. 2, Summer 1990, pp. 3 -32.

27. Sutter, cited in Johnston, *op.cit*., p. 31.

28. Hahn, cited in Dellios, *op.cit.*, p. 84.

29. Anselmo, J., "China's military seeks great leap forward", *Aviation Week and Space Technology*, vol. 146, no. 20, 12 May 1997, p. 70.

30. *Ibid*.

31. Gronlund *et al., op.cit*., p. 151.

32. *Ibid*.

33. Prados, J., "China's new thinking on nuclear arms", *The Bulletin of the Atomic Scientists*, vol. 45, no. 5, June, 1989, p. 33.

34. Prados, *op.cit.*, p. 32.

35. Figure based on lowest 'conservative' estimate, IISS, *op.cit*., p. 178.

36. Figure based on highest 'bold' estimate, Gronlund *et al., op.cit*., p. 151. Calculation excludes

sources that did not attach numbers to individual delivery systems.

37. Johnston, *op.cit.*, pp. 18 - 20.

38. *Ibid*.

39. Lewis *et al.* 1992*, op.cit*., p. 20.

40. See Lewis, *et al.* 1992, *op.cit*., Table 1, pp. 9 -11.

41. *Ibid.*

42. *Ibid*., pp. 7 - 9.

43. Lewis, J. & Xue Litai, *China's strategic seapower*, Stanford University Press, California, 1994, pp. 18 - 19.

44. Tow, *op.cit*., pp. 231 - 232.

45. *Ibid*.

46. Lewis *et al.* 1992, *op.cit*., p. 22.

47. Lewis, *et al.* 1992, *op.cit.*, p. 22.

48. Tow, *op.cit*., p. 231; Dellios, *op.cit*., p. 85.

49. Tow, *ibid*.

50. Lewis *et al.*, *ibid.*, p. 23.

51. Hahn, cited in Dellios, *op.cit*., p. 85.

52. Tow, *op.cit*., p. 233.

53. Gurtov, M. & Byong-Moo Hwang, *China's security: the new roles of the military*, Lynne Rienner, London, 1998, p. 131.

54. Robertson, D., *Guide to modern defense and strategy*, Europa Publications, London, 1987, p. 63.

55. Johnston, *op.cit*., p. 31.

56. Robertson, *ibid*., pp. 211-212.

57. Tow, *op.cit*., p. 232.

58. Cambone, S.A. & Garrity, P.J., "The future of US nuclear policy", *Survival,* vol. 36, no. 4, 1994/95, p. 74.

59. Johnson, R.E., "China's nuclear forces and policies", in Wortzel, L.M. (Ed), *China's military modernisation: International implications*, Greenwood Press, Connecticut, 1988, p. 87.

60. Buzan, B., *An introduction to Strategic Studies: military technology and international relations*, St. Martin's Press, New York, 1987, p. 193.

61. Johnson, *op.cit*., p. 77.

62. Garrett *et al., op.cit.*, p. 76.

63. Johnston, *op.cit*., p. 18.

64. Johnston, *op.cit*., p 18; Tow, *op.cit*., p. 230; Dellios, *op.cit*., p.86.

65. Johnson, *op.cit*., p. 77.

66. Whiting, A., *China's calculus of deterrence: India and Indochina*, University of Michigan Press, Michigan, 1975, pp. 204 - 208.

67. Chong-Pin Lin, *China's nuclear weapons strategy: Tradition within evolution*, Lexington Books, Lexington, 1988, pp. 68 -69.

68. Gurtov *et al, op.cit.*, p. 125; Dellios, *op.cit.*, p. 91.

69. Dellios, *ibid.*

70. Tow, *op.cit*., p. 225.

71. Dellios, *ibid*.

72. Johnson, *op.cit*., p. 77.

73. Gurtov *et al., op.cit*., p. 124.

74. Johnston, *op.cit*., pp. 7 - 9.

75. Johnson, *op.cit*., p. 73.

76. Dellios, *op.cit.*, p. 88.

77. Lewis *et al.* 1992, *op.cit*., p. 5.

78. Johnston, *op.cit*., p. 8.

79. Lewis *et al*., *ibid*., p. 20.

80. Lewis *et al.* 1992, *op.cit*., p. 20.

81. *Ibid*.

82. Beaver, P., "China prepares to field new missile", *Jane's Defence Weekly*, vol. 31, no. 8, 24 Feb. 1999, p. 3.

83. Johnson, *op.cit.*, p. 83.

84. Dellios, *op.cit*., p. 87.

85. Zhan, J., "China goes to the blue waters: the navy, seapower mentality and the South China Sea", *The Journal of Strategic Studies*, vol. 17, no. 3, 1994, pp. 193 - 195.

86. Lewis *et al.* 1992, *op.cit*., p. 28.

87. *Ibid*.

88. Beaver, *op.cit*., p. 3.

89. Lewis *et al*., *ibid*., pp. 28, 35.

90. *Ibid.*

91. Beaver, *ibid*.

92. Robertson, *op.cit*., pp. 34-35.

93. *Ibid*.

94. O'Donnell, L., "Zhu targets Star Wars", *The Australian*, Tuesday, 23 Feb. 1999, p. 12. See also Bender, B., "USA is likely to tread slowly on Taiwan theatre missile defence", *Jane's Defence Weekly*, vol. 31, no. 4, 27 Jan, 1999, p. 5.

95. Falkenrath, R., "Theatre Missile Defence and the Anti-Ballistic Missile Treaty", *Survival*, vol. 36, no. 4, Winter 1994-95, p. 142.

96. Falkenrath, *op.cit.*, p. 142.

97. Seigle, G., "DoD boosts THAAD development programme", *Jane's Defence Weekly,* vol. 31, no. 4, 27 Jan. 1999, p. 3.

98. Falkenrath, *op.cit*., p. 143.

99. *Ibid*.

100. Seigle, G., "USA seeks renegotiation of ABM Treaty for NMD", *Jane's Defence Weekly,* vol. 31, no. 4, 27 Jan. 1999, p. 3.

101. Robertson, *op.cit*., p. 35.

102. Cambone, S., "The United States and Theatre Missile Defence in northeast Asia", *Survival*, vol. 39, no. 3, Autumn 1997, p. 69.

103. Falkenrath, *op.cit*., p. 142.

104. See Falkenrath, *ibid.*, pp. 143 - 145; Buzan, *op.cit*., pp. 159 - 160.

105. O'Donnell, *op.cit.*, p. 12.

106. Cambone, *op.cit*., p. 72.

107. Falkenrath, *op.cit*., p. 144.

108. *Ibid*.

109. Starr, B., "China could 'overwhelm' regional missile shield", *Jane's Defence Weekly*, 23 April, 1997, p. 16.

110. Garrett *et al., op.cit.*, p. 74.

111. IISS, *op.cit.*, p. 178; Tow, *op.cit*., p. 233.

112. Gurtov *et al., op.cit.*, p. 132.

113. Garrett *et al., op.cit.*, p. 72.

114. Gronlund *et al., op.cit*., pp. 150 - 153.

Bibliography

Anselmo, J., "China's military seeks great leap forward", *Aviation Week and Space Technology*, vol 146, no. 20, 12 May 1997, pp. 68 - 72.

Beaver, P., "China prepares to field new missile", *Jane's Defence Weekly*, 24 February 1999, p. 3.

Bender, B., "USA is likely to tread slowly on Taiwan theatre missile defence", *Jane's Defence Weekly*, vol. 31, no. 4, 27 Jan. 1999, p. 5.

Buzan, B., *An introduction to strategic studies: Military technology and international relations*, St. Martin's Press, New York, 1987.

Caldwell, J. & Lennon, A., "China's nuclear modernisation program", *Strategic Review*, vol. 23, no. 4, Fall 1995, pp. 27 -37.

Cambone, S., "The United States and Theatre Missile Defence in north-east Asia", *Survival*, vol. 39, no. 3, Autumn 1997, pp. 66 - 84.

Cambone, S. & Garrity, P., "The future of US nuclear policy", *Survival*, vol. 36, no. 4, 1994/95, pp. 73 - 95.

Chong-Pin Lin, *China's nuclear weapons strategy: Tradition within evolution*, Lexington Books, Lexington, 1988.

Dellios, R., *Modern Chinese defence strategy: Present developments, future directions*, Macmillan, London, 1989.

Delpech, T., "Nuclear weapons and the 'New World Order': Early warning from Asia?", *Survival*, vol. 40, no. 4, Winter 1998-99, pp. 57 -76.

Falkenrath, R., "Theatre Missile Defence and the Anti-Ballistic Missile Treaty", *Survival*, vol. 36, no. 4, Winter 1994-95, pp. 140-160.

Garrett, B., & Glaser, B., "Chinese perspectives on nuclear arms control", *International Security*, vol. 20, no. 3, Winter 1995/96, pp. 43 - 78.

Godwin, P., "From continent to periphery: PLA doctrine, strategy and capabilities towards 2000", *The China Quarterly*, vol. 146, June 1996, pp. 464 - 487.

Gronlund, L., Wright, D. & Yong Liu, "China and a fissile material production cut-off", *Survival*, vol 37, no. 4, Winter 1995-96, pp. 147-167.

Gurtov, M. & Byong-Moo Hwang, *China's security: The new roles of the military*, Lynne Rienner, London, 1998.

Hildreth, S. & Ellis, J.D., "Allied support for Theatre Missile Defence", *Orbis: A journal of world affairs*, vol 40, no. 1, Winter 1996, pp. 101 - 122.

The International Institute of Strategic Studies, *The Military Balance 1998-99*, Oxford University Press, London.

Johnson, R., "China's nuclear forces and policies", in Wortzel, L. (Ed), *China's military*

modernisation: International implications, Greenwood Press, Connecticut, 1988.

Johnston, A., "China's new 'old thinking': the concept of limited deterrence", *International Security*, vol. 20, no. 3, Winter 1995/96, pp. 5 - 42.

Lewis, J. & Hua Di, "China's ballistic missile programs", *International Security*, vol. 17, no. 2, Fall 1992, pp. 5 - 40.

Lewis, J. & Xue Litai, *China builds the bomb*, Stanford University Press, California, 1988.

Lewis, J. & Xue Litai *China's strategic seapower: The politics of force modernisation in the nuclear age*, Stanford University Press, California, 1994.

Mohan Malik, J., "Chinese debate on military strategy: Trends and portents", *Journal of Northeast Asian Studies*, vol 9, no. 2, Summer 1990, pp. 3- 32.

O'Donnell, L., "Zhu targets Star Wars", *The Australian*, 23 February 1999, p. 12.

Prados, "China's new thinking on nuclear arms", *The Bulletin of the Atomic Scientists*, vol. 45, no. 5, June 1989, pp. 32 - 35.

Robertson, D., *Guide to modern defense and strategy*, Europa Publications, London, 1987.

Seigle, G., "DoD boosts THAAD development programme", *Jane's Defence Weekly*, 27 January 1999, p. 3.

Seigle, G., "USA seeks renegotiation of ABM treaty for NMD", *Jane's Defence Weekly*, 27 January 1999, p. 3.

Starr, B., "China could overwhelm regional missile shield", *Jane's Defence Weekly*, 23 April 1997, p. 16.

Tow, W., *Encountering the dominant player: US extended deterrence strategy in the Asia-Pacific*, Columbia University Press, New York, 1991.

Whiting, A., *China's calculus of deterrence: India and Indochina*, University of Michigan Press, Michigan, 1975.

Zhan, J., "China goes to the blue waters: The navy, seapower mentality and the South China Sea", *The Journal of Strategic Studies*, vol. 17, no. 3, 1994, pp. 193 - 195.

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