NO OIL FOR THE LAMPS OF CHINA?

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The ubiquitous *Made in China* stickers and labels on consumer products remind us daily of China's incredible economic rise. The world is accustomed to this powerful phenomenon and seems to expect that China's economy will grow at 10 percent annually for at least another decade. Such remarkable economic progress has lifted millions of Chinese out of poverty and also substantially benefited the global economy. It is also arguably the cornerstone of Chinese Communist Party legitimacy.

Western and Asian hunger for inexpensive Chinese goods fuels much of this growth, but China's economic engine cannot run without imports of raw materials, such as bauxite, iron ore, timber, and, perhaps most significantly, crude oil. Once a significant exporter, China became a net importer of crude in 1993 and now struggles to deal with this dependency.

Chinese security analysts fear that oil import dependency is a potential pressure point that could be exploited by future adversaries of the People's Republic of China (PRC).[1] Approximately 80 percent of China's 3.3 million barrels per day (bpd) in crude oil imports passes through the Straits of Malacca. Such funneling could facilitate interdiction of China's oil lifeline in times of crisis.[2] The United States, India, and Japan are all seen as potential blockaders, but Chinese observers appear to believe that only the United States has both the capability and the will to blockade oil shipments to China.[3] One recent Chinese article postulates that the most

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likely triggers of an oil blockade of China include a fight over Taiwan and a situation in which China's rise becomes hostile and directly threatening to other major powers.[4]

Some Chinese analysts argue that the need to protect shipments of oil and other vital raw materials is a key driver behind the PRC's intensive aerial and naval modernization programs.[5] Yet despite impressive improvements, the People's Liberation Army Navy (PLAN) lacks the ability to defend the sea lines of communication (SLOCs) over which Chinese oil supplies flow. Among other limitations, the PLAN lacks guaranteed access to ports for refueling, repairing, and replenishing as well as adequate numbers of at-sea-replenishment vessels necessary to support long-range missions. More fundamentally, the PLAN rarely undertakes long-distance operations, which would provide vital training and experience for SLOC-protection missions.

In contrast, some of Beijing's potential adversaries have decades of blue-water experience, world-class logistical capacity, global access to replenishment ports, and doctrine and equipment oriented toward warfare on the high seas. Beijing's strategists recognize this disparity and are presumably devising plans to counter any possible future efforts to cut China's petroleum umbilical cord.

This article examines potential Chinese responses to possible forms of energy blockade.[6] The first two sections discuss how a distant blockade might be conducted and surveys possible Chinese responses to such an action. The third section hypothesizes a close blockade and then analyzes potential courses of action in response. The fourth section examines the possibility of a "blockade by convoy," while the final section considers an energy-denial strategy that would target China's ability to transport and process crude oil.

The authors conclude that an energy blockade of China would not only fail to achieve its objective but also send destructive shock waves through the global economic and political landscape. Frankly discussing energy sea-lane security will, ideally, promote trust and lay a foundation for deeper energy security cooperation between China and other major oil consumers.

ASSUMPTIONS

The imperatives of continued economic growth and global interdependence among states make major wars unlikely. Nonetheless, this analysis assumes a state of war between the PRC and the blockading state. Even an "embargo" implemented as a measure short of war would likely trigger open hostilities, because it would threaten China's continued economic growth and would be interpreted by Beijing as an intolerable and unjustifiable breach of sovereignty. We assume, therefore, that Beijing would interpret a blockade under any name as an act of war and would respond accordingly.

This article also assumes that if faced with an energy blockade China would restrict or prohibit the use of private automobiles and other nonessential transportation and ration the sale of all liquid fuels to commercial users. These and similar measures would reduce PRC oil needs, perhaps even to levels that could be sustained with domestic production and Kazakh and Russian pipeline and rail imports. China's indigenous oil sources currently provide more than 3.5 million bpd and by 2010 could reach 4 million bpd. For comparison purposes, in fiscal year 2004 the U.S. military, fighting wars in Iraq and Afghanistan and sustaining normal operations as well, used approximately 395,000 bpd of oil.[7] While U.S. military fuel consumption levels cannot be directly correlated with those of the Chinese military in a hypothetical context, these figures strongly suggest that even in a high-intensity conflict the PRC would have access to sufficient fuel to run its military machine, as well as most portions of its current economy, assuming that the export channels and the import of critical nonenergy imports continued unabated.

We acknowledge that a blockade that prohibited fuel imports while permitting the continued shipment of other raw materials to China, as well as the export of finished products, is an artificial and unlikely contingency. A comprehensive ban on maritime shipping in and out of Chinese ports would have a far more powerful effect than an energy blockade alone. However, much of the Chinese internal discussion on blockades deals directly with the possibility of a maritime energy blockade.

MODES OF BLOCKADE AND POSSIBLE PRC RESPONSES

The Distant Blockade

An energy blockade of China could be initiated at such choke points as the Malacca and Hormuz straits, both of which lie far from the Chinese coast. Chinese analysts worry, perhaps with good reason, that a relatively small number of warships could in that way effectively sever China's oil lifeline. After all, a distant maritime energy blockade might be very attractive to civilian policy makers and military planners preparing for conflict with China. If successful, such a course might achieve political objectives with very low levels of violence.[8] Additionally, at least in the near term, there would seem little that China's conventional military forces could do to challenge such a blockade directly.

One of the greatest obstacles facing the PRC in such a scenario would be the distance of the energy choke points from its naval bases. China's naval vessels rarely operate very far from their home waters or for very long and, with a few exceptions, probably lack the experience necessary to undertake extended, distant missions during wartime. Compounding this weakness, Beijing's limited

number of replenishment vessels is inadequate for and inexperienced in sustaining distant operations.[9] In the near term, therefore, any PLAN counterblockade task force would be operating at or beyond the limits of its professional ability and combat range. Blockading forces, on the other hand, would probably suffer from neither limitation. Another feature of the long distances involved is that PLAN ships would likely be detected well before they could bring their weapons within range, if not immediately after departing their home ports. During its entire transit, therefore, a PRC surface action group would be vulnerable to subsea, surface, and aerial threats at locations of the blockading force's choosing.

Another symmetrical option available to the PLA would be attacks by air-launched antiship cruise missiles (ASCMs) against blockading vessels. Yet the distances involved, the likely early detection of incoming aircraft, and the lack of an adequate in-flight refueling ability would be severe impediments. Furthermore, PRC bombers and strike aircraft operating far from mainland China would be highly vulnerable to surface-to-air missiles (SAMs), land-based air-superiority fighters, and carrier-based aircraft. China possesses approximately ninety highly capable Su-30 fighter bombers that could conceivably reach the Straits of Malacca, conduct strikes against enemy surface warships there, and return to base. Such an operation would, however, require a level of proficiency in aerial refueling and long-range strike operations that the PLA has yet to demonstrate. Thus, successful aerial attacks against blockading forces are presently unlikely, although the situation could change if the PLA develops the doctrine, infrastructure, and experience necessary.

Alternatively, China could threaten distant blockading ships with its submarine force. However, its submarines would be at a disadvantage; any attempt to transit from a mainland base to the Straits of Malacca would have to overcome the antisubmarine efforts of the blockading powers, some of which could be extremely sophisticated.[10] Beijing's diesel-powered submarines would be forced to snorkel frequently, greatly increasing the probability of detection and destruction. China's limited number of notoriously noisy nuclear-powered attack submarines (SSNs) could deploy from their North Sea Fleet base but would be vulnerable while en route. PLAN submarines also rarely undertake long patrols and so are likely to have little institutional knowledge of how to conduct such an operation.

China's submarines, furthermore, would have little utility if the blockade were conducted in the Straits of Malacca. Many portions of those waters are too shallow to allow the submerged passage or sustained operation of any submarine. If the blockade were on the western approaches to the strait proper, PLAN submarines would have to either pass through on the surface, and be readily detected and attacked, or transit submerged around the Indonesian archipelago, making the

journey that much longer and more challenging. For a variety of reasons, shallow waters greatly inhibit the use of torpedoes, thereby depriving submarines of their most lethal weapons, at least in many areas of the straits. ASCMs would also be of limited use, since their difficulty in discriminating among targets would make successful attack on a warship in the crowded strait statistically unlikely, especially from longer ranges.[11] The same arguments apply to the Strait of Hormuz. PLAN submarines, consequently, are not a counterblockade panacea, though the threat they represent cannot be completely dismissed. It must also be said that should the Shang or follow-on classes of Chinese SSNs—or even, to a somewhat more limited extent, air-independent-propulsion diesel submarines—prove sufficiently quiet and are capably operated, the threat they would pose to surface warships would be significantly increased.

Since Beijing has limited ability to oppose directly forces conducting a distant energy blockade, it might seriously consider taking retaliatory actions elsewhere.[12] One option available includes using submarines to mine the entrances to a blockader's commercial ports and naval bases. Others include using short- and medium-range ballistic missiles to pummel regional targets and attacking a blockader's replenishment ships with submarines.[13] There is strong evidence that China has developed a land-attack cruise missile similar to the Tomahawk.[14] In the near future, this weapon, particularly variants launched by long-range bombers or submarines, could be employed against a wide range of critical regional targets, giving China a powerful asymmetric response option. The PLAN could also mine the approaches to an opponent's harbors with submarines or converted merchant ships. Defending against these threats would tax the blockading navy by forcing individual ships to be on the tactical defensive throughout the region, thereby straining the theater's military forces overall as they struggled to protect vulnerable infrastructure. A host of other escalatory steps could be taken in response to an energy blockade, perhaps even including the use of nuclear weapons, notwithstanding China's "no first use" pledge.

But if the distant blockade seems relatively attractive from a blockading state's point of view, its implementation poses several critical challenges. Captured ships would have to be sent to a central marshaling area. If the crew proved unwilling, the blockader would have to supply a prize crew of mariners to take the ship there, in addition to a warship escort. This could be a complex undertaking, especially if multiple vessels were seized in a short period of time. It is unlikely that many military sailors have the necessary knowledge to operate oil tankers, and certainly naval ship-manning requirements are not set with an eye to prize crews. Selecting the marshaling area would also likely be problematic, since Southeast Asian states might balk at openly abetting the blockading state.

Further, many, if not most, harbors are too shallow to allow the entry of deep-draft supertankers.

Aside from the seized tankers themselves, blockading forces would face the perplexing issue of what to do with the seized crews and cargoes. Tanker crews are often multinational.[15] The owners of seized ships and cargoes would presumably vigorously protest to their governments;[16] their pressure, in turn, on the blockading state to release the ships might lead to the phenomenon, not infrequent in blockades, of having to seize the same ship more than once.[17]

The oil trade's flexibility would also make a distant blockade difficult to execute. Fifty-two tankers pass through the Straits of Malacca daily, carrying approximately 11.7 million barrels of crude oil.[18] A blockading naval force would have to determine which of these tankers carried, among them, the roughly 3.3 million of these daily barrels that were bound for China.[19] Presumably, tankers sailing under PRC flags or having known PRC ownership would also be relatively easy to distinguish and stop. Yet only about 10 percent of China's energy imports are presently carried on domestic hulls, a fact that would force a blockader to identify and intercept the other 90 percent.[20] A very large crude carrier (VLCC) of 250,000 deadweight tons (DWT) serving the Arabian Gulf–Far East route typically carries just under two million barrels of crude oil per trip. This suggests that as few as two VLCCs can carry China's daily crude oil imports, and that would seem to bode well for a navy contemplating a distant maritime energy blockade. Yet the tankers carrying oil to China on any given day could be in any of a wide range of configurations, depending on commercial concerns that will be discussed shortly, and their number could range from two vessels to ten or more. This larger prospective volume suggests that identifying in advance which tankers are destined for the PRC would be problematic. Each tanker passing through the strait, therefore, would have to be boarded, and its shipping documents examined. Any tanker with a legitimate bill of lading that stated the oil was destined for Japan, Korea, the Philippines, or elsewhere would have to be allowed to proceed;[21] those stating a PRC destination would be seized.

But a distant blockade would be easy to defeat using conventional commercial means. For instance, it is not unusual for cargoes to be sold between ports of embarkation and destination; some oil cargoes are resold on the spot market as many as thirty times while the tankers carrying them are still at sea.[22] This suggests that the cargo of a tanker with a legitimate bill of lading for, say, Korea could be sold to PRC interests after it had been inspected at the blockade and allowed to pass. This feature of the modern oil trade would greatly reduce any state's ability to determine a tanker's final destination by examining only the bill of lading. In addition, oil cargoes are frequently "parceled out," with one tanker carrying oil bound for several consumers.[23] For example, of a VLCC's two-million-barrel crude oil cargo,

five hundred thousand barrels might be headed to Singapore, five hundred thousand to South Korea, and a million to the PRC. If an embargo against oil shipments to China seemed imminent, parceling would likely quickly rise as Chinese oil importers sought to avoid being singled out. Even if a shipper honestly declared that a quarter of the cargo was headed to China, a blockader might create very serious diplomatic and economic repercussions if it detained a vessel that was also carrying crude to South Korean and Singaporean buyers. This would be particularly true in the case of a conflict over Taiwan, as regional nations might resist taking sides in a confrontation between the PRC and an outside power.

Shipping documents can also be forged. Forgery can be quite sophisticated, especially if (as it no doubt would be in this case) abetted by the PRC government. The blockading force would probably find no tankers with bills of lading that declared China as their destination. The Chinese government and state-owned energy companies could almost certainly offer private shippers and oil producers sufficient compensation to ensure their complicity in such a scheme.

Another issue would be how to stop a ship that simply refused to stop and be boarded. Sinking an uncooperative supertanker seems implausible in conditions short of total war, given the value of the cargo, the environmental havoc created by the resulting oil spill, and the threat to the civilian crew. With high enough stakes, a blockader might use the minimum force necessary to ensure compliance, but serious diplomatic repercussions could follow disabling fire directed against a foreign vessel (e.g., a Greek or Norwegian supertanker). A blockader would probably be able to stop uncooperative ships without gunfire or other lethal force, but those means could be overtaxed if enough ships resisted boarding. Beijing could orchestrate disobedience; blockaders might encounter ten vessels in one day that refused to stop.

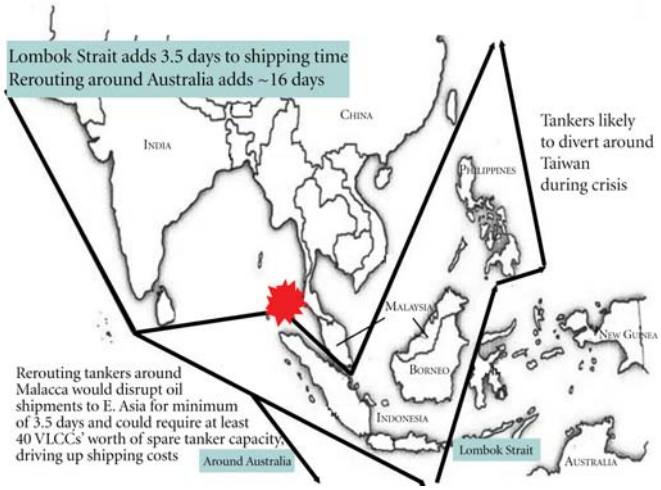
Maritime insurance and its effect on oil transport during war is also worth consideration. Under normal operating conditions, hull insurance for a tanker runs between 2.5 percent and 3.75 percent on an annualized basis.[24] Thus, a tanker owner operating a $130 million VLCC can expect to pay $8,900–$13,300 a day in insurance costs. Lloyd's of London, like other insurers, however, automatically revokes hull insurance upon any outbreak of war between China and the United Kingdom, France, the United States, or Russia, potentially meaning that all shipping to and from China would automatically stop during hostilities.[25] In practice, however, cargo owners and shippers can obtain compensating coverage, known as "hull war risks and strikes" policies, if they operate in a declared war-risk exclusion zone.[26] In waters so designated, rates can climb to 7.5 percent to 10 percent of a ship's value on a per-trip basis, meaning that the same VLCC operator would have to pay between $8.9 and $13.3 million per trip to

insure his ship while it was in the danger zone.[27] Beijing would have to subsidize such costs, either directly or indirectly, if it wanted delivery of oil on privately owned vessels to continue.

PRC state-owned tankers could conceivably be self-insured and thereby continue oil delivery to the home country without paying such premiums. This may explain recent efforts by Chinese nationally owned shipping corporations to build and operate larger fleets of oil tankers. In addition, it is possible that the PRC could entice shippers and shipowners with direct payments or through some type of laundering mechanism. A high enough return can induce some shippers to send vessels into war zones without insurance. Crews willing to sail them can also be found, for the right price.[28] In such ways, insurance barriers during blockades would likely be overcome.

Yet another method of sidestepping the blockade would involve avoiding the Malacca Straits altogether by sailing tankers through the Lombok and Sunda straits, or even circumnavigating Australia and approaching East Asia from the open Pacific.[29] This would render a distant blockade even more unlikely to achieve its goal and would necessitate additional forces. Tanker rerouting would result in four to sixteen days of disrupted oil shipments to East Asian consumers depending on whether shippers rerouted through the Lombok Strait or all the way around Australia. That in turn would drive up shipping rates and final prices for all oil consumers. The figure shows the increased tanker demand and delivery disruption times that would result from rerouting tankers around the Malacca Straits.

PRC TANKER REROUTING OPTIONS



In any case, a distant blockade would be unable to interdict oil transshipped from neighboring nations to China. The blockading state could exert pressure on East Asian nations to prohibit such transshipments, but the economic incentive to allow them would doubtless be considerable. Furthermore, preventing transshipment would mean intercepting—in close proximity to the mainland—large numbers of smaller ships carrying oil cargo into China, a problem that will be discussed shortly.

Estimating Required Forces. The practical problems associated with conducting a distant blockade suggest a robust force structure. That would have a high opportunity cost, because it would reduce the number of ships available to deal with the conflict that prompted the blockade in the first place. The number of surface warships necessary to conduct a distant blockade can be roughly estimated. The driving factor is the need to ascertain which tankers passing through the Straits of Malacca contain oil bound for China. If each tanker must be boarded, a given warship can send teams on board four tankers in a twenty-four-hour period, and fifty-two tankers pass through the strait every day, as at present, thirteen surface warships are needed. If the number of tankers requiring boarding could be winnowed—say, if bills of lading could somehow be verified electronically—the number could be reduced. Perhaps then six surface warships would be able to conduct the necessary boardings and inspections, with one dedicated replenishment vessel.[30]

The ships on station, however many there are, would also require in-theater replacements for maintenance or combat casualties, as well as backups should any of the blockading ships be diverted to escort or pursuit functions. It appears then, that at least ten surface warships and two replenishment vessels would be required to establish an effective and protected distant blockade at the Straits of Malacca. This number would increase proportionally if the Lombok Strait, Sunda Strait, and the route around Australia also had to be patrolled. The authors estimate that three surface warships and accompanying replenishment vessels per additional strait would be necessary to provide reasonable assurance that all passing tankers could be boarded, inspected, and if necessary escorted to a quarantine anchorage. This gives a minimum total of sixteen surface warships and four replenishment vessels, counting neither the supporting forces that would be necessary to interdict and defeat any attacking PRC counterblockade forces or the units necessary to relieve the initial group. Clearly, only large navies would be capable of contemplating such a blockade.

More Limitations, and PRC Options. In addition to the problems mentioned above, a distant maritime energy blockade would be unable to prevent the overland transport of oil into China. As with the transshipment to smaller ships, economic incentives would drive oil delivery to China in significant amounts via pipeline, train, truck, or other means. Russia currently ships over three hundred thousand barrels per day of oil to China by rail and anticipates being able to pipeline up to 280,000 bpd of crude to northern China by the end of 2008. Severing these overland oil flows would require attacking critical infrastructure deep within Chinese territory, with all the escalatory risks such strikes would entail.

Notably, no blockade of China in history has succeeded without Russian acquiescence.

China also has diplomatic options should it be subjected to a blockade. Unless China committed some misdeed of such magnitude as to unite the international community against it, a blockading power would likely face Beijing alone. China's vital role in the global economy means that a blockader, while it might be militarily superior, would face extreme international pressure to conclude operations quickly. Such pressure would rise steadily as economic damage mounted, whereas even if conducted flawlessly the blockade would probably take months or even years to register its full effect; eventually the blockader would alienate its allies and even become an international pariah. Meanwhile, international diplomacy would severely hamper the blockade. Beijing would doubtless employ its proven diplomatic ability to align states sharing its energy and economic interests, thus raising the diplomatic, economic, and even military costs for the blockader.

Among other diplomatic options, the PRC might decide or threaten to proliferate previously denied arms to states unfriendly to those conducting the blockade, or renege on previous agreements that benefited the blockading state. Beijing could also reflag its tankers to a third nation and thereby greatly complicate the legalities involved in boarding them. It is likely that Chinese planners, believing that an energy blockader could in some such way convince or compel some states to acquiesce to boarding, searching, and interdiction, might place vessels under the flags of states that a blockader would be reluctant to confront. Such ships could sail through a distant blockade with impunity, unless the blockading state were prepared to risk broadening the conflict.

China might also attempt to disrupt the energy systems of its opponents. Hurricane Katrina demonstrated the fragility of Gulf Coast oil production, refining, and distribution; other nations dependent on hydrocarbon imports doubtless have similarly vulnerable concentrations of energy infrastructure. China could conduct physical or electronic attacks against such critical nodes and so limit the amount of oil blockading nations could themselves import. Attacks against financial, electrical, and even food distribution networks are also conceivable and could have very profound effects.

In short, although China would not be able to counter a distant oil blockade effectively by traditional military might, it would likely be able to reduce a blockade's effectiveness greatly by commercial, diplomatic, and unconventional military means. Even if Beijing could not maintain its peacetime level of oil imports, domestic production, overland importation, and restrictions on consumption would allow it to hold out as long as the population remained convinced that the objective that had brought about the blockade was worth the cost.

Simultaneously, global business and diplomatic interests would doubtless clamor for a resumption of trade with China. Such a scenario would seem to be to Beijing's, and not a blockader's, advantage.

The "Supply Side" Blockade

A state contemplating an energy blockade against China might consider a "supply side" blockade, in which major oil exporters would be forbidden to sell oil to China. Such an approach could be enforced by either inducing the countries to reduce exports by an amount equal to their average exports to China or monitoring outbound tankers and taking punitive actions against those carrying cargoes to China. A supply-side blockade, however, would likely require the use of force to achieve cooperation from recalcitrant oil exporters like Iran or Venezuela, thereby substantially widening the conflict. In addition, by reducing the total amount of oil available to the world market, a supply-side embargo would trigger frantic bidding by China and other major consumers, causing increased costs for all oil consumers, including those in the blockading state. Furthermore, as the 1973 Arab oil embargo demonstrated, the embargoed country eventually receives oil, even from the embargoing states, at increased prices and through third parties. A supply-side blockade, consequently, would be neither effective nor feasible.

The Close Blockade

If a distant blockade cut off delivery of oil to China via large tankers, it is likely that delivery via smaller vessels would increase, in response to this new demand signal. A blockading state would be forced to consider a close blockade.

A close blockade would entail placing surface warships in close proximity to China's three major oil-handling port concentrations, Guangzhou/Hong Kong, Shanghai/Ningbo, and Tianjin/Dalian. Each of these concentrations would require perhaps six surface combatants to conduct the boardings, inspections, and, if necessary, seizures of ships attempting to run the blockade. Blockading forces would also have to be prepared to stop, or at least greatly reduce, the coastwise traffic of smaller ships between Chinese and other Asian countries. In all, a close blockade would require tens of surface warships near the Chinese coast. The risks to them in a wartime environment would be substantial; the blockading state would probably quickly find itself in a naval and aerial war of attrition. A blockading state would be tempted, in order to achieve the upper hand in such a scenario, to strike at PLAN supporting infrastructure (e.g., command and control nodes, fleet headquarters, and fuel depots). Such actions could prove dangerously escalatory and define a critical difference between the distant and close blockades.

Blockade by Convoy

Another option available to the blockading state would be to implement a system of convoys—not for defensive purposes but to ensure compliance with an energy embargo against China. Each convoy would consist of tankers bound for neutral and friendly Asian states and would be escorted by a surface warship. No other tankers would be permitted to sail in eastern Pacific waters. That seems simple, but assuming that five VLCCs per day would be needed to supply non-Chinese Asian oil demand, the logistics would overwhelm most or even all navies. Each group of five VLCCs would require a round-trip sailing time of upward of twenty days between Singapore and Japan or South Korea—which are the two largest non-Chinese oil consumers in Asia—plus a two-day turnaround, making cycles of twenty-two separate convoy groups, one leaving per day; each would need at least one escort and corresponding replenishment ships. Additional ships would be required to allow maintenance to be performed on the escorting ships and to establish patrols to ensure that no cheaters entered China from the east or from other routes. All this would require an enormous force structure; it could be mounted only by the largest of navies, and only with the active cooperation of neighboring states.

CALIBRATED ENERGY-ACCESS DENIAL AND POSSIBLE CHINESE RESPONSES

Given the shortcomings of the maritime blockade options discussed above, a blockading state might seek an alternative way to deny China energy imports. A possible method of at least partially achieving the intent of an energy blockade would involve preventing China from processing and distributing oil, regardless of how it got into the country. China, like all other major oil consumers, is vulnerable to precision attacks on key energy infrastructure, such as refineries and pumping stations. The destruction of critical infrastructure components could almost completely deny China the ability to process crude oil or transport refined products efficiently. This could conceivably be achieved with minimal destruction and violence while minimizing risk to attacking forces.

A sufficiently capable adversary could conceivably destroy such a target set in a very short time. Conversely, an attacker might adopt a calibrated approach as a method of demonstrating resolve and increasing incentives for negotiated settlement. In such a scheme, oil off-loading wharves and adjacent strategic petroleum reserve facilities could be attacked first, followed perhaps by pumping stations on the Chinese portion of pipelines carrying oil from Kazakhstan and Russia, and finally, if necessary, by strikes on oil refineries. With key refining units thus disabled, China would lose the ability to produce liquid fuels from petroleum for six or more months.[31]

Yet unlike imposing a naval blockade, which can be quickly reversed, destroying refinery components that take a half-year or more to replace would have serious long-term repercussions for China's economy and would effectively constitute an irreversible act, likely to trigger conflict escalation. Compounding these escalatory dangers, Russia and Kazakhstan could react strongly to the loss of significant portions of their energy exports and to the prospect of political, social, and economic upheaval on the other side of their Chinese borders.

PRC military planners undoubtedly realize that the destruction of energy infrastructure could appeal to an adversary. The PRC's heavy investment in advanced air defense systems, such as the Russian SA-10 and S-300 and indigenous variants like the HQ-9, suggests that countermeasures to precision weaponry upon which such a scheme would depend are being acquired.[32] China could also defend against such a campaign by stockpiling parts necessary for quickly rebuilding critical energy nodes. Fear of precision conventional attacks on energy infrastructure and other critical potential targets could also explain why China's naval modernization seems designed to render its fleet able to push opposing forces beyond the "first island chain," and hence eventually out of manned tactical aircraft and cruise missile range.[33]

If China were subjected to a precision energy infrastructure destruction campaign, it could employ the same retaliatory options described earlier. Nonetheless, Beijing's symmetrical military response options would be less likely to be effective, since naval forces supporting the precision campaign would operate at distances from China sufficient to provide some measure of safety. This difficulty in responding in a parallel manner would, however, only increase the escalatory pressures that accompanied the crisis leading to the blockade's imposition.

An even more critical failing of an energy denial campaign is that it immediately involves strikes conducted against the PRC mainland. This is antithetical to the purpose of naval blockades, which could be considered a desirable use of military power specifically in that they rely on a limited use of force that can be modulated and, if necessary, withdrawn quickly, with little permanent damage done. In contrast, any actions, such as those involved in a precision energy-denial campaign, that significantly endanger Chinese economic growth also threaten the survival of Chinese leaders and their regime's legitimacy, thereby producing extreme escalatory pressures. Beijing has long maintained a nuclear deterrent, which is being made extensively more survivable through the addition of a long-range ballistic missile on new missile-carrying submarines (SSBNs) and road-mobile ICBM systems. Occasional mutterings and dark allusions from senior PLA officers suggesting a willingness to trade nuclear blows raise real questions as to what constitutes Beijing's nuclear "red lines." One would hope that such scenarios would be

avoided in all but the most fundamental and unconstrained struggles for national survival.

RECALIBRATING CONVENTIONAL WISDOM

A distant naval energy blockade, though it could be conducted with low to moderate tactical risk with some navies' force structures, could probably not prevent the delivery of oil to China by means of alternative sea routes, falsified bills of lading, or transshipment of oil via third parties. Such a blockade will become even less feasible as China extends the reach and lethality of its naval and aerial forces. A close blockade, on the other hand, would require large numbers of ships to operate in close proximity to the PRC's impressive and increasingly lethal antiaccess weaponry, where they would be subject to attrition, with attendant escalatory risk. A blockade by convoy would also require a very large force structure, and a supply-side blockade of oil shipments to the PRC would only drive up prices for all global oil consumers.

None of these blockade schemes could prevent the flow of oil into China via pipeline, rail, or truck, and none could prevent China from extracting oil from its interior oil fields. In 2005, domestic sources accounted for over 60 percent of the oil that China consumed. That same year imported oil constituted only about 10 percent of China's overall energy consumption. These numbers strongly suggest that China could withstand a complete denial of seaborne oil imports. Furthermore, effective blockades typically take years to achieve their goals and even then succeed only when they are a part of a comprehensive military action that usually includes invasion or massive aerial bombardment.[34] It is difficult to imagine a limited-war scenario that would justify such actions by any blockading nation.

The primary conclusion of this article's examination of blockade scenarios, then, is that, contrary to what appears to pass for conventional wisdom among naval analysts and observers in the PRC, China is not fundamentally vulnerable to a maritime energy blockade in circumstances other than global war.[35] This view has far-reaching implications. For one, it suggests that China does not need to build up naval capacity for the purpose of defending energy SLOCs against potentially hostile naval forces.

Such a realization might recalibrate internal Chinese discussions in ways that increase transparency and engender increased trust between China and concerned regional powers. This in turn potentially opens the door for much more meaningful naval and SLOC security cooperation between the PLAN and other navies. The twin trends of China's skyrocketing resource demands and the accelerating tendency of regional countries to modernize their navies creates a dire need for frank discussions on core energy and maritime security issues.

Including tough subjects like blockades puts the discussion in concrete terms and may help participants move beyond the "talking" stage and into policy implementation.

Seeking deeper understanding between China and other regional and global powers would help reduce tensions and foster more effective multilateral solutions to energy transport security. This might be accomplished by such measures as encouraging the International Energy Agency to accept China as a full member, increasing military-military contacts, and offering to share strategic petroleum reserve management expertise. For players on either side of a potential conflict to play, whether accidentally or explicitly, on China's sense of vulnerability to an energy blockade is destabilizing and ultimately erodes security of all sides.

NOTES

The views expressed are the authors' personal thoughts and analyses and do not reflect official assessments or policies of the Department of Defense or other agencies of the U.S. government. This article borrows extensively from the authors' *China's Energy Strategy: The Impact on Beijing's Maritime Policies,* forthcoming in 2008 from the Naval Institute Press.

1. See, for example, Gabe Collins, Andrew Erickson, and Lyle Goldstein, "Chinese Naval Analysts Consider the Energy Question," in *Maritime Implications of China's Energy Strategy: Interim Report* (Newport, R.I.: Chinese Maritime Studies Institute, Naval War College, December 2006).
2. See P. Parameswaran, "U.S., China, India Flex Muscle over Energy-Critical Sea Lanes," Agence France-Presse, 4 October 2006, available at www.defensenews.com.
3. 凌云 [Ling Yun], 龙脉 [The Dragon's Arteries], 现代舰船 [Modern Ships] (October 2006), pp. 8–19.
4. Ibid., p. 15.
5. Lei Wu and Shen Qinyu, "Will China Go to War over Oil?" *Far Eastern Economic Review* 169, no. 3 (April 2006), p. 38.
6. Throughout this article the word "blockade" will be used to describe efforts that seek to deny the transport and delivery of products—in this case, petroleum-based energy—to a given nation. The legal requirements and definitions of a blockade can differ from the hypothetical conditions put forth in this article, but such differences would not prove insurmountable to a nation intent on denying another's access to energy during war. The authors also recognize the many compelling reasons to consider a war between China and the United States highly unlikely and undesirable.
7. Sohbet Karbuz, "The U.S. Military Oil Consumption," *Energy Bulletin,* www.energybulletin.net/13199.html.
8. The method of blockade assumed in this article is the boarding and searching of suspect ships. Those with contraband would be either seized or forced to proceed to holding areas, while those with authorized cargoes and destinations would be allowed to proceed. This article does not envision the selective or indiscriminate sinking of suspect vessels in conditions other than unrestricted warfare.
9. Deployments by PLAN vessels such as that of the Luhu-class destroyer *Qingdao* and a replenishment vessel to the west coasts of Canada and the United States in the late summer of 2006 are among the infrequent exceptions to this rule.
10. The distance from the PLAN's submarine base on the south coast of Hainan Island to the Straits of Malacca is approximately 1,200 nautical miles. PLAN diesel submarines can travel submerged quietly at a maximum speed of approximately four knots without rapidly depleting their batteries. Assuming, then, that they can travel nearly one hundred nautical miles a day, they will require twelve days to travel from their base to the Straits of Malacca. After arriving,

PLAN submarines would have to operate in and around the very crowded and shallow waters of the straits against the combined, formidable, and concentrated antisubmarine efforts of the blockading force. Success for a PLAN submarine in such an environment is far from assured.

11. Autonomous weapons like ASCMs do not generally discriminate well among potential targets, instead attacking whatever radar return first satisfies their arming and attack criteria. Hence, one Chinese-manufactured C-802 ASCM fired by Hezbollah against the Israeli *Hanit,* a Sa'ar 5 corvette, on 14 July 2006 missed and instead is alleged to have struck and destroyed an Egyptian merchant vessel. Another, of course, hit its target. See Yitzhak Shichor, "Silent Partner: China and the Lebanon Crisis," *China Brief* 6, no. 17 (16 August 2006), available at www.jamestown.org/publications_details.

12. Bruce Blair, Chen Yali, and Eric Hagt, in "The Oil Weapon: Myth of China's Vulnerability," *China Security* (Summer 2006), have noted a doctrine of PLAN escalation in naval warfare, quoting former PLAN commander Liu Huaqing as having written in his memoirs, "When enemies attack our coastlines, we will attack our enemies' home base" (p. 43).

13. Although operations of this type could ultimately prove unsuccessful due to PLAN inexperience, any blockading force would have to honor the threat and deploy assets accordingly.

14. "Land Attack Cruise Missiles (LACM) Hong Niao/Chang Feng," Globalsecurity.org.

15. For example, a Norwegian ship-owning company specializing in the maritime transport of petrochemical gases, liquid propane gas, crude oil, and liquid natural gas recruits officers and crews for its ships in St. Petersburg, Russia, and Wuhan, China. These ships are then chartered to major international companies. See *The I. M. Skaugen Group,* www.skaugen.com.

16. Using modern communications, a ship about to be seized would surely tell its owners of this fact; they in turn could inform the cargo owners, who could sell the cargo on the spot market. A VLCC carrying a 300,000-ton shipment (about 2.2 million barrels) of crude has a cargo value (at ninety dollars a barrel) of nearly $200,000,000. Such enormous financial stakes would doubtless result in sophisticated maneuverings that would greatly complicate the challenge of determining cargo ownership. It is also conceivable that the PRC government and its oil companies could set up shell companies that would permit any tanker threatened with boarding to sell its cargo almost instantaneously to what appeared to be a non-PRC buyer.

17. James Goldrick, "Maritime Sanctions Enforcement against Iraq, 1990–2003," in *Naval Blockades and Seapower, Strategies and Counter-Strategies, 1805–2005*, ed. Bruce Elleman and S. C. M. Paine (London: Routledge, 2006), p. 210.

18. The fifty-two-tankers-per-day estimate is derived from information reported to the Malaysian Vessel Traffic Service at Klang; it is available from Malaysian Vessel Traffic Service statistics posted on the Malaysian Marine Department website, www.marine.gov.my/misc/index.html. For the barrels-per-day figure, see "World Oil Transit Chokepoints, Strait of Malacca, November 2005," at *Energy Information Administration,* www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Malacca.html.

19. In 2005 China imported approximately 27 percent of the oil that passed through the Straits of Malacca bound for either China (3.1 million barrels per day imported), Japan (5.2 mbpd), South Korea (2.2 mbpd), or Taiwan (1 mbpd) (see "Top World Net Oil Importers, 2004," at *Energy Information Administration,* www.eia.doe.gov); 3.1 million barrels of oil can be carried on as few as two VLCCs or on any number of smaller ships.

20. "China Needs More Supertankers to Ensure Oil Supply Security: Report," Xinhua News Agency (11 August 2006), english.people.com.cn.

21. A bill of lading is a document issued by a shipper acknowledging that specific items have been received on board as cargo to be shipped to a designated destination for delivery to a consignee, who is usually stipulated.

22. *The International Crude Oil Market Handbook 2004,* 5th ed. (New York: Energy Intelligence Group, 2004), p. A12.

23. This observation was made during an interview with a former VLCC officer. It is also mentioned in John S. Burnett, *Dangerous Waters: Modern Piracy and Terror on the High Seas* (New York: Penguin, 2002), p. 43.

24. See, for example, P. Manoj, "War Risk Insurance for Indian Flag Ships Liberalized" *Hindu Business Line,* 28 December 2004, www.thehindubusinessline.com.

25. Michael D. Tusiani, *The Petroleum Shipping Industry,* vol. 2, *Operations and Practices* (Tulsa, Okla.: PennWell, 1996), pp. 216–17.

26. Ibid.

27. See, for example, Perrine Faye, "Iraq Attacks Drive Up Oil Tanker Insurance," *Middle East On Line,* 28 April 2004, www.middle-east-online.com/english/?id=9821. Interviews with industry specialists suggest that in some cases the charges cited in the text can be incurred daily.

28. During the Iran-Iraq Tanker War some crews agreed to sail in the Persian Gulf for triple pay; Tusiani, *Petroleum Shipping Industry,* p. 217. Willing crews would be even easier to find during a blockade marked by seizures rather than sinkings.

29. An excellent summary of the limitations and delays involved in rerouting oil tankers if the Straits of Malacca were closed can be found at Mokhzani Zubir, "The Strategic Value of the Strait of Malacca," *Maritime Institute of Malaysia,* www.mima.gov.my.

30. These half-dozen combatants would require protective forces, since distance and shallow water alone would be insufficient to ensure their safety. If the blockading navy possessed one or more aircraft carriers, their air wings could provide welcome self-defense, surveillance, and reconnaissance, all of which would benefit the blockade. Any such carrier, however, would require additional surface ships and submarines for self-defense, as well as a dedicated replenishment vessel.

31. This estimate is based on authors' conversations with experienced refining specialists.

32. China's SAM order of battle is partially described in "Surface-to-Air Missiles,"*Chinese Defence Today,* www.sinodefence.com/army/surfacetoairmissile/default.asp. China's advanced SAM acquisitions are also described in the 2005 "DoD Report to Congress on the Military Power of the People's Republic of China," pp. 12, 23, 32, available at www.defenselink.mil/news/Jul2005/.

33. For discussion by a PLAN senior captain of the imperative to extend the operational capabilities of China's navy in this fashion, see Xu Qi, "Maritime Geostrategy and the Development of the Chinese Navy in the Early Twenty-first Century," trans. Andrew S. Erickson and Lyle J. Goldstein, *Naval War College Review* 59, no. 4 (Autumn 2006), p. 62.

34. The allied blockade of World War I, the Union blockade of the Confederacy, Britain's blockade of Napoleonic France, and the U.S. blockade of Japan in World War II are cases in point.

35. Other recent research supports this assertion. Using two calculation methods, a 2006 analysis concluded that a total stoppage of seaborne oil into China would reduce Beijing's gross domestic product (GDP) by 5.4 to 10.8 percent. The study noted that this reduction in GDP would either halve (best case) or nearly eliminate (worst case) China's continued annual 10 percent GDP growth. This would certainly be painful for China but by itself would be unlikely to provide PRC leadership sufficient incentive to enter negotiations to end whatever conflict had precipitated the blockade. See Blair, Chen, and Hagt, "Oil Weapon Myth," p. 43.