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U.S. CONVENTIONAL ACCESS STRATEGY

Denying China a Conventional First-Strike Capability

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The People's Republic of China makes extensive territorial claims over Taiwan, the East China Sea, and the South China Sea. China's neighbors openly dispute these claims and the international community does not recognize most of them. The Chinese government views the settlement of these disputes on terms favorable to China as a national priority. Ideally, the Chinese government would like to resolve these disputes through diplomatic channels or by using coercive and paramilitary techniques that fall short of triggering armed conflicts.[1] However, concurrently the People's Liberation Army (PLA) is preparing war plans and acquiring capabilities to resolve these disputes through the use of armed force. The Chinese government views all its territorial disputes as "core interests" and has signaled its willingness to achieve these core interests through the use of armed force. The U.S. government openly opposes any coercive or aggressive activities that upset the status quo, putting it at odds with the Chinese government.[2]

The problem is that the Chinese leadership appears unconvinced that the United States would risk a conflict with China—one that could escalate to a nuclear war—over disputes concerning territories that geographically are distant from the U.S. mainland and seemingly are unrelated to core U.S. national security interests.[3] However, the PLA has a relatively small nuclear arsenal, estimated at fewer than four hundred warheads, in contrast with the U.S. arsenal, which has around 1,550 warheads.[4] Any nuclear strike China made on the United States would involve only a fraction of the PLA's overall arsenal, because it would need to retain

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some reserve to deter other nuclear-armed neighbors, such as Russia and India. If the Chinese leadership authorized a nuclear strike against the U.S. homeland, or even a limited nuclear strike against forward-deployed U.S. forces, it would be inviting overwhelming devastation from the considerably larger U.S. nuclear force.[5] For these reasons, China likely would aim to confine itself to the use of conventional weapons during any potential high-intensity conflict with the United States—particularly given that China already possesses a lethal array of long-range, conventional, theater-strike options.[6] Such a strategic, conventional, first-strike option is one that the United States should seek to deny China by developing an effective conventional access strategy.

The U.S. military has three principal strategic objectives. The first is to protect the U.S. mainland and offshore U.S. territories from armed attacks.[7] The second is to foster a stable, rules-based, global security order through an interconnected web of alliances and partnerships. The third is to deter and, if necessary, decisively defeat aggressors through the projection of military power. Under the national military strategy that the Joint Staff published in 2015, the U.S. military would deter and defeat state aggressors by leveraging U.S. forward-deployed units, force-projection capabilities, alliances, communications networks, and "resilient logistics" infrastructure.[8] This strategy appears identical to the U.S. military's force-projection approach to the 1991 Gulf War.[9] But the central problem with emulating the Gulf War style of force-projection operations is that in future decades the U.S. military no longer will enjoy uncontested use of its forward bases or the ocean.[10]

Operation DESERT STORM required the U.S. military to transport around five hundred thousand personnel, 6.1 million tons of fuel, and 3.7 million tons of equipment and stores to the Persian Gulf theater. Building up sufficient personnel, equipment, stores, and supplies required seven months of intense air and sealift operations, as well as access to bases in Saudi Arabia.[11] Because of the range limitations of tactical aircraft and payload-laden airlifters, the U.S. Air Force (USAF) was forced to use in-flight refueling tankers to form "air bridges." Air bridges allowed aircraft with range limitations to cross oceans by flying between in-flight refueling tankers until they reached the desired theater of operations. USAF in-flight refueling tankers also supported U.S. and allied short-range tactical aircraft, flying around 16,868 sorties to deliver four hundred thousand tons of fuel in flight.[12] The U.S. military deployed a total of around 1,600 short-range tactical aircraft that operated from in-theater air bases and six U.S. Navy (USN) aircraft carriers stationed in littoral waters.[13] Long-range, precision-guided munitions accounted for around 5 percent of all air-to-ground ordnance delivered, supported by around sixteen Global Positioning System (GPS) satellites.[14] U.S.

military satellite constellations also gathered intelligence and provided global communications.[15]

The PLA keenly observed the 1991 Gulf War, particularly American exploitation of conventional, long-range, precision strikes.[16] The PLA also observed how two USN carrier strike groups intervened during the 1995–96 Taiwan Strait crisis. Both developments highlighted the PLA's technological inferiority and inability to prevent USN sea power from threatening the Chinese mainland.[17] In response, the PLA has developed a "counterintervention strategy," designed specifically to negate traditional U.S. advantages in global force projection. The core problem is that the PLA's counterintervention capabilities could be used to undermine the U.S. military's credibility to deter and defeat state aggressors—thereby increasing the likelihood of a China-U.S. armed conflict.

PLA COUNTERINTERVENTION STRATEGY

Strategically, the PLA is tasked with using its counterintervention strategy to deter the United States and deny the U.S. military access to the western Pacific. The primary purpose of this strategy is to provide the Chinese government with the ability to isolate and coerce U.S. allies or regional countries to accept Chinese sovereignty demands in a number of territorial disputes.[18] The PLA might be directed to apply this counterintervention strategy in relation to the disputed sovereignty over Taiwan, the Yellow Sea, the East China Sea, and the South China Sea.[19]

The PLA's counterintervention strategy requires four main types of military operations: theater strike, denial of service, antiaccess, and area-denial operations. Ideally, all four types of operations would be carried out simultaneously; however, the PLA's finite resources might force it to prioritize. If the PLA were forced to prioritize, it would place the greatest emphasis on neutralizing forward-deployed U.S. forces, followed by denying critical services to the U.S. military, followed by activities to prevent the U.S. military from reinforcing the Pacific theater. Theater-strike operations would be required to disable or destroy forward-deployed U.S. military assets, including aircraft, ships, and submarines, in addition to infrastructure at U.S. bases located west of Pearl Harbor.[20] Strikes against these targets would be executed rapidly at the outset of a conflict to catch adversaries unprepared and achieve decisive in-theater superiority.[21]

In carrying out this strategy, the PLA will employ each of its four subordinate service branches: the PLA Army, the PLA Navy (PLAN), the PLA Air Force (PLAAF), and the PLA Rocket Force (PLARF). PLAN submarines would execute undersea attacks against U.S. ships and submarines in port or at sea and strike at land targets with cruise missiles.[22] The PLAAF would execute air strikes against

U.S. aircraft on the ground or in the air, as well as U.S. ships and submarines in port or at sea. Strikes against U.S. bases would occur with extended-range missiles launched from PLAAF combat aircraft or conventional ballistic missiles launched from the Chinese mainland.[23]

PLAAF combat aircraft can deliver antiship cruise missiles (ASCMs) out to two thousand kilometers (km) from the Chinese mainland, and PLAAF H-6 long-range bombers can deliver land-attack cruise missiles out to 3,300 km from the Chinese mainland. Air-launched cruise missiles would be supplemented by PLARF conventional ballistic missiles. The PLARF's DF-16 short-range ballistic missile would strike land targets at a range of around eight hundred kilometers. The PLARF's DF-21 medium-range ballistic missile (MRBM) would strike land targets or moving ships in the DF-21D antiship ballistic missile (ASBM) configuration at a range of around 1,500 km.[24] The PLARF's DF-26 intermediate-range ballistic missile (IRBM) would strike land targets or moving ships in the ASBM configuration at ranges around three thousand kilometers.[25]

Denial-of-service operations would aim at denying the United States unfettered use of its command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) infrastructure.[26] Successful PLA denial-of-service operations would hinder the U.S. military's ability to execute land-attack strikes from USN submarines in the western Pacific, receive up-to-date intelligence from USN submarines on patrol, marshal combat resources to reinforce the Pacific theater, and communicate with surviving U.S. forces in the western Pacific. One method would be for the PLA to apply its antisatellite (ASAT) technologies to incapacitate, disrupt, or destroy U.S. military satellite constellations used for global communications, satellite navigation, and intelligence gathering.[27] PLA ASAT technologies include lasers, microwave technologies, and hard-kill methodologies.[28] Cyberwarfare capabilities also provide the PLA with a sophisticated method to disrupt or deny the U.S. military's use of its C4ISR infrastructure.[29]

Antiaccess operations would degrade or deny USAF and USN force-projection capabilities for accessing the western Pacific, thus isolating U.S. allies.[30] Denying USN seaborne force-projection capabilities would be a priority because over 90 percent of all U.S. military assets, stores, and equipment are transported by sea.[31] PLA antiaccess operations would force USN task forces to run a gauntlet of layered offensive PLA capabilities during the approach to the western Pacific.[32] Surviving USN task forces likely would arrive in theater with depleted missile magazines, having suffered fleet-wide damage or ship losses, or both, just to come within range of the Chinese mainland. Weapons and vessels available for Chinese antiaccess operations include DF-21D ASBMs, potentially

DF-26 ASBMs, air-launched ASCMs, diesel-electric and nuclear-powered attack submarines, and surface combatants.[33]

U.S. airpower also could be denied access to the western Pacific through the deployment of PLAN aircraft carrier battle groups. Other options might include arming PLAN nuclear-powered attack submarines with submarine-launched, antiair missiles to shoot down USAF in-flight refueling tankers and cargo-transport aircraft. Concurrently, some PLA units would aim to interdict U.S. follow-on forces outside the western Pacific, particularly in Hawaii and Australia, with the aim of harassing and interfering with the deployment of U.S. and allied forces into theater.[34]

Area-denial operations would be required to limit the freedom of maneuver of air or maritime forces in coastal areas close to the Chinese mainland. PLA capabilities that could be used for area-denial operations include advanced sea mines, diesel-electric submarines, maritime strike aircraft, surface combatants, Type 022 missile patrol boats armed with ASCMs, coastal ASCM batteries, land-based air-defense systems, and land-based conventional and rocket artillery batteries.[35]

PLA PASSIVE DEFENSES

Concurrently, the PLA has invested in three types of passive-defense capabilities designed specifically to enable continuity of PLA conventional and nuclear warfighting capabilities, even if the Chinese mainland comes under heavy attack. PLA passive-defense capabilities include land-based sensor networks; land-based command, control, and communications (C3) networks; and hardened facilities.

First, the PLA has invested in extensive land-based sensor networks to provide persistent wide-area surveillance of the western Pacific to enable PLA land-based, long-range strike capabilities. The PLA uses land-based Skywave over-the-horizon (OTH) radar technology to track aircraft and ships at ranges of several thousand kilometers from the Chinese mainland.[36] The PLA uses Surfacewave OTH radar arrays to track aircraft and ships at long ranges from the Chinese mainland.[37] These capabilities are being augmented with other infrared, pulsed-Doppler radar, phased-array radar, and passive radar detection technologies.[38] The PLA uses passive undersea sensors to detect and track submarines operating within Chinese littoral waters.[39] The PLA's land-based intelligence, surveillance, and reconnaissance (ISR) capabilities are augmented by PLAAF airborne warning and control system aircraft, unmanned aerial vehicles, and ISR satellites.[40]

Second, the PLA has invested in survivable, land-based C3 systems designed specifically to enable the Chinese national command hierarchy to retain basic C3 functions over all PLA branches, even while under heavy attack.[41] PLA C3 systems include underground fiber-optic cables; microwave relays; and

TABLE 1
TYPES OF HARD TARGETS

Type	Definition
Hardened structure (HS)	Aboveground HS: aboveground facilities or structures that are protected from kinetic and air-blast weapons effects because of their aerodynamic shape that deflects blast waves—typically covered with earth and reinforced concrete[a]
	Shallow-underground HS: underground facilities or structures up to twenty meters below the earth's surface
	Deep-underground HS: underground facilities or structures twenty or more meters below the earth's surface
Hard and deeply buried target (HDBT)	Underground facilities one to seven hundred meters below the earth's surface that protect a country's national command structure, critical activities, equipment, personnel, or strategic military response options from nuclear weapons effects

Note:
a. National Research Council of the National Academies, *Effects of Nuclear Earth-Penetrator and Other Weapons* (Washington, DC: National Academies Press, 2005), p. 14.

long-range, high-frequency radio technologies augmented by civilian communication channels.[42]

Third, the PLA has invested heavily in aboveground hardened structures (HSs), shallow-underground HSs, deep-underground HSs, and strategic hard and deeply buried targets (HDBTs) (see table 1). The purpose of these hardened facilities is to enable the Chinese national command hierarchy, strategic assets, and other key capabilities such as logistics to survive and remain operational, even after a nuclear strike.[43] The PLA has invested in strategic HDBTs to protect the Chinese national command hierarchy in the event of an armed conflict.[44] These HDBTs are connected to the outside world through extensive land-based communications networks that enable the Chinese national command hierarchy to remain in command of its sea, air, and land forces.[45]

The PLARF has an extensive network of hardened tunnels and facilities buried deep underground and within mountains that can protect land-based strategic assets such as road-mobile ballistic missiles, launchers, and PLARF personnel.[46] Some reports indicate that the PLARF has 4,856 kilometers of such hardened and deeply buried tunnels, some as deep as one thousand meters. The tunnels form part of an extensive underground web of HDBT facilities and are serviced by internal transport or train networks that move ordnance and launchers. These facilities have surface-level entrances where the missile transporter-erector-launchers (TELs) can access surface-level launchpads.[47]

The PLAAF has hardened its air bases to protect its combat aircraft.[48] PLAAF air bases feature hardened aboveground HSs, such as aircraft hangars, with reinforced concrete protection estimated to be between 0.9 and 1.2 meters thick. PLAAF air bases also feature underground HSs that function as hangars and

storage facilities. Some of the PLAAF underground HSs are very large, provided with multiple entrances, constructed inside mountains, and covered by anywhere from twenty to sixty meters of concrete, dirt, and rock. Other passive measures include revetments between parked aircraft and long paved areas that can be used as emergency runways, as well as multiple points of access for runways. These measures usually are augmented by advanced camouflage and advanced air-defense systems.[49]

The PLAN also has constructed extensive underground HSs to protect its submarine forces, accessed by sea-level tunnels in coastal areas. These facilities offer PLA submarines the ability to deploy covertly and return without being visible to U.S. overhead surveillance capabilities.[50] The PLAN naval base on Hainan Island currently is equipped with hardened underground submarine facilities of this nature.[51] The PLAN also plans to construct a significantly larger and more modern underground HS naval base sufficient to protect and house its nuclear-powered, ballistic-missile submarines.[52]

PLA CONVENTIONAL FIRST-STRIKE CAPABILITY

The PLA's most significant counterintervention capability is its inventory of long-range conventional ballistic missiles, particularly given that the U.S. military does not field an equivalent capability. PLA DF-21 MRBMs and ASBMs have ranges around 1,500 km; PLA DF-26 IRBMs and ASBMs have ranges around three thousand kilometers. It is also important to note that the PLA currently possesses between two and three hundred MRBMs and likely will expand this inventory with the introduction of the DF-26. The long range and growing inventory of PLA conventional ballistic missiles would force relatively slow U.S. maritime assets to run a lethal gauntlet of PLA ASBMs while they are unable to return fire and degrade the threat.[53]

The U.S. Office of Naval Intelligence has assessed that the PLA's conventional ballistic missiles use maneuvering reentry vehicles (MARVs) equipped with infrared and radar seekers, enabling PLA ballistic missiles to acquire fixed or moving targets during the terminal phase of flight. PLA MARVs are difficult opponents because of their significant agility and high reentry speeds (around Mach 12), as well as electronic warfare, decoy, chaff, and flare countermeasures.[54]

PLA conventional ballistic missiles have the potential to carry submunitions warheads capable of inflicting wide-area destruction, which increases their threat profile.[55] Against fixed land targets, however, MARV penetrator warheads provide the capability to inflict serious damage to hardened targets.[56] MARV penetrator warheads could sink USN ships outright, whereas submunitions warheads could inflict a range of damage to them.[57] For instance, aircraft carrier flight decks, arresting gear, catapults, and landing signal systems could be damaged,

thereby preventing flight operations.[58] Similarly, USN cruisers and destroyers could suffer damage to phased-array radar panels and Mk 41 vertical launching system (VLS) missile batteries. Damage of either type likely would result in a "mission kill," rendering the damaged ship unfit to fight. The predicted high lethality and significant impact of PLA conventional ballistic missiles pose a serious challenge to the survivability of U.S. forces operating in the western Pacific and thus to U.S. force-projection capabilities.

The PLA's unmatched conventional ballistic-missile arsenal and rapidly evolving military capabilities, combined with a perception of relative invulnerability to U.S. retaliatory strikes, could lure Chinese leaders into a belief that a conventional first strike might deliver temporary PLA regional superiority, during which time Chinese leaders could settle regional disputes coercively, on their terms.[59] A perception of PLA superiority in a conventional theater strike is not helped by the U.S. military's apparent lack of a strategy outlining a credible response to an overwhelming PLA conventional first strike.[60] Without clear U.S. deterrence, the risk of miscalculation only will increase—particularly as the PLA's confidence in its own capabilities grows in future decades.[61]

TOWARD A U.S. CONVENTIONAL ACCESS STRATEGY

The Cold War concept of mutually assured destruction (MAD) maintained relative stability between the United States and the Soviet Union.[62] Underpinning MAD was the knowledge that both sides possessed credible nuclear second-strike capabilities—the ability to absorb a nuclear first strike and still retain sufficient operable capability to respond with unacceptable devastation.[63] This understanding provided a relative degree of stability, since both sides clearly understood their mutual vulnerability and that any preemptive nuclear first strike would receive a response in kind.[64] Using Cold War deterrence theory as an underlying basis, this article advocates that the U.S. military should consider introducing a conventional access strategy, designed specifically to balance the PLA's counterintervention strategy. The purpose would be to provide the U.S. military with an improved capacity to deter a PLA conventional first strike, and, if necessary, degrade PLA capabilities with long-range conventional strike forces, to facilitate access for follow-on U.S. forces.

Strategically, a U.S. conventional access strategy would provide Chinese leaders with a clearer understanding of how the U.S. military can impose costs on China, even in the aftermath of a PLA conventional first strike. Operationally, it would increase the permissiveness of the western Pacific for forward-deployed and follow-on U.S. forces. The Department of Defense's Joint Operational Access Concept (JOAC) states that "in-range combat forces at the beginning of a crisis can facilitate operational access" for other forces in antiaccess/area-denial (A2/

AD) environments.[65] The primary operational objective of a U.S. conventional access strategy would be to degrade the effectiveness of the PLA's conventional strike capability, as opposed to seeking its complete eradication, so as to facilitate access for U.S. forces entering the western Pacific. The JOAC states that the U.S. military must be able to strike deep into enemy A2/AD capability networks to "disrupt the integrity of the enemy defensive system" and that preferred targets include "logistics and command and control nodes, long range firing units and strategic and operational reserves."[66] The secondary operational objective would be to deny the PLA unfettered use of communications, logistics, and transport capabilities such as airfields, airports, ports, rail networks, land-based C4ISR networks, and fuel or ordnance stocks. By degrading PLA strike and war-fighting capabilities, forward-deployed U.S. forces could increase the permissiveness of the western Pacific for U.S. forces arriving in theater.

A U.S. conventional access strategy would require four distinct capabilities. A theater-wide passive-defense capability would enhance the ability of forward-deployed U.S. forces to survive initial PLA conventional strikes. A conventional theater-strike capability would enable the U.S. military to begin degrading PLA capabilities immediately at the outset of a conflict, without access to in-flight refueling tankers or usable runways. A theater-recovery capability would restore basic runway access in the aftermath of PLA conventional strikes. A rapid-response capability would allow long-range USAF bombers and fighter escorts to deploy rapidly to U.S. bases in the western Pacific, capitalizing on freshly repaired runways as well as pre-positioned stocks of aviation fuel and conventional earth-penetrating ordnance.

Theater-Wide Passive-Defense Capability

The PLA aims to be capable of striking at intercontinental distances with hypersonic boost-glide (HBG) missiles by 2020 and capable of striking at intercontinental distances with hypersonic aircraft by 2025.[67] The 2013 Air-Sea Battle Concept (ASBC) states that in a future armed conflict, U.S. bases could be attacked and that "even the US homeland cannot be considered a sanctuary."[68] Both factors indicate that the United States should consider hardening its infrastructure in the western Pacific and at key locations across Hawaii and the continental United States, so as to deny any adversary a relatively easy way to degrade or deny U.S. force-projection capabilities.

Within this context, a theater-wide passive-defense capability would require improvements in the hardening of critical fixed sites to withstand kinetic threats, and the hardening of critical C4ISR systems to resist nonkinetic strikes. Hardening of critical fixed sites might include building aboveground HS submarine pens, aboveground HS aircraft shelters, and deep-underground HS fuel- and

ordnance-storage facilities, as well as deep-underground HS or HDBT shelters for theater-strike missiles, personnel, and base-repair kits. A 2007 study from the RAND Corporation notes that major U.S. forward bases should protect their in-theater fuel stocks in underground HSs and that stores should be sufficient to enable several weeks of high-intensity air operations.[69] Hardening of critical C4ISR systems might include the protection of base computer networks and electronic infrastructure from the effects of cyber, electromagnetic pulse (EMP), and high-powered microwave (HPM) weapon effects. At the bare minimum, such improvements in hardened infrastructure should be rolled out across all U.S. bases in the western Pacific. It also might be desirable for the U.S. military to consider selectively rolling out similar hardened infrastructure packages across key Hawaiian and mainland installations, such as Pearl Harbor and San Diego.

Conventional Theater-Strike Capability

A conventional theater-strike capability would allow forward-deployed U.S. forces to respond within minutes or hours of a PLA conventional first strike. A U.S. conventional theater-strike capability would enable the U.S. military to begin degrading PLA strike and C4ISR capabilities at the outset of a conflict, even if U.S. bases, air assets, and naval assets were destroyed or otherwise unavailable. A conventional theater-strike capability should consist of theater-strike missiles, hypersonic undersea strike missiles, ASAT weapons, cyberstrike weapons, and autonomous underwater vehicles (AUVs). As mentioned earlier, the purpose of such strikes would not be to destroy these capabilities outright but to degrade PLA strike and war-fighting capabilities, thereby achieving the JOAC objective of helping ensure access for follow-on U.S. forces attempting to enter the theater of operations.[70]

Theater-Strike Missiles. Theater-strike missiles would enable forward-deployed U.S. forces to execute conventional strikes against heavily defended targets on the Chinese mainland, without support from in-flight refueling tankers or in-theater runway access. Conventional missile strikes could take place in immediate response to, or in the aftermath of, a PLA conventional first strike. For U.S. bases to retain a credible conventional theater-strike capability, theater-strike missiles would have to be stored in hardened facilities.

One option might be road-mobile IRBMs with conventional warheads and a range of 5,500 km, sufficient to strike at Haixi City in Qinghai Province from Guam or the Cocos Islands. Another option might be an HBG missile with intercontinental or intermediate range, consisting of a rocket booster stack and hypersonic glide vehicle (HGV).[71] After the boost phase, the HGV would exhibit a limited ballistic trajectory before sharply reentering the atmosphere, followed by the HGV's transition into a high-altitude glide phase of flight to the intended

target.[72] The United States is developing an HGV that can be deployed from a modified USAF intercontinental ballistic missile (ICBM) rocket booster.[73] Either option could carry a variety of conventional warheads, including penetrators for hardened targets, submunitions for wide-area destruction, and EMP or HPM warheads to cripple electronic infrastructure.

HGVs could exploit hypersonic terminal speeds and combine with existing conventional penetrator technology to threaten PLA HSs. The GBU-39 is a small-diameter bomb that weighs 130 kilograms (kg) and can penetrate over four meters of reinforced concrete.[74] The GBU-28 is a 2,268 kg bomb capable of penetrating over thirty meters of earth or over six meters of reinforced concrete.[75] The GBU-57 massive ordnance penetrator (MOP) weighs 13,600 kg and is capable of penetrating over sixty meters of five-thousand-pounds-per-square-inch reinforced concrete.[76] One option is for theater-strike missile HGVs to deploy existing GBU-39 ordnance, as GBU-28 and GBU-57 ordnance is too large and heavy. The other option is for the United States to develop a new penetrator that combines hypersonic speeds with the GBU-57's penetration technology, which would be sufficient to threaten all grades of HSs up to one hundred meters below the earth's surface. Using GBU-39 technology could provide HBG theater-strike missiles with the ability to neutralize aboveground HSs, such as ordnance magazines and hardened aircraft shelters, and also to inflict heavy damage to paved areas necessary for flight operations. Using the GBU-28 technology could provide theater-strike missiles with the ability to neutralize all grades of shallow-underground HSs and some grades of deep-underground HSs. Using the GBU-57 technology could provide theater-strike missiles with the ability to neutralize most grades of deep-underground HSs.

HBG theater-strike missiles ideally should be capable of being launched from road-mobile TELs. Road-mobile HBG strike missiles would enable forward-deployed U.S. bases, such as Guam, to protect ordnance and launchers from PLA conventional strikes in HDBT facilities. After a PLA conventional strike, the TELs could be driven out of their hardened facilities and launched. Road-mobile weapons also would increase the tactical survivability of deployed TELs, as they would be better dispersed and camouflaged compared with fixed missile batteries.

HBG theater-strike missiles should be used to target the weakest points of PLA hardened facilities and infrastructure. Typically, these will be a hardened facility's communication links to the outside world and the surface-level entrances. The reason for attacking entrances is that every underground hardened facility, by its very nature, will have some surface-level access point. This is a vulnerability that can be exploited by U.S. HBG theater-strike missiles to collapse the entrances to

PLA hardened facilities, sealing all personnel and ordnance inside, or at the very least impeding the movement of PLA assets in and out of the facility. In the case of PLA HSs inside mountains, surface-level entrances would be vulnerable to landslides, which could be triggered by U.S. HBG warhead detonations higher up the mountain. However, the main problem with targeting the entrances of PLA HSs is that they are likely to be camouflaged and "virtually undetectable by current imagery assets."[77] Locating a significant portion of PLA hardened facility entrances would require years of dedicated intelligence gathering by the entire U.S. Intelligence Community, using its wide array of collection techniques.

Hypersonic Undersea Strike Missiles. Hypersonic undersea strike missiles would enable forward-deployed U.S. forces to strike at heavily defended but not hardened targets across the Chinese mainland. Prime targets would include but not be limited to Chinese civilian airports, military airstrips, military and civilian ports, electrical power grids, communications nodes, and fuel depots. The purpose of striking at these targets would be to deny the PLA unfettered use of these facilities, which otherwise could be exploited to enhance PLA operations.

Until the project's apparent termination, the Defense Advanced Research Projects Agency (known as DARPA) was developing the Arclight HBG weapon, designed around the RIM-161 Standard Missile 3 booster stack and designed to achieve full compatibility with strike-length Mk 41 VLS naval batteries. Arclight was built to deliver an HGV payload with a total mass of 45–90 kg out to a range of 3,700 km in less than thirty minutes.[78] Although budget reports suggest that the Arclight program has been terminated, it does provide insight into the types of capabilities that might be feasible.

Any future hypersonic undersea strike missile would need to be fully compatible with the U.S. Navy's undersea wide-diameter payload tubes, which measure 2.2 meters in diameter and currently store seven UGM-109E Tomahawk land-attack missiles.[79] Ideally, a future hypersonic undersea strike missile also would be fully compatible with strike-length Mk 41 VLS cells. Full compatibility with both launching systems would enable the same missile design to be supported by *Arleigh Burke*–class guided-missile destroyers (DDGs), *Virginia*-class nuclear-powered attack submarines (SSNs), and *Ohio*-class nuclear-powered guided-missile submarines.

Undersea towed payload modules (TPMs) are another launch option for future USN undersea strike weapons. TPMs essentially are containers fitted with vertically launched undersea ordnance that would be submerged and towed by submarines into theater.[80] TPMs are the most attractive option for several reasons. First, TPMs lack the expensive crew life support, hotel loads, fuel storage, and propulsion systems of surface combatants and submarines, and they can be acquired in large numbers. Second, TPMs could be pre-positioned in littoral

waters near Guam years in advance of any conflict. Third, targeting data could be uploaded by the towing submarine into a TPM computer system prior to launch. An onboard TPM computer system would enable the TPM to activate on a time delay, giving the towing submarine time to escape the area before the TPM launch cycle compromised its location. At the outbreak of hostilities, one or more submarines could tow the pre-positioned TPMs to within striking distance of the Chinese mainland.

Antisatellite Strike and Cyberstrike Weapons. ASAT strike weapons would enable the U.S. military to neutralize Chinese military and civilian satellite constellations rapidly.[81] Similarly, cyberstrike capabilities would enable the U.S. military to degrade the effectiveness of PLA C4ISR networks. These targets would be a high priority for the United States since PLA counterintervention capabilities rely on space-based assets to enhance OTH targeting of U.S. bases and moving ships at sea.[82] In theater, ASAT capabilities are launched from ground-based missile launchers. Out of theater, ASAT capabilities enter by way of destroyer-launched ordnance.

Autonomous Underwater Vehicles. Long-range AUVs with large conventional warheads would enable forward-deployed U.S. forces to strike at Chinese port infrastructure, PLA naval bases, and PLA hardened submarine pens accessed by sea-level undersea tunnels. Notice that only the entrance to a PLA hardened sea-level tunnel would need to be sealed or rendered impassable to generate a mission-kill effect and trap any submarines inside the PLA undersea facility.

Boeing's Echo Voyager unmanned undersea vehicle measures 2.6 by 2.6 by 15.5 meters, is fully autonomous, and has a range of around 12,038 km. It also has a maximum diving depth of three thousand meters and seagoing endurance of several months, is fitted with non-GPS navigation technologies, and is capable of carrying very large payloads of up to eight tons, with a total internal space of 14.75 square meters. The Boeing Echo Voyager uses an inertial navigation system (INS), Doppler velocity logs (DVLs), depth sensors, and various other technologies to navigate independent of GPS satellite navigation constellations. Given the exceptional range, seagoing endurance, diving depth, GPS-independent navigation technologies, and large payload, Boeing's Echo Voyager could be an ideal baseline from which to build an AUV tailored specifically for neutralizing or rendering inoperable Chinese ports, PLA naval bases, and PLA hardened submarine pens, particularly by attacking sea-level tunnel entrances. To ensure the survivability of AUVs from PLA conventional strikes, AUVs should be submerged in littoral waters close to shore, or alternatively stored in hardened underground facilities ashore.[83]

The PLA has invested extensively in capabilities to deny U.S. forces access to satellite-based C4ISR and GPS navigation systems, particularly given its perception that space-based satellite constellations are a major vulnerability.[84] Consequently, a credible U.S. conventional theater-strike capability would need to be capable of functioning in denied war-fighting environments. In practical terms, this means that HBG theater-strike missiles, Arclight HBG weapons, ASAT weapons, and AUVs must be capable of executing their respective roles without access to last-minute intelligence from C4ISR, space-based communications systems, and space-based navigation systems. Instead, all these proposed conventional theater-strike capabilities should rely on high-end autonomous navigation systems (ANSs). ANSs might include INSs fitted with advanced-inertial-measurement-unit components, DVLs, and advanced computing systems.[85]

Because of the threat that PLA kinetic and nonkinetic strikes pose against C4ISR capabilities, at the outset of a conflict forward-deployed U.S. forces may not have access to late-minute intelligence.[86] Furthermore, computer networks containing critical information might be disabled or destroyed. As a contingency, the United States could deliver hard-copy intelligence packets with targeting data to forward-deployed forces. This would enable forward-deployed forces to target at least China's fixed land and coastal targets, even if C4ISR is unavailable.

Theater-Recovery Capability

A theater-recovery capability would enable the U.S. military to regain use of its in-theater bases and space-based infrastructure after a PLA conventional first strike. Central to this capability would be the ability to repair damage to bases by relying only on resources forward deployed at each base, resources deployed by assets that would not require runway access, or both. A theater-recovery capability would consist of hardened in-theater facilities, pre-positioned air-base-repair kits and machinery, airdrop repair teams, airships, and microsatellite launches.

Hardened facilities would shield personnel, supplies, repair kits, and reserve air- and missile-defense (AMD) systems from a PLA conventional first strike. Ideally, hardened facilities would be buried deep underground. Airdrop repair teams would enable the U.S. military to repair damaged runways at bases without requiring USAF C-5 and C-17 airlifters to land. The USAF maintains prime base engineer emergency force (Prime BEEF) units that execute on-site repairs, largely using equipment and stores located at each base. Prime BEEF units are supplemented by USAF rapid engineer deployable heavy operational repair squadron engineer (RED HORSE) units, which specialize in repairing air bases under combat conditions. RED HORSE units can be air-dropped into distant locations, and they aim to be capable of operating without support for limited durations.[87]

If current heavy machinery is too heavy or bulky to be air-dropped and a PLA conventional first strike were to render most on-base heavy repair equipment unusable, it would be more difficult for air-dropped RED HORSE teams to repair major damage such as large-diameter craters. One solution might be for the USAF to develop a suite of custom, lightweight, facility-repair machines that could be air-dropped, along with RED HORSE units and supporting stores, into theater from C-5 and C-17 airlifters.

Large-payload airships would bolster repair capabilities without use of runways. An extended-range variant of the Lockheed Martin P-791 hybrid airship could fulfill such a role; the current version has a range of 2,592 km carrying a payload of 21,000 kg.[88] To reach Guam, an extended-range P-791 would need a range of around 3,300 km to deploy nonstop from Darwin Royal Australian Air Force (RAAF) air base, in northern Australia. Alternatively, an existing P-791 airship could island-hop from Wheeler Army Airfield on Oahu to Midway Atoll (around 2,087 km), from Midway to Wake Atoll (around 1,900 km), and from Wake Atoll to Andersen Air Force Base on Guam (around 2,400 km).

Microsatellite launches would enable the United States rapidly to supplement or replace USAF navigation, communications, and intelligence satellites lost to PLA ASAT strikes.[89] The airborne launch assist space access (ALASA) vehicle, as deployed from USAF fourth-generation aircraft, could fill this role, given its ability to launch several microsatellites at short notice.[90]

Rapid-Response Capability

In the aftermath of a PLA conventional first strike, runways on Guam and other U.S. islands in the western Pacific likely would be inoperable, at least until repaired by Prime BEEF or RED HORSE teams. After initial repairs were complete, the United States could fly long-range stealth bombers into theater, from Hawaii and the U.S. mainland, so as to execute long-range conventional strikes against hardened targets across the Chinese mainland. The pre-positioning of GBU-57 ordnance in HDBTs on Guam and the Northern Mariana Islands would significantly enhance a USAF rapid-response capability, as the logistics burden would be greatly alleviated.

USAF B-2 Spirit stealth bombers have an unrefueled combat radius of around 5,500 km.[91] However, the USAF inventory contains only twenty B-2s, as the acquisition program was reduced significantly from an original order of 132 aircraft.[92] The USAF also is replacing its legacy B-1B and B-52H bomber fleets with one hundred B-21 Raider long-range stealth bombers.[93] However, the B-21 Raider could have an unrefueled combat radius as short as 4,600 km—significantly shorter than the B-1B at 6,900 km and the B-52H at 8,100 km.[94] Assuming that the B-21 Raider has a combat radius of at least 5,500 km, both

B-2s and B-21s would be capable of executing deep strikes across the Chinese mainland without access to in-flight refueling—as deep as Haixi City from Guam or the Cocos Islands. Both the B-2 and B-21 can deliver the enormous GBU-57 MOP, which measures eighty centimeters in diameter by 6.25 meters in length and weighs 13,600 kg per bomb. The B-2 is capable of carrying two GBU-57 MOPs, one in each internal weapons bay.[95]

If a PLA conventional first strike denied use of runways on Guam and the Cocos Islands, USAF B-2s and B-21s could operate from the RAAF Learmonth air base, in western Australia, outside the range of most PLA conventional strike capabilities.[96] Assuming the B-21 Raider has an unrefueled combat radius of 5,500 km, USAF B-2s and B-21s operating from RAAF Learmonth could be refueled from RAAF in-flight refueling tankers orbiting the Cocos Islands, followed by strikes out to 5,500 km. The return journey would be the mirror opposite, with in-flight refueling above the Cocos Islands before returning to RAAF Learmonth. The advantage of this option is that it would depend only on in-flight refueling tankers and RAAF air bases outside the range of most PLA conventional strike capabilities, and thus would provide a robust contingency plan.[97]

However, a fleet of 120 long-range stealthy bombers (twenty B-2s and one hundred B-21s) is unlikely to meet the U.S. military's operational needs during a China-U.S. conflict, for several reasons. First, the high number of targets across the Chinese mainland, exacerbated by the significant distance from Guam, will reduce drastically the fleet-wide sortie rate—the number of targets that a bomber can strike per twenty-four-hour period.[98] Second, only a fraction of the entire fleet will be available for combat operations, as the rest will be needed for training, maintenance, and reserve functions.[99] For instance, a combat-coded force of 160 B-21 Raiders would require an overall fleet of two hundred aircraft.[100] Third, the B-2s and B-21s would play a disproportionate role in the air war portion of any China-U.S. conflict.[101] This is because B-2s and B-21s would be the only aircraft in the USAF inventory with sufficient stealth to penetrate advanced PLA air defenses; sufficient unrefueled range to strike at the Chinese mainland from Guam, without depending on in-flight refueling tankers; and sufficient payload to carry the GBU-57 MOP for neutralizing PLA HSs. In 2015, the Mitchell Institute for Aerospace Studies found that the USAF might require a total fleet of two hundred stealthy long-range bombers, particularly given reduced sortie rates, combat coding, payloads, and the risk of force attrition.[102]

INVENTORY ESTIMATES

During any armed conflict nothing ever works perfectly or goes entirely according to plan. As Clausewitz once stated, this concept of "friction" means that the

outcome of military operations is inherently uncertain and that any element of a plan can fail.[103] In the cases of conventional theater-strike, theater-recovery, and rapid-response operations, the United States would need to consider how many stores of various types are sufficient to respond to operational uncertainties that might arise. For instance, conventional theater-strike capabilities could exhaust in-theater ordnance stores, theater-recovery capabilities could run out of base-repair kits, and a rapid-response capability could run out of in-theater ground-penetrating ordnance.

To insulate against operational uncertainties, U.S. forward bases would need large pre-positioned inventories of theater-strike missiles sufficient for at least two strikes per PLA target. This estimate of two strikes per PLA target is based on the RAND Corporation's assessment that two weapons per hard target would be needed to generate a kill probability of greater than 90 percent.[104] In addition, the U.S. military would need to retain a strategic reserve of ordnance, in the event that in-theater stores were exhausted, as well as for use in other global contingencies.

For the theater-recovery capability, U.S. forward bases likely would need very large inventories of base-repair kits and ALASA ordnance with microsatellite payloads pre-positioned and sufficient to execute two full base repairs or ALASA salvos, plus strategic reserves at mainland facilities for an additional four full base repairs and four ALASA salvos. These reserves might be necessary if the PLA executes persistent strikes and ASAT attacks throughout a protracted conflict.[105]

A rapid-response capability might need very large inventories of pre-positioned GBU-57 MOP ordnance and aviation fuel, in shallow-underground HS facilities at U.S. forward bases. This might require sufficient ordnance for two strikes per PLA target, plus a strategic reserve for further combat sorties or use in other global contingencies.

ADVANTAGES OF A U.S. CONVENTIONAL ACCESS STRATEGY

A conventional access strategy would provide six major advantages. The first is that it would deny the PLA a conventional first-strike capability against U.S. bases and forward-deployed forces, through passive-defense measures, a conventional theater-strike capability, a theater-recovery capability, and a rapid-response capability. With passive hardening of critical military infrastructure, a greater portion of U.S. forces might survive the initial waves of PLA conventional strikes. Surviving in-theater forces could then execute land-based, undersea, ASAT, and AUV strikes against a variety of PLA targets, across the Chinese mainland and in orbit. This would enable the U.S. military to begin degrading the PLA's capabilities at the outset of a conflict, enabling theater-recovery capabilities to operate more

effectively. With airfields repaired, B-21 and B-2 stealth bombers could then be flown into theater to commence strikes against PLA targets across the Chinese mainland.

The second advantage is that degrading PLA conventional strike capabilities at the outset of a conflict would increase the permissiveness of the entire theater for other force-projection assets. Undermining the PLA's capability to execute ASBM and ASCM strikes against USN task forces and logistics ships would provide USN assets with greater freedom of action and enhanced survivability. With intense and persistent conventional strikes, PLA capabilities might be degraded sufficiently to enable USN aircraft carriers eventually to operate with relative impunity close to the Chinese coastline, significantly increasing the sorties generated by carrier air wings.

The third advantage is that it would buy time for U.S. force-projection capabilities to be mobilized, marshaled, and deployed to the western Pacific. With significant air and naval assets deployed globally, the military would require time to redeploy and logistically support a significant force in theater. For example, a 1993 General Accounting Office report stated that with a total projected force of twelve USN aircraft carriers, six carriers could deploy with thirty days' notice and nine carriers with sixty days' notice.[106] Equivalent times likely would be required to deploy or redeploy the full range of U.S. air, land, and sea assets necessary to execute theater-wide, joint-service campaigns in the Pacific.

The fourth advantage is that it would focus the military's attention on critical capabilities needed to enhance the survivability and operational effectiveness of traditional force-projection assets: tactical aircraft, in-flight refueling tankers, aircraft carriers, surface combatants, logistics ships, and sealift ships. For instance, prioritizing long-range strike capabilities not dependent on U.S. bases or in-flight refueling would in turn drive the military to prioritize conventional theater-strike missiles, undersea-launched hypersonic missiles, ASAT and cyberstrike weapons, and AUVs, combined with a large fleet of B-21s with range similar to the B-2 Spirit.

The fifth advantage is that a credible U.S. conventional theater-strike capability would force the PLA to reevaluate its allocation of resources to offensive versus defensive systems. The PLA might be driven to divert sizable defense funding to harden its vulnerabilities further across the vast Chinese mainland and improve costly AMD systems. This would reduce the funding available for the PLA to pursue offensive war-fighting systems.

The sixth advantage is that a U.S. capacity to execute a conventional theater strike from the Cocos Islands would complicate significantly the PLA's operations to defend the Chinese mainland. During a South China Sea or East China Sea crisis, the PLA could deploy most of its AMD systems along China's east and

southeast coastlines. However, if the Australian government allowed the U.S. military to operate conventional B-21s or HBG theater-strike missiles from the Cocos Islands, the PLA would have to defend a significantly greater area. For instance, PLA AMD units would have to be more thinly dispersed along China's vast coastline as well as along the land borders of its Qinghai, Sichuan, and Yunnan provinces. Consequently, U.S. strike bombers and theater-strike missiles would have an improved capability to penetrate PLA AMD networks and neutralize the intended targets.

LIMITATIONS OF A U.S. CONVENTIONAL ACCESS STRATEGY

A conventional access strategy would incur seven major limitations.

Homeland Sanctuary

The first limitation is the vexing issue of homeland sanctuary: the concept that nuclear powers refrain from attacking the homelands of other nuclear powers, to avoid triggering a nuclear response. The argument is that in a China-U.S. conflict each side would initially avoid strikes against the other's homeland, even with conventional ordnance, to minimize the risk of nuclear escalation.[107] It has been pointed out that this asymmetry could allow China to strike at U.S. territories in the western Pacific, such as Guam and the Northern Marianas, without retaliatory U.S. strikes on the PLARF and Chinese mainland—at least initially.

Four problems arise out of this argument. First, forward-deployed U.S. forces at overseas territories such as Guam and the Northern Marianas are likely to be heavily inundated by barrages of PLA ordnance in the initial phase of any China-U.S. conflict. Such PLA strikes are likely to inflict very heavy losses in terms of personnel and combat assets and other matériel.[108] In such a scenario, the United States might inadvertently honor homeland sanctuary as a direct result of successful PLA strikes degrading U.S. in-theater capabilities. However, high losses also would trigger significant pressure from Congress, cabinet secretaries, senior officials, and the general public for the president to authorize robust conventional strikes against targets across the Chinese mainland.

Second, even if the United States suffered very heavy initial losses in personnel and matériel, it eventually would execute high-intensity conventional strikes across the Chinese mainland, if U.S. force-projection assets were able to deploy into theater. For instance, the JOAC, which contains the ASBC and Gaining and Maintaining Access Concept (GMAC), aims to execute high-intensity, war-fighting operations and strikes against the homelands of A2/AD adversaries.[109] Notice also that the GMAC explicitly states that U.S. Army and Marine Corps special forces might be inserted covertly into an adversary's homeland to "provide human contact to complement other intelligence."[110]

Third, the U.S. Department of Defense openly acknowledges that the military must be ready to execute joint military operations against A2/AD adversaries "at the outset of a contingency to avoid delays for buildups."[111] The JOAC states that "joint forces will attempt to penetrate into the depth of an enemy's anti-access/area-denial defenses . . . to disrupt the integrity of the enemy defensive system."[112] The ASBC states that deep strikes against A2/AD adversaries have the objective of "disrupting, destroying or defeating an adversary's A2/AD capabilities." The ASBC also states that "even the US homeland cannot be considered a sanctuary."[113] The deep-strike objectives of Pentagon operating concepts and the notion of covert special forces teams operating across the Chinese mainland, combined with the stated need to be ready at the outset of a conflict and open acknowledgment that the U.S. homeland could be targeted, strongly suggest that the U.S. military does not plan on granting the PLA homeland sanctuary during a China-U.S. conflict.

Fourth, the United States, owing to its geographic distance from the western Pacific, could be seen by global public opinion as a largely unnecessary target. This is in stark contrast to the Chinese homeland, which out of necessity would be seen as a valid target for conventional U.S. strikes, since the vast majority of PLA conventional-strike capabilities are land-based ballistic missiles and long-range bombers. Consequently, if the PLA executed conventional strikes against the U.S. mainland, particularly in a conflict in which China was viewed globally as the aggressor, then global public opinion could strengthen the scale of coalition forces levied against the PLA. This would be true particularly in the case of U.S. allies and security partners that otherwise might opt out of direct participation in a China-U.S. conflict. As the RAND Corporation has noted, in a short conflict third parties would make little difference, but in a more protracted conflict between China and the United States the implications could be significant.[114] Despite these counterarguments, the Chinese government still might believe that the PLA could strike at U.S. forces in the western Pacific with minimal risk of conventional strikes against the Chinese mainland, given an asymmetry in homeland sanctuary.

Treaty Limitations on Aircraft

The second limitation is that the New Strategic Arms Reduction Treaty (New START) severely handicaps the acquisition of B-21 Raider long-range strike bombers, since the aircraft will be capable of delivering both conventional and nuclear ordnance.[115] New START requires U.S. and Russian nuclear arsenals not to exceed 1,500 nuclear warheads and eight hundred nuclear delivery vehicles, with seven hundred deployed and one hundred not deployed.[116] Under New START, nuclear delivery vehicles are defined as ICBMs, submarine-launched

ballistic missiles, and heavy bombers.[117] A nuclear bomber is defined by New START as an aircraft that has a maximum one-way range exceeding eight thousand kilometers and that could carry nuclear weapons.[118] The problem is that a B-21 Raider with an unrefueled combat radius of 5,500 km, as needed to strike deep into the Chinese mainland from Guam, would give the aircraft a total range of around eleven thousand kilometers. Given that the B-21 will be capable of delivering both nuclear and conventional ordnance, it will be counted under New START. Consequently, the challenge for the USAF will be finding a way to increase the size of its combat-coded conventional long-range stealth bomber force without violating New START.

One solution would be to produce a nonnuclear-capable variant of the B-21, since nonnuclear variants would not count. According to the treaty, a nuclear bomber is no longer counted once it has been permanently modified to be incapable of delivering nuclear ordnance and is visibly distinguishable from nuclear-capable variants.[119] Modifications include ensuring that all mechanisms of the internal weapon bays are "incapable of employing nuclear armaments."[120] Other modifications would need to be made to the external design of a conventional B-21 variant to render it visibly different from the nuclear variant.[121] With a conventional-only B-21 variant, the United States theoretically could produce as many conventional B-21s as it requires without breaching New START. Another solution might be to reduce modestly the USAF's inventory of nuclear-armed ICBMs, from four hundred under New START to three hundred.[122] This would allow the USAF to order a total of two hundred B-21 Raiders and still comply with New START. Ultimately, either solution would increase significantly the number of combat-coded B-21s, greatly enhancing the capacity of the USAF to execute long-range strikes across the Chinese mainland from Guam. Moreover, increasing the B-21 Raider production order to two hundred or more units would drive down acquisition costs by distributing fixed research, development, and other costs over a larger production run.

Treaty Limitations on Weapons

The third limitation is that the acquisition of conventional theater-strike HBG weapons could breach New START, the Intermediate-Range Nuclear Forces (INF) Treaty, or both. Under New START, an ICBM is defined as a nuclear-capable system that travels for most of its flight path in a ballistic trajectory, with a range exceeding 5,500 km.[123] The INF Treaty requires that U.S. and Russian militaries dismantle all ballistic missiles with ranges between 500 and 5,500 km. The INF Treaty defines a ballistic missile as a weapon that follows a ballistic trajectory for the majority of its flight path.[124]

However, HBG weapons do not follow a ballistic trajectory for the majority of their flight path and thus would not be subject to limitations under New START or the INF Treaty.[125] Consequently, the U.S. military could develop an HBG weapon with a range of 5,500 km or greater, yet avoid breaching either treaty.

First-Strike Risk

The fourth limitation is that launching one or more HBG weapons could be misconstrued by the PLA, Russia, or both as a U.S. nuclear first strike. This risk has been discussed since the conceptualization of hypersonic boost-glide systems, because they depend on long-range rocket boosters similar to those that nuclear-armed ballistic missiles use.

However, the nonballistic flight path of hypersonic boost-glide weapons, plus a brand-new rocket booster design, would make a U.S. hypersonic boost-glide system appear distinct on Chinese and Russian nuclear early-warning systems.[126] If the United States were able to assure China and Russia that its hypersonic boost-glide systems were used exclusively for conventional payloads, this would further reduce the likelihood of HBG-weapon use being misinterpreted as a nuclear first strike.

Potential Nuclear Aggression

The fifth limitation is that striking at the PLA's conventional ballistic-missile manufacturing and maintenance facilities, storage facilities, and launchers could be misconstrued as an attempt by the United States to degrade the PLA's nuclear deterrent.[127] This risk would arise because U.S. theater commanders would be unable to distinguish readily between nuclear and conventional versions of the PLA's ballistic-missile arsenal, particularly if U.S. C4ISR systems were degraded by PLA ASAT and cyber strikes.

This problem could be solved through a U.S.-China bilateral agreement for the PLA to separate clearly its nuclear ballistic missiles from its conventional arsenal and a mutual commitment to exclude all nuclear deterrents from targeting. The net result would be a reduced risk of U.S. conventional strikes inadvertently targeting PLA nuclear capabilities.

Hardened Structures

The sixth limitation is that a U.S. conventional access strategy might not overcome the PLA's extensive investments in hardened structures. This is a very real possibility. To paraphrase Moltke, no plan, however good, survives contact with the enemy.[128] However, the measures proposed under a U.S. conventional access strategy would provide a reasonable ability to neutralize PLA hardened facilities, such as underground tunnels and sea-level submarine pens. This conventional access strategy prioritizes advanced penetrator ordnance delivered by HBG theater-strike missiles and B-2s and B-21s, as well as AUVs armed with

large conventional warheads for sea-level tunnels and submarine pens. While the penetration capabilities of all ordnance might not be able to overcome PLA HDBTs, such as tunnels buried deep within mountains, what this ordnance could do is target the most vulnerable points of these structures. For instance, these weapons could target external communications links and surface-level entrances. By targeting surface-level entrances of PLA hardened facilities, U.S. penetrator ordnance could be sufficient to seal the structures from the outside world, or at the very least impede the movement of traffic in and out of the facilities. The advantage of targeting surface-level entrances is that every underground hardened structure must be accessible from the surface, making them a vulnerability of all PLA HSs and HDBTs that can be exploited.

Survivable and Capable Force-Projection Capability

A seventh limitation is that the United States might consider fielding a highly survivable and capable force-projection capability designed to achieve the same objective as the proposed conventional access strategy, just with less risk of escalation. While it is true that the United States *could* field a highly capable and survivable force-projection capability, funding levels will determine whether it will do so.

To field a force structure capable of defeating A2/AD adversaries, the U.S. military would need to invest in many of the nine following critical capabilities: arsenal ships; additional future guided-missile frigates (FFG-Xs); additional *Virginia*-class SSNs; a large number of AUVs; a new, sixth-generation, long-range, carrier-based strike aircraft; a new, sixth-generation, long-range, land-based air-superiority fighter; additional B-21 Raiders; a new, stealthy C3 intelligence, surveillance, and reconnaissance (C3ISR) aircraft; and a new, stealthy, in-flight refueling tanker (see table 2). The numerous new research, development, and acquisition programs needed would cost hundreds of billions of dollars, even without accounting for significant additional orders of DDGs, FFG-Xs, SSNs, and B-21s.

In short, the United States can field a highly survivable and capable counter-A2/AD force—it is just a question of the funding and political willingness to do so. Conversely, a U.S. conventional access strategy aims to achieve similar power-projection objectives with less of a burden to the U.S. taxpayer, or fewer seismic departures from the planned military force structure, or both.

The PLA's counterintervention capabilities could be used to execute a conventional first strike against U.S. bases and forward-deployed forces west of Hawaii. The Chinese leadership could be convinced that a decisive conventional first strike, in conjunction with other PLA capabilities, would provide the PLA with

TABLE 2
U.S. COUNTER-A2/AD FORCE-PROJECTION CAPABILITIES

Capability	Description
Arsenal ships	The U.S. Navy could consider a new class of large-displacement surface ship, armed with 288–512 strike-length Mk 41 vertical launching system cells and a larger, more capable ballistic missile–defense radar than the AN/SPY-6.
Additional FFG-Xs	The U.S. Navy could consider expanding its order of FFG-Xs to serve as capable surface combatant escorts for convoys of fleet oilers and dry-cargo and resupply ships, as would be needed to sustain high-intensity combat operations in the western Pacific.
Additional nuclear-powered attack submarines (SSNs)	The U.S. Navy could consider accelerating the acquisition of Virginia Payload Module–equipped SSNs, particularly given the projected undersea strike shortfall when the fourth *Ohio*-class nuclear-powered guided-missile submarine is retired in 2028.[a]
Autonomous underwater vehicles (AUVs)	The U.S. Navy could consider acquiring AUVs armed with lightweight torpedoes designed to deny maritime zones to PLA surface and subsurface forces.
Sixth-generation carrier-based aircraft	The U.S. Navy could consider truncating its order of F-35Cs in favor of developing a sixth-generation carrier-based, long-range strike and air-superiority aircraft.
Sixth-generation land-based aircraft	The U.S. Air Force could consider truncating its order of F-35As in favor of developing a sixth-generation land-based, long-range air-superiority aircraft with sufficient unrefueled range to escort B-21s during deep-penetration strikes.
Additional B-21s	The U.S. Air Force could consider retaining its planned fleet of one hundred nuclear-capable B-21s, plus a significant order of conventional-only B-21s, perhaps on the order of three to four hundred aircraft.
Stealthy C3ISR aircraft	The U.S. Air Force could consider developing a stealthy, very high-altitude, long-range C3ISR aircraft, capable of replacing satellite communications networks during a conflict.
Stealthy in-flight refueling tanker	The U.S. Air Force could consider developing a stealthy, long-range in-flight refueling tanker. This aircraft should be fitted with a tail ramp to enable variants to support the covert insertion and sustainment of special operations forces deep inside hostile territory.

Note:
a. Gunzinger and Dougherty, *Outside-In,* p. 85.

temporary regional superiority, giving China a rare window of opportunity to settle regional disputes through coercion and on terms favorable to China. Any such perception would undermine seriously the U.S. military's ability to deter Chinese aggression in the western Pacific.

The solution is not for the U.S. military to build a larger force structure but rather for it to rearrange its thinking around a conventional access strategy. This would require the U.S. military to acquire four critical capabilities: a theater-wide passive-defense capability, a conventional theater-strike capability, a

theater-recovery capability, and a rapid-response capability. Strategically, a conventional access strategy would accomplish several things: it would deny the PLA a conventional first-strike capability, increase the permissiveness of the western Pacific for follow-on U.S. forces, buy valuable time needed to mobilize and deploy U.S. power-projection assets, focus the military's attention on critical capabilities, and impose resource constraints on the PLA. However, a conventional access strategy would require the United States to think seriously about developing and assigning a new rocket booster exclusively for use by hypersonic boost-glide systems, as well as to assure Russia and China that U.S. HBG weapons would carry only conventional payloads. Furthermore, the United States and China would have to give serious consideration to entering into a bilateral agreement for the PLA to separate clearly its nuclear ballistic missiles and for both parties to exclude nuclear deterrents from targeting.

Even with its limitations, a U.S. conventional access strategy would return the China-U.S. strategic deterrence calculus to a more stable equilibrium. One hopes that this would deter Chinese leaders from seeing a conventional first strike as a credible option. Pursuing a U.S. conventional access strategy would be a political decision for the president and Congress. Such a decision would have to take into account numerous dimensions, including military, political, fiscal, diplomatic, and technological maturity considerations. Such discussions fall beyond the scope of this article but provide ideal areas for future research.

NOTES

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