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# Table of Contents

EXECUTIVE SUMMARY...........................................................................................................1

INTRODUCTION.........................................................................................................................1

CONFIDENCE-BUILDING MEASURES FOR A NEW TECHNOLOGICAL COMPETITION...............2

RISKS OF INADVERTENT ESCALATION AS A POTENTIAL ROAD TO U.S.-CHINA CONFLICT........3

FRAMING THE PROBLEM ........................................................................................................5

RESEARCH INSIGHTS................................................................................................................6

GAPS IN CURRENT UNCREWED SYSTEM CBMS ..................................................................10

OPTIONS FOR UNCREWED SYSTEM CBM DEVELOPMENT ..................................................15

TABLETOP EXERCISE: TEST-DRIVING UNCREWED SYSTEM CBMS ..................................15

CONCLUSION AND RECOMMENDATIONS..............................................................................17

APPENDIX A: PROPOSED LANGUAGE FOR AUTONOMOUS INCIDENTS CBM PROVISIONS ........19

APPENDIX B: DEFINITIONS AND DISTINCTIONS ................................................................22
Executive Summary

In a time of growing international tension, with interstate warfare ongoing in Europe and openly threatened over Taiwan, military forces worldwide are looking increasingly to autonomous and uncrewed systems to provide new capabilities, field forces more quickly and at reduced costs, and reduce risks to military personnel. Given most militaries’ relative lack of experience in operating uncrewed systems, with novel benefits come novel risks: of accidents, miscalculation, and inadvertent conflict.

During previous times of military innovation and international tension, even adversarial nations agreed on rule sets that standardized and managed interactions, increased communications, and mitigated the negative impacts of novel weapons and platforms. The ongoing large-scale introduction of autonomous and uncrewed systems, particularly in a time of increased great power tension, calls for the development of rule sets and confidence-building measures (CBMs) to mitigate the risks associated with their operational employment.

This report carefully considers the history of CBMs and finds there is promise in verifiable measures built on existing maritime and air safety rules, even if successful CBMs have been rare in practice. As such, this report endeavors to develop realistic and mutually beneficial rule sets and CBMs for U.S. and international policymakers to consider. The report’s recommendations include amending U.S.-China agreements to cover uncrewed systems and pushing to update multilateral maritime and air rules, as well as establishing standard signals and communications for uncrewed platforms. It also recommends defining potential exclusion zones for armed uncrewed systems, agreeing not to deploy nuclear weapons on these systems, and creating mechanisms to indicate loss of control of them. In the absence of U.S.-China agreement, unilateral adoption of CBM principles by the United States (and potentially its allies and partners) could be beneficial.

Introduction

This report begins with an overview of behavioral norms and their relation to CBMs, and then examines the risks of inadvertent U.S.-China military escalation that CBMs could help forestall. It then provides a research framework for U.S.-China CBM development and provides key questions to consider in doing so. The report provides research findings on CBMs and how they might be applied to uncrewed systems within the U.S.-China strategic competition, and analyzes gaps in the existing CBM framework that could be addressed to provide coverage for them. It then lays out specific options for uncrewed system CBM development and provides the results of a tabletop exercise (TTX) that assessed the potential effectiveness of those options within the context of a hypothetical crisis. Finally, it provides recommendations for uncrewed system CBM development and implementation, as well as specific CBM provisions and wording.
The paper endeavors to answer the following questions about potential uncrewed system CBMs:

- Which types of autonomous systems are of greatest relevance for potential CBMs?
- What information should be shared between participating nations? How might that information be shared?
- How might states share results from accidents or near-accidents caused by uncrewed systems?
- To what extent may accepted behavior for crewed systems and platforms need to be adapted for uncrewed systems?
- How might uncrewed systems communicate their level of autonomy, such as through standardized signals or marking?
- Should there be specific geographic areas within which the use of uncrewed systems (or certain categories of uncrewed systems, such as armed ones) is mutually curtailed or prohibited?
- Should autonomy of nuclear-capable systems be uniquely restricted?
- What unilateral declaratory statements could be useful as precursors to full international rule set implementation?

Confidence-Building Measures for a New Technological Competition

As states interact with each other in their application of new and changing technologies—such as uncrewed systems—norms of behavior inevitably will form and evolve over time. Norms can be reinforced or clarified by communication between states, through unilateral declarations or bilateral or multilateral agreements. But norms themselves are not established merely by fiat or declaration; rather, they grow out of a particular social context and consist of a shared understanding of appropriate behavior. Norms are related to, but not the same as, laws (including treaty law). The law can serve as a basis for norms, and norms can be formulated into law.

CBMs are a type of international agreement that can clarify and reinforce norms of military behavior. Traditionally, CBMs have consisted of actions in the following categories:

- Exchanging information between parties,
- Exchanging observers and/or conducting inspections,
- Establishing “rules of the road” for military operations, and
- Applying restraints on the operations and readiness of military forces.

CBMs tend to follow a process: they start with easier areas where agreement is possible; then, as cooperation becomes established, they expand the range of agreement to more parties, or to more contested issues. Pursuing a process of political commitments like these, rather than a
formal treaty, can allow for a more flexible approach to construction and diffusion of norms. Most CBMs do not require the same level of state commitment as a treaty (including, for some states, formal domestic approval through treaty-ratifying processes).\(^8\)

As policymakers consider the best processes for constructing and adopting CBMs, they should keep in mind some key considerations related to norms. First, grafting new norms onto existing rules and behaviors can enhance their legitimacy, making them seem as outgrowths of existing rule sets and institutions.\(^9\) Also, critical to norm emergence are “norm entrepreneurs” who frame the problem: naming, interpreting, and dramatizing it and then, on that basis, proposing a norm to address it. Being first in framing the problem is important, as these frames can be hard to dislodge once established.\(^10\) Of note, this first-mover advantage could encourage the United States and its partners to push forward with CBMs in this area, rather than let its strategic competitors establish the framing of an important field of technological advance like uncrewed systems.

Once a norm is proposed, framing it as a “best practice”—with early adoption by a few key players—can help to encourage adoption by others, with the threat of labeling as “rogues” those who do not sign up. This is another incentive for the United States and like-minded nations to move first in promoting CBMs for uncrewed systems.\(^11\)

Lastly, pursuing norms on a bilateral basis can have clear advantages, as adoption may be easier with only one other party involved, and transaction costs may be relatively low. Two high-status norm adopters may also inspire more parties to sign on over time. However, pursuing norms on a multilateral basis among like-minded states also can be useful, creating “islands” of norm convergence that can influence states outside the group.\(^12\)

**Risks of Inadvertent Escalation as a Potential Road to U.S.-China Conflict**

This report’s primary impetus for proposing CBMs for uncrewed systems is to avoid dangerous incidents that might inflame tensions between the United States and China. In recent years, multiple analysts of artificial intelligence (AI) and autonomous military systems have posited new risks associated with those systems—such as the brittleness of algorithms, the potential for arms racing and threats to nuclear stability, and the risk that militaries might put too much trust in AI-driven systems. This study aims to proposed specific means to achieve mitigation of these risks.\(^13\)

While the risk of accidental escalation may be apparent in close encounters between U.S. and People’s Republic of China (PRC) ships and aircraft, few major wars have broken out in this way—though there have been some close calls, such as the Cuban Missile Crisis.\(^14\) Regardless, while accidental or inadvertent escalation into open conflict may be somewhat rare in the historical record, several factors may result in a significantly higher risk between China and the United States in the years to come.\(^15\)

First, given that a U.S.-China air or maritime incident seems most likely to occur at a flashpoint in China’s near abroad due to China’s expansive territorial claims, there are likely to be quite
different U.S. and Chinese perceptions of what caused the incident. The PRC is likely to believe—actual international law notwithstanding—that the incident happened in “their” air or sea space, such as within China’s “Nine Dash Line” or within the Taiwan Strait (despite its status as international waters). From the U.S. side, a challenge to freedom of navigation and overflight that goes unmet would be a betrayal of generations of American commitment to the concept, going all the way back to the initial forging of the ethos of the U.S. Navy in the Barbary Wars of the early 19th century.

Additionally, unlike when the United States and Soviet Union maintained Cold War–era military communication links that were useful for defusing an accident- or misperception-driven crisis, the United States and China have not been using similar links. And this is despite an increasing number of close encounters. U.S. efforts to restore these links have been frequently rebuffed, though there have been some recent signs of progress at the highest levels. It seems that China perceives links with the U.S. military as a reward to be given to the U.S. government for what the PRC sees as less hostile behavior, rather than as a tool whose utility may be at its greatest when bilateral relations are at their lowest.

Last, and perhaps most important with respect to the possibility of rapid military escalation, is a piling up of first-mover military advantages that may drive escalation ferociously if one side believes it has been attacked—or even is about to be attacked. Decades of war at sea in the missile age show that, even more than in past eras of naval warfare, victory is likely to go the side that can attack effectively first. This is reinforced by history (and arithmetic) that demonstrates that in naval warfare—given roughly equal technology and training—the larger navy almost always wins; and a smaller missile-age navy that gets off a surprise first salvo may make itself the larger one in a matter of minutes. When it comes to naval warfare the People’s Liberation Army (PLA) Navy is—perhaps more so than any other major navy in the world—a missile-centered force. Further driving first-mover incentives outside of naval warfare, PLA doctrine writ large is focused on attacking suddenly (and likely by surprise) to seize air and information dominance before an adversary like the United States can bring its other advantages to bear. For example, the PLA has an entire service branch dedicated to missile warfare, the PLA Rocket Force, that is arguably the crown jewel of the Chinese military. Central to the PLA’s plans for any major conflict, the Rocket Force’s ballistic and hypersonic missiles likely would be significantly more effective if they could catch adversary aircraft on the ground and non-dispersed, target enemy ships in port and at their piers, and strike fixed command centers while they are still full of key decision-making personnel. For both sides, the incentives to escalate quickly by striking first—while still able to do so, given both sides’ likely focus on paralyzing enemy command and control—could cause a crisis driven by accident or misunderstanding to spiral far more quickly than in previous international confrontations. And this does not even consider the even greater speed with which developments may unfold given the more rapid decision-making that may occur when conducted by AI systems or due to their assistance to human decision makers.
Framing the Problem

This report examines how CBMs could impact the operational employment of U.S. and Chinese uncrewed systems to reduce escalation risks. The geopolitical framing of this study and proposed rule sets are grounded in the competition between the United States and China in the Indo-Pacific—an air- and maritime-dominated theater where both players have nuclear weapons that significantly increase the potential consequences of unintended escalation. This competition also includes two nations at the forefront of AI and uncrewed system development.23

The report focuses on the operation of uncrewed air and maritime platforms, as they are most likely to interact with one other in the international commons. Such uncrewed systems could be autonomous or remotely piloted. The paper also covers loitering munitions, as the distinction between some such munitions and other uncrewed platforms continues to narrow over time.24 It considers potential interactions between crewed and uncrewed platforms, as those seem at least as likely to occur—and may have greater stakes with personnel at risk in the crewed platforms—as uncrewed-on-uncrewed interactions.

This report considers what CBMs could be created and take effect over a period of roughly five to fifteen years. This timeline is keyed to what seems likely to be a time of increasing tension and geopolitical risk in the mid- to late-2020s.25 On the short end of the timeline, a goal given the likely pace of negotiation and norm development could be to provide amendments of existing agreements in the interest of quickly putting in place CBMs.26 A 15-year limit (out to 2039) provides a reasonable time to possibly obtain a more comprehensive rule set that incorporates more years of experience operating uncrewed systems. Technological and geopolitical conditions also are more likely to be difficult to predict much beyond that time frame, given the accelerating pace of autonomy and uncrewed system development.

This report assumes the following will color the geostrategic environment between 2029 and 2039:

The United States and China will continue to be engaged in a strategic rivalry across the Indo-Pacific region, driven by factors such as disputed Chinese territorial claims against U.S. allies and partners (including the continued existence of Taiwan as a separate state), disagreements over the freedom of air and maritime navigation, and U.S. and international criticism of China for ongoing human rights abuses—the mere enunciation of which China considers to be a violation its sovereignty. 27

The rivalry between the United States and China will not break out into a state of war, but at the same time the United States will remain engaged enough in the region that U.S.-PRC interactions remain a potential flashpoint for such conflict.

Uncrewed system development will continue on an upward trajectory, with no international agreements reached to ban or significantly curtail the use of such systems in international air and sea spaces.
Given some of the advantages that AI integration may confer on uncrewed systems (e.g., reduced reaction times, a greater ability to operate with denied communications, etc.), an increasing proportion of them become autonomous rather than remotely operated, introducing AI-associated risks and uncertainty.

**Research Insights**

Based on this paper’s review of the literature and history of CBMs, as well as the trendlines of uncrewed system development and employment, the following insights may provide a background for potential uncrewed system rule set development.

**Successful CBM agreements are rare and tough to get right.**

The very process of negotiating and executing CBM agreements can consume trust, and they are only as strong as the fundamental political will for compromise. Challenges to negotiation include the perceived cost of CBMs—political, military, and otherwise—versus their likely benefits. These challenges are particularly acute when the negotiating parties lack a shared understanding of the risks of conflict or its potential causes, and include sensitivities to who proposes what and when, asymmetries in military capability and investment, difficulty reaching agreement on areas of applicability and participants, and asymmetries of impact. Challenges to implementation can include difficulty in maintaining the interest of parties, incomplete and vaguely drafted agreements, misalignment or changing of national motivations between the negotiation and implementation phases, domestic political challenges, and deceptive or selective compliance with agreements. Several examples exist of CBMs that have been negotiated and agreed to, then violated later when their provisions became inconvenient to one or both sides of the agreement. Soviet Navy warships conducted “shouldering” actions against U.S. Navy ships in the 1980s, more than a decade after the largely-successful U.S.-Soviet Incidents at Sea (INCSEA) agreement was signed between the two parties in 1972. On multiple occasions, Chinese PLA Navy warships risked collision and conducted close approaches to U.S. Navy ships in violation of the International Maritime Organization’s (IMO’s) International Regulations for Preventing Collisions at Sea (COLREGS), despite an existing U.S.-China maritime safety Memorandum of Agreement (MOU) that should prohibit such action. While such violations may not have rendered their associated CBMs useless, they do point to their limits. The INCSEA agreement reduced the number and severity of collisions and near-collisions between the U.S. and Soviet navies, but did not eliminate these incidents entirely. In a crisis, violations could be perceived as justification for compensatory escalation, with a possible net negative result in terms of escalation risk.

While CBMs can be a useful coordination mechanism when states seek to avoid conflict, they are not an effective constraint against deliberate escalation. India and China have multiple agreements in place to reduce border tensions, including restricting military buildups along their border. These agreements did not prevent a series of deadly clashes between Indian and Chinese troops beginning in 2020. However, these CBMs may have prevented greater fatalities than would have been the case had the agreements not been in place—in short, agreements to reduce weapons along the border led troops to fight with fists and clubs, rather than firearms.
That said, while the current India-China border standoff has not yet broken out into armed conflict, cooperation has continued to unravel since 2020. In the eyes of some Indians, China’s recent actions have rendered the agreements near-meaningless, as both sides now regularly violate them. \(^{37}\) Violations in one element of CBMs can undermine adherence overall, causing a cascading effect as states lose trust and willingness to cooperate.

CBMs also likely would not have prevented, for example, a March 2023 incident in which a Russian military aircraft interfered with and ultimately collided with a U.S. MQ-9 Reaper drone, causing it to crash in international waters in the Black Sea. \(^{38}\) CBMs can be a mechanism to help states avoid unwanted escalation, miscalculation, and accidents, but if one state wants to violate an agreement, there is nothing preventing it from doing so. States may violate CBMs if they see it as in their interests to do so.

**Despite some challenges, air and maritime uncrewed platforms in the Indo-Pacific may be a promising area for CBM development.**

First, the United States and China share a mutual interest in avoiding inadvertent regional conflict, though for different reasons. As a status quo power, the United States is likely to want to avoid unnecessary conflict that might upset stability in the Indo-Pacific, while still indicating a willingness to fight. On the PRC side, Chinese military doctrine expresses a strong interest in maintaining “effective control” during a crisis (e.g., by not having an accidental war). Also, pre-existing U.S.-China air and maritime safety MOUs and the Code for Unmanned Encounters at Sea (CUES) framework provide starting points for negotiation and iteration. \(^{39}\) Next, China’s growing nuclear arsenal may motivate both sides to seek greater strategic stability given a future reality of assured nuclear second-strike capability on both sides. Finally, maritime confidence building generally has been productive (see the long history of maritime prize law, COLREGS, CUES, INCSEA, etc.), and the locus of U.S.-China competition is a largely maritime theater.

**On current technological and geopolitical trendlines, the at-scale deployment of lethal autonomous weapons (LAWS), at least in the air and maritime domains, appears likely to be inevitable. As such, a focus on uncrewed system CBMs rather than arms control (i.e., attempts to ban or eliminate LAWS) may be more productive.**

As a first data point, there are loitering munitions already operationally deployed that are virtually indistinguishable from LAWS. For example, the Israeli Harpy loitering munition and the U.S. Long-Range Anti-Ship Missile have autonomous target selection or discrimination systems using electronic emissions or electro-optical or infrared imaging sensors, and likely already meet some parties’ definitions of LAWS. \(^{40}\) Additionally, uncrewed platforms in general, whether remotely piloted or autonomous, are unlikely to be limited in any serious way due to the already widespread deployment—and combat-proven effectiveness—of remotely piloted vehicles (RPVs). Since autonomy is mostly a function of software, LAWS are likely to be essentially indistinguishable from RPVs.

Next, China and the United States both have made uncrewed systems a focus of future air and maritime platform development plans. \(^{41}\) Since both sides are likely to focus on disrupting each other’s communications in the event of armed conflict, some autonomous capability will be
necessary to ensure combat effectiveness. Given the incredibly high stakes for any such conflict, self-limitations on the use of this lethal autonomy probably will be swept aside under the pressure of large-scale combat.

Some observers postulate that to not employ LAWS in a conflict may be counter to international humanitarian law. Uncrewed systems could provide significant humanitarian benefits on the battlefield, including improved and less emotional decision-making, better system accuracy, and as a result possibly reduced loss of life. Also, in the interest of maritime safety, autonomous navigation systems may be able to reduce human error, the most common cause of collisions at sea.

Finally, the temptation to use LAWS in the air and maritime domains is likely to be subject to less pushback than for ground systems: most targets will be platforms (i.e., aircraft or ships) rather than personnel, and semi-autonomous systems already have been operating in the air and maritime domains for decades (e.g., the AEGIS and PATRIOT air defense systems, the CAPTOR antisubmarine mine-torpedo, smart mines, and the Mk 48 ADCAP submarine-launched torpedo).

The CBMs most likely to be successful would build on existing rule sets and agreements.

Building on existing agreements leverages already-agreed norms of behavior as a starting point for negotiation and takes advantage of the already-established legitimacy of those agreements.

As precedents, the U.S.-Soviet INCSEA air and maritime safety agreement, existing U.S.-China air and maritime safety MOUs, and the multinational CUES agreement all lean heavily on existing rules of behavior and established means of communication. The COLREGS, the UN Convention on the Law of the Sea (UNCLOS), and International Civil Aviation Organization (ICAO) guidelines are referenced extensively within these agreements to provide details of expected behavior during interactions by state vessels. Communications arrangements within these documents reference established international signals, frequencies, etc.

The process of developing CUES—within the Western Pacific Naval Symposium, a biennial set of multinational working group discussions among regional navies—could be a good model. Similarly, a new set of agreements could build on existing consultative agreements, such as the U.S.-China Military Maritime Consultative Agreement, and use multinational vehicles such as the Western Pacific Naval Symposium to socialize development of them. Such a process could establish a rule set on a multinational basis that others could sign onto as desired, and then adapt the rule set for bilateral use where appropriate. For example, CUES is referenced as a source of behavioral guidelines within U.S.-China air and maritime safety MOUs.

Similarly, COLREGS provides a good starting point for the behavior of uncrewed maritime platforms; since aircraft follow a somewhat similar set of “rules of the road,” ICAO guidance may be similarly modifiable for uncrewed aircraft use. Based on current maritime safety agreements, new agreements (or amendments to existing ones) will be necessary to account for uncrewed surface ships. And while uncrewed aircraft are mentioned in some existing agreements (e.g., CUES), updates also likely would be necessary to account for a transition to full autonomy. These gaps in coverage will be covered in more detail below.
Updates to uncrewed system guidance in COLREGS (via the IMO) and the “rules of the air” equivalents (via ICAO) are still in development. As of early 2024, there are only draft sets of proposals—under IMO and ICAO working group development—for how to start thinking about modifying regulations to account for the routine presence of uncrewed systems in the air and maritime environments. IMO’s current plans call for nonmandatory updated guidance covering autonomous ships to take effect in 2025, and to form the basis for a mandatory update to enter into force in 2028.

Given an existing low level of trust between competitor states—such as between the United States and China—CBMs are more likely to be effective if they include provisions for verification.

Through verification measures, states can ascertain compliance, deter violations, and gain assurance and mutual confidence. CBMs governing uncrewed systems are likely to be most successful if they focus on information and behaviors that are verifiable, and not on non-verifiable items where a lack of existing trust may drive suspicion of violations—real or imagined. Potential examples of verifiable versus non-verifiable items might include:

Verifiable items (i.e., possible good choices to manage via CBMs):

- For some uncrewed systems, whether they are armed and with what types of weapons (potentially verifiable via visual inspection)
- Observable uncrewed systems’ position and motion (e.g., whether they are in a given operating area, operating at a certain speed or altitude, in what numbers, etc.)
- Uncrewed systems’ day-to-day behaviors and platform interactions (e.g., whether routine interactions are conducted according to agreed-upon rule sets and behaviors)
- Uncrewed systems’ markings, lights, etc. (visually verifiable)
- Information broadcast by uncrewed systems, whether via voice (e.g., voice warnings) or digital broadcast (e.g., AIS data for vessels or ADS-B data for aircraft, verifiable via correlation with other sensor data).

Items not likely to be readily verifiable (i.e., non-optimal choices to manage via CBMs):

- Whether uncrewed systems are operating via remote control or autonomously
- What in-extremis rules of engagement uncrewed systems have been programmed to follow or that remote operators have been trained to follow (e.g., whether they will respond with lethal force to attack or to being approached within a certain close distance)
- The reaction of a state party to having uncrewed system(s) damaged, detained, or destroyed (this is a function of true intentions, which cannot easily be ascertained, and might change)
- Whether uncrewed systems are being operated by a state, or by a commercial operator for a state (e.g., Saildrone uncrewed surface vessels being operated under contract for the U.S. Navy in the Persian Gulf region)
• Which state operator owns or controls an uncrewed system (numerous examples exist of systems that have been sold to multiple different nations)
• The number of uncrewed systems deployed to a given geographic area (due to their generally smaller size than manned platforms, and sometimes low-observable design, they may be easier to hide from detection and inspection)
• Whether an uncrewed system is carrying nuclear weapons (though there are U.S. efforts afoot to attempt to limit the role of AI in nuclear command and control).  

Any approach to China on CBM verification measures should consider that China’s record of support for verification measures in arms control is mixed.

China tends to believe that verification activity can provide an asymmetric advantage to the stronger party, posing a threat to China’s security interests. This idea is driven in part by some Chinese experts’ belief that the United States misused arms control verification against the Soviet Union, providing an opening into Soviet society. China also tends to see mutual national trust as a precondition for verification cooperation, rather than the typical Western preference for implementing CBMs as a means of building that trust; China also has a preference for multilateral verification regimes over bilateral ones. These factors need to be taken into account in the development of realistic and effective uncrewed system CBMs.

Gaps in Current Uncrewed System CBMs

Considering that the CBMs most likely to be successful are those built on pre-existing rule sets and agreements, and there are three primary agreements related to air and maritime platforms that could be updated to encompass the impact of uncrewed systems:

1. The 2014 U.S.-China MOU for safety of air and maritime encounters
2. A 2015 U.S.-China MOU supplement covering air-to-air encounters
3. The Western Naval Symposium’s Code for Unplanned Encounters at Sea (CUES).

In addition to updates to these CBMs, the current COLREGS will require updating to covered uncrewed vessels. While a multinational COLREGS update effort is underway—and is beyond the scope of U.S.-China bilateral agreement—until this effort is completed, gaps in COLREGS will exist.

The following is a detailed assessment of uncrewed system coverage and applicability (or lack thereof) within the three primary CBM agreements. See Table 1 for a summary of these gaps.

2014 U.S.-China MOU for Safety of Air and Maritime Encounters

Section I “Definitions”, which states that a “military vessel” includes warships (referencing UNCLOS Article 29) and naval auxiliaries (referencing CUES Paragraph 1.3.3), likely will require revision.
UNCLOS Article 29 defines a warship as: “a ship belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the State and whose name appears in the appropriate service list or its equivalent, and manned by a crew which is under regular armed forces discipline.” Without further clarification, the 2014 MOU appears to exclude uncrewed warships.

CUES Section 1.3.3 states a “naval ship” is a descriptor that is assumed to include warships, naval auxiliaries, and submarines. For warships, CUES also references UNCLOS Article 29 (thus excluding uncrewed warships). Of note, CUES Section 1.3.4 describes a “naval auxiliary” as a vessel, other than a warship, that is owned or under the exclusive control of the armed forces of a State and is being used for government non-commercial service. While this does not explicitly exclude uncrewed vessels, it still calls for clarification, as some future uncrewed vessels are likely to be equipped and operated primarily as uncrewed combatant vessels, which is not what “auxiliary” is intended to cover, whether crewed or otherwise.

Section VI – Rules for Establishing Mutual Trust at Sea may require revision.

Part I, Peacetime Security Measures, provides guidance that the Commander (or Commanding Officer or Master) of a military vessel is responsible for determining when their vessel is threatened by a vessel or aircraft, providing no guidance for how this decision should be made in the case of an uncrewed, autonomous platform.

Part II, which describes actions that a prudent Commander should avoid, gives guidance to avoid taking action such as using shining lights at another vessel’s bridge or shining a laser at personnel. It contains no guidance for which actions should be avoided with respect to the other side’s uncrewed vessels, such as blinding sensors, interfering with vessels’ operation, or jamming communication and control channels.

Part IV, Rules for Emergency On-Scene Coordination, states, “one Side may not board or salvage the other Side’s military vessel or military aircraft without prior explicit consent.” This passage may pertain to uncrewed vessels, as such vessels have in the past been seized (at least temporarily) by one of the parties (China) without consent, and as such may call for clarification.

MOU Section VII, covering communication rules, provides vessel-to-vessel and vessel-to-aircraft radio frequencies, and indicates that working frequencies are to be decided after establishing communications. This section requires clarification, as uncrewed platforms may not be equipped to conduct such communication over typical crewed platform frequencies.

Throughout the MOU, parties are called to comply with relevant maneuvering, light, and sound rules of COLREGS, with which uncrewed vessels may not be able to fully comply (see below).
2015 U.S.-China MOU Supplement

This supplement adds a term of reference for military aircraft to the 2014 U.S.-China MOU, defined to include “manned and unmanned fixed-wing aircraft, rotary-wing aircraft, and helicopters of both sides’ militaries.”

Section I states that military aircraft should “operate consistent with the Convention on International Civil Aviation and its Annexes and guidance to the extent practicable when compatible with mission requirements.” ICAO Annex 2, Rules of the Air, section 3.1.9 states, “a remotely piloted aircraft shall be operated in such a manner as to minimize hazards to persons, property or other aircraft.” This guidance would seem to override the rules for Avoidance of Collisions (Section 3.2), which, depending on the geometry of an aircraft encounter, gives some aircraft right-of-way. It is not clear which guidance applies, and there is no guidance for how uncrewed aircraft should interact with each other.

CUES

This agreement provides the guidance previously discussed regarding warships and naval auxiliaries (i.e., excludes uncrewed vessels as warships, and lacks clarity as to whether uncrewed vessels are covered as naval auxiliaries). It states that a “naval aircraft” includes “helicopters, fixed wing aircraft and unmanned aerial systems or vehicles.” However, CUES makes no mention of uncrewed surface or undersea vessels. In general, communications and identification requirements provided in CUES are written largely with an assumption of communication between crewed platforms, and thus do not provide prearranged means of communication with or between uncrewed platforms. Similar to the 2014 U.S.-China MOU, CUES calls for navies to comply with COLREGS, which may require clarification for uncrewed vessels.

COLREGS

According to a recent IMO Regulatory Scoping Exercise, COLREGS will require amendment for both remotely operated and fully autonomous vessels. Likely areas of revision will include terminology, lights, shapes, and sound signals, the role of the vessel’s master, responsibility of remote operators, and distress signals. However, COLREGS “in its current form is still the reference point and should retain as much of its current content as possible.”

COLREGS provides for the possibility of special lights, shapes, and sound signals for unusual government vessels (such as uncrewed vessels), stating,

Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provisions of any of these Rules with respect to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signaling appliances, such vessel shall comply with such other provisions in regard to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signaling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect to that vessel.
Rule 2, “Responsibility,” states,

Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.58

Rule 2 may require clarification as to its application to uncrewed vessels, as well as when and how uncrewed vessels may deviate from the Rules, and the decision-making behind such deviations.

Rule 5, “Look-out,” states, “Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.” It is unclear how Rule 5 would apply to uncrewed vessels; would optical and auditory sensors suffice, given that they may have fields of view and sound directionality inferior to those of a human lookout?59

Section II, “Conduct of Vessels in Sight of One Another,” may require revision, as it may be difficult to determine, using machine vision, when an uncrewed vessel is “in sight” of another vessel.60 Additionally, Section III, “Conduct of Vessels in Restricted Visibility,” also may require clarification or amendment, as “This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.”61
## Table 1: Uncrewed Platform CBM Gap Summary

<table>
<thead>
<tr>
<th>Current Agreement</th>
<th>Uncrewed System Gaps and Ambiguities</th>
</tr>
</thead>
</table>
| **2014 U.S.-China Air and Maritime Safety MOU** | - Excludes uncrewed warships  
- Coverage of naval auxiliaries unclear due to reference to CUES  
- Unclear who decides if an uncrewed platform is being threatened  
- Lacks relevant guidance to constrain acts such as blinding or interfering with control and operation of uncrewed platforms  
- Lacks guidance for how uncrewed systems should communicate with crewed platforms or each other  
- Refers to COLREGS for vessel maneuvering rules, which itself lacks clarity for some uncrewed vessel interactions |
| **2015 U.S.-China Aircraft Supplement MOU** | - By referring to ICAO rules of aircraft interaction, is unclear whether uncrewed aircraft should remain clear or interact as other aircraft do with respect to right-of-way |
| **Code for Unplanned Encounters at Sea (CUES)** | - Lacks clarity as to whether uncrewed vessels are included as naval auxiliaries  
- Includes “unmanned aircraft” but lacks clarity in application to uncrewed surface and undersea vessels  
- Does not delineate means of communication with or between uncrewed platforms  
- Calls for state vessels to comply with COLREGS for interaction, which itself requires revision and/or clarification |
| **COLREGS** | - Per IMO, requires revision for terminology, lights, shapes, sound signals, etc., to account for uncrewed vessels  
- May require clarification for when uncrewed vessels should deviate from the Rules for special circumstances, and who should make such a decision  
- Requires clarification as to when maneuvering Rules for vessels in sight of one another vs. restricted visibility Rules apply for uncrewed vessels  
- Requires clarification for application of lookout requirement to uncrewed vessels |
Options for Uncrewed System CBM Development

This section uses the most promising characteristics of potential uncrewed system CBMs, such as verifiability and building on previous rule sets, to develop specific options to implement them. There are several options to close the gaps in applicability and/or clarity for uncrewed platforms under the agreements and documents discussed above, which could be pursued individually or sequentially:

**Unilateral Declaration**: make a unilateral U.S. declaration that extends U.S. coverage of the 2014 and 2015 U.S.-China MOUs, as well as CUES, to U.S. uncrewed vessels and aircraft. Those vessels and aircraft would follow ICAO and IMO rule sets (e.g., COLREGS) to the greatest extent practicable pending their revision. Another variant of this approach could be to make a plurilateral declaration with other like-minded CUES signatories, providing greater momentum for norm adoption.

This unilateral/plurilateral approach could provide a benefit for the U.S. and its partners of establishing the new norms and pressuring China, though with some costs to U.S. freedom of action under certain circumstances. However, this approach might make China more suspicious, given the U.S. role as a first mover in the process.

**Minimalist Negotiated Approach**: negotiate minor additions or revisions to current U.S.-China agreements to extend coverage explicitly to uncrewed vessels and aircraft, with additional statements that both sides should follow ICAO Annexes, COLREGS, and other international guidance to the greatest extent practicable pending forthcoming revisions to ICAO, COLREGS, and other international rule sets.

**Proactive Negotiated Approach**: negotiate additions and/or revisions to current U.S.-China agreements to extend coverage explicitly to uncrewed vessels and aircraft. Pending revision to ICAO Annexes, COLREGS, and other international guidance, move ahead to negotiate explicit bilateral or multilateral (e.g., CUES) clarifications, where appropriate, for the expected behavior of uncrewed platforms under those rule sets.82

See Appendix A for specific potential CBM language and provisions that could form the basis of unilateral/plurilateral U.S. and allied declarations, and bilateral U.S.-China agreements.

**Tabletop Exercise: Test-Driving Uncrewed System CBMs**

To explore whether CBMs would have an impact on operations involving uncrewed systems, a tabletop exercise (TTX) was held with expert participants, including a diverse group of senior academic, government, and private sector national security and emerging technologies experts.

The goal of the TTX, designed by Dr. Jacquelyn Schneider of the Hoover Institution, was to explore the efficacy of the various development options for CBMs for uncrewed systems. The
goal was to help inform this report, placing the proposed CBMs in a hypothetical future crisis between China and United States to examine their impact on expected outcomes.

DESIGN OF THE TABLETOP EXERCISE

The TTX was set in 2030, during a live-fire exercise and forward deployment of crewed and uncrewed PRC surface vessels, underwater vessels, and aerial systems within contested waters in the South China Sea. This activity included harassment of Philippine vessels and flights within a newly extended Philippine air defense identification zone. In response to the Chinese activity, the United States sent a carrier strike group to the region as well as an arsenal of uncrewed surface, underwater, and aerial systems. In the scenario, the United States and China were on the edge of conflict breaking out; both countries had significantly increased their rhetoric, and were operating in increasingly contested and congested air- and sea-space, with crewed and uncrewed systems on both sides.

The TTX featured four groups: (1) a no-CBM group (control group), (2) a group using a unilateral set of CBMs adopted only by the United States that extended existing U.S.-China agreements, (3) a group using a minimalist agreed-upon set of U.S.-China CBMs, and (4) a group using a proactively negotiated, extended set of CBMs between the United States and China. These groups then were asked not to play as the United States or China, but instead to adjudicate how the interactions of the Chinese and U.S. forces might play out considering the introduction of the CBMs they were provided. Players briefed out their adjudication in a combined plenary session, allowing teams to compare their assessments given the different sets of CBMs they were asked to adjudicate.

INSIGHTS FROM THE TABLETOP EXERCISE

The experts identified a useful set of insights from the exercise and discussion, with the following standing out as the most relevant.

Which uncrewed systems fall under the CBMs is important and can be ambiguous. The CBMs as presented in the pre-TTX discussion were designed primarily for uncrewed platforms, and also could apply to some loitering munitions. However, the wide range of uncrewed systems that could be fielded—pocket-size systems, munitions, autonomous sensors, small to large underwater vehicles, small drones, and large Global Hawk-type systems—made it difficult to apply CBMs uniformly in the TTX. Each domain also created unique problems for safety, inadvertent escalation, and feasibility of CBM implementation. The wide range of sizes and missions of these systems meant that overly broad CBMs could inadvertently constrain the employment of systems that the United States would like to use. As a result, the “Definitions and Distinctions” section in Appendix B endeavors to narrow and define which uncrewed systems might best be covered by potential CBMs.

A potential stability-instability paradox exists for uncrewed systems, which could make them useful in a crisis. The proposed CBMs in the exercise were designed primarily to curb the chance of an accident or inadvertent escalation resulting from uncrewed system operations causing open conflict between the United States and PRC. However, as groups discussed the utility of the CBMs in the scenario, they stressed that uncrewed systems also might be useful to
help defuse a crisis from escalating into violence. In particular, the reduced emotional impact of losing an uncrewed system versus human lives could act as a pressure-release valve for the countries looking to coerce the other side during a crisis without escalating to war. Participants stressed that uncrewed systems were special and different than crewed assets precisely because they allowed decision-makers to mitigate risk in otherwise dangerous scenarios. This created a stability-instability paradox where there might be significant contestation—and even bloodless violence—because of the increase in uncrewed systems, but that the use of machines over human platforms also may create a kind of stability when it comes to violent escalation, allowing states to de-escalate even with the loss of valuable uncrewed systems.

This insight represents a real factor to weigh when evaluating the net risk reduction associated with potential uncrewed system CBMs. At the least, it merits consideration for providing an “escape clause” in the event of crisis, which would allow for suspension of CBMs to support the use of uncrewed systems to shift risk from crewed to uncrewed platforms.

**Uncrewed system CBMs are potentially most useful before and after a crisis, but not in the midst of one.** Most of the groups believed that the crisis was both too heightened and at the same time not significant enough for CBMs to play a large role in the outcome of the crisis. This led players to debate when CBMs might have the largest role in avoiding accidents or inadvertent conflict. The group concluded that there are potentially two times when CBMs are most effective: (1) During normal, but perhaps slightly heightened tensions; for example, during a U.S. freedom of navigation operation or an isolated show of force or resolve; and (2) post-crisis, if a failure of crisis control leads both sides to conclude CBMs are in their best interests.

**There may be unique benefits to unilateral (or plurilateral) CBMs.** Participants suggested that the United States may benefit from adopting rules of engagement or CBMs even if China has no interest in doing so. They considered that there likely would be a minimal cost for the United States to adopt such an approach, as U.S. uncrewed systems already are being built mostly to operate under existing rules of behavior for crewed systems, such COLREGS. Participants concluded that there are advantages to “retaining the moral high ground” internationally while also allowing latitude for the United States to be more flexible if the PRC behaves poorly first.

**Conclusion and Recommendations**

This report’s insights suggest that uncrewed air and maritime platform CBMs could play a significant role in preventing unintended great power escalation due to interactions with and between these systems. While successful CBM agreements have been rare and difficult to get right, air and maritime uncrewed systems in the Indo-Pacific may be a promising area for CBM development. These insights also suggest that the focus of the U.S. and allied and partner defense establishments should be on CBMs rather than outright arms control, and that the CBMs most likely to be successful would be those that build on existing rule sets and agreements such as INCSEA, COLREGs, CUES, and U.S.-China air and maritime safety MOUs. Finally, given the low level of trust between adversarial states, these CBMs are more likely to be effective if they focus on provisions conducive to verification—though care will need
to be taken in how verification regimes are prepared and presented given apparent Chinese sensitivity on the topic.

There are multiple options for how the United States and like-minded nations could go about pushing forward the development of uncrewed system CBMs—by unilateral/multilateral declaration, a minimal modification of existing agreements, or via a more comprehensive negotiated agreement with China. Based on the findings of this report, the United States (and its partners and allies, as feasible and appropriate) should take the following measures, assuming the geopolitical context supports them. Each measure builds on the effects of the previous ones, and Appendix A offers specific language and provisions for each recommended measure.

First, adopt a unilateral declaration of uncrewed CBMs, announced in coordination with plurilateral CUES-specific measures by other like-minded allied and partner CUES signatories (recommended focus: Australia, Canada, France, Indonesia, Japan, New Zealand, the Philippines, Singapore, and South Korea). Such an announcement would include a statement of the right, at any time, to suspend these measures and revert to the existing CBM framework.

Next, negotiate through existing U.S.-China maritime consultative mechanisms “minimalist” measures, including the right of both sides to suspend such measures.

Finally, pursue more comprehensive measures including:

1. Providing working frequencies for uncrewed aircraft and vessels allowing for communication with crewed platforms, as feasible

2. Avoiding blinding uncrewed platforms’ navigation and collision-avoidance sensors, and control and communication systems

3. Agreeing that both sides’ uncrewed aircraft should operate in a manner that minimizes hazards to other aircraft

4. Agreeing that neither side will use uncrewed ships, aircraft, or undersea vessels to carry, deploy, or employ nuclear weapons

5. Agreeing that either or both sides, at any time, may declare an exemption of uncrewed systems from these measures for as long as required—except for measures related to nuclear weapons.

Policymakers should consider that the utility of these CBMs may be limited in a full-blown U.S.-China crisis: they may be set aside by one or both sides, given the potential utility of uncrewed systems as lower-stakes platforms that can serve as a stabilizing “half-rung” in an escalation ladder. But by implementing uncrewed system CBMs at other, more normal times, policymakers on both sides may be able to reduce the risk of just such a crisis happening in the first place.

This section provides proposed language and/or provisions to implement each of the CBM options discussed above.

1. A unilateral U.S. declaration extending and clarifying existing U.S.-China CBMs could include the following provisions:

a. U.S. uncrewed platforms will operate, as practicable, in accordance with COLREGS, CUES, and relevant ICAO Annexes.

b. It is the intention of the United States, in complying with the 2014 U.S.-China MOU, that a “military vessel” includes warships and naval auxiliaries, whether crewed or uncrewed.

c. Any decision that an uncrewed platform is being threatened during peacetime, along with any decision to use lethal force as a result, will be made by a human commander controlling that platform.

d. When practicable, working frequencies for communication with and by uncrewed platforms will be conducted over the same frequencies as crewed platforms; also—when practicable—the United States will provide for a capability for human operators to conduct such communications remotely via uncrewed platforms’ communication systems.

e. In addition to the 2014 U.S.-China provisions for actions to avoid under Section VI, part ii, the United States will avoid taking peacetime action against uncrewed platforms such as blinding their navigational or collision-avoidance sensors, interfering with their control, or jamming communication systems.

f. To the greatest extent practicable, U.S. uncrewed vessels will abide by COLREGS guidance for the avoidance of collision, including active measures for proactive and timely communication. U.S. uncrewed vessels will attempt to maintain a safe distance to avoid the risk of collision. U.S. uncrewed vessel operators and autonomous control systems will consider relevant provisions of COLREGS and CUES, and the special circumstances at sea at the time, to be the primary basis for determining safe distance.

g. U.S. uncrewed aircraft will operate in a manner that minimizes hazards to other aircraft, remaining well clear and employing all available sensors to sense and avoid other aircraft.

h. While the United States will not confirm or deny the presence of nuclear weapons on any particular platform, it is the policy of the United States not to carry, deploy, or employ nuclear weapons via uncrewed ships, aircraft, or undersea vessels.
i. The United States reserves the right, at any time, to suspend the declarations and clarifications delineated above.

2. A minimalist U.S.-China negotiated approach could consist of the following provisions:

   a. A revision to the 2014 U.S.-China MOU that clarifies that a “military vessel” includes warships and naval auxiliaries, whether crewed or uncrewed

   b. A revision to the 2014 U.S.-China MOU, referencing the 2015 U.S.-China MOU supplement, that agrees that both sides’ uncrewed vessels and aircraft will be operated in a manner consistent with COLREGS, CUES, and relevant ICAO annexes—as practicable—pending their revision to provide more explicit guidance for the operation of uncrewed vessels and aircraft

   c. An agreement by both sides acknowledging that either or both sides, at any time, may declare an exemption of uncrewed systems from U.S.-China CBMs for as long as required.

3. A pro-active negotiated approach could consist, in addition to the provisions of the minimalist approach above, of the following provisions:

   a. Revision to the 2014 U.S.-China MOU that clarifies that working frequencies for communication with and by uncrewed platforms will be conducted, when practicable, over the same frequencies as crewed platforms; also, that both sides, when practicable, will provide for a capability for human operators to remotely conduct such communications via uncrewed platforms’ communication systems.

   b. An additional clarification within the 2014 U.S.-China MOU that any decision that an uncrewed platform is being threatened, and any decision to use destructive force as a result, will be made by a human commander controlling that platform.

   c. A revision to the 2014 U.S.-China MOU that adds additional actions to avoid under Section VI, part ii, such as blinding uncrewed platforms’ navigation and collision-avoidance sensors, interfering with their control, or interfering with their communication systems.

   d. A revision to the 2014 U.S.-China MOU that states that uncrewed vessels, to the greatest extent practicable, should abide by COLREGS guidance for the avoidance of collision, including active measures for proactive and timely communication. Also, that uncrewed vessels should attempt to maintain a safe distance to avoid the risk of collision, and that uncrewed vessel operators and autonomous control systems should consider relevant provisions of COLREGS and CUES, and the special circumstances at sea at the time, to be the primary basis for determining safe distance.
e. An addition to the 2015 U.S.-China MOU Supplement that states that both sides’ uncrewed aircraft should operate in a manner that minimizes hazards to other aircraft, remaining well clear and employing all available sensors to sense and avoid other aircraft.

f. An addition to the 2014 U.S.-China MOU that states that neither side will use uncrewed ships, aircraft, or undersea vessels to carry, deploy, or employ nuclear weapons.

g. Additions to the 2014 U.S.-China MOU and 2015 supplement that provide means of communicating that an uncrewed platform has “gone rogue”—and is no longer under effective command—such as lights, broadcasted information, or other communication circuits.

h. A push for updates as appropriate—and in a follow-on multinational forum—to CUES.

i. An agreement by both sides acknowledging that either or both sides, at any time, may declare an exemption of uncrewed systems from U.S.-China CBMs for as long as required.
Appendix B: Definitions and Distinctions

Definitional questions often loom large in discussions of uncrewed and autonomous weapons; the very meaning of “autonomous” is often perceived in different ways by different audiences, with meaningful ramifications to the policymaking process. To attempt to maintain consistency and relevance to policymaking, this report uses key definitions consistent with those used by the U.S. Department of Defense in its relevant documents.

First, this report considers an “autonomous weapon system” to be one that can select and engage targets without further intervention by an operator, including those weapon systems that are operator-supervised but can select and engage on their own unless overridden. Of note, this definition is related specifically to mission autonomy: how the weapon system carries out its mission of engaging targets, and not necessarily navigational autonomy—how the platform makes its way through the air or sea. As such, this report considers an “autonomous platform” to be a platform that has mission and/or navigational autonomy, as inadvertent escalation could occur over a misunderstanding or miscalculation merely related to the operation and navigation of an autonomous platform.

Relating to a platform’s overall control, a “remotely piloted platform” would be one that is actively controlled by an operator who is not physically present on the platform. This definition would include the majority of uncrewed aircraft and surface vessels currently operated by the United States, though in the future this is likely to be less the case given improvements in autonomous capabilities—as well as the need to account for likely efforts by the Chinese PLA to gain the capability to disrupt communications with remotely operated platforms.

For the purpose of CBM development, this paper considers air and maritime uncrewed vehicles, defined as follows:

- **Uncrewed Air Vehicles (UAV):** remotely piloted or autonomous aircraft, fixed- or rotary-wing. In alignment with DoD and FAA classifications of UAVs, this study applies to UAVs larger than 55 pounds (per DoD, Groups 3–5; per FAA, “Large UAS”). Small UAVs like quadcopters are unlikely to be able to maneuver independently in accordance with aircraft rules of behavior promulgated by ICAO and are less likely to pose an operational threat to other aircraft. This category includes some loitering munitions, which may operate for an extended period, or in some cases even return for re-use.

- **Uncrewed Surface Vehicles (USV):** remotely piloted or autonomous vessels designed to operate on the sea surface. In alignment with IMO’s definitions of Maritime Autonomous Surface Ships (MASS), this paper considers surface vessels categorized as MASS Degree Three (remotely controlled, with no seafarers on board) and Degree Four (fully autonomous). The paper considers USVs of all sizes, as the IMO’s COLREGS apply to vessels of all sizes.

- **Uncrewed Underwater Vehicles (UUV):** remotely piloted or autonomous vessels designed to operate primarily under the sea surface.
Notes


3 This executive summary, lightly edited, was generated by a large language model AI.


5 Finnemore and Hollis, “Constructing Norms for Global Cybersecurity,” 441.


7 Finnemore and Hollis, “Constructing Norms for Global Cybersecurity,” 472.

8 Finnemore and Hollis, “Constructing Norms for Global Cybersecurity,” 470.


10 Finnemore and Hollis, “Constructing Norms for Global Cybersecurity,” 447.

11 Finnemore and Hollis, “Constructing Norms for Global Cybersecurity,” 452.


14 As one example, while there is a general public perception that World War I was an “accidental” war due to inadvertent escalation, many historians have come to conclude that Germany was intent on becoming a superpower by engaging in what it thought would be a brief and decisive conflict with Russia and France, and merely found the reason it was looking for in the events of July 1914. See Michael Lind, “Germany’s Superpower Quest Caused World War I,” The National Interest, June 30, 2014.

Perhaps the best example of a (somewhat) inadvertent escalation—driven partly by misunderstanding and misperception—was the Second Gulf of Tonkin Incident, where heightened tensions combined with bad weather and spurious radar returns to drive American perception of a Vietnamese torpedo boat attack that appears to be have been completely imaginary. This misperceived attack drove significant U.S. escalation into direct warfare with North Vietnam—helped along by a Defense Secretary who appears to have lied to Congress and the public to drive his agenda of further American involvement. See Pat Paterson, “The Truth About Tonkin,” Naval History 22, no. 1 (February 2008).

Accidental escalation would be when an accident or unplanned incident causes unintended escalation, such as the Gulf of Tonkin Incident; inadvertent escalation would be when a planned action causes unanticipated escalation, such as when Germany marched through Belgium in the opening days of World War I, failing to anticipate that the United Kingdom would take that action as cause for a declaration of war.


Wayne Hughes, Fleet Tactics and Naval Operations (Annapolis: Naval Institute Press, 2018), 189.

Hughes, Fleet Tactics and Naval Operations, 29–32.


Of note, this analysis of CBMs for uncrewed systems does have broader applicability beyond the U.S.-China context. Uncrewed aircraft are widely proliferated to state and non-state groups around the world, and an increasing number of these groups are adopting USVs and UUVs as well. While there are many other potential flashpoints around the world where CBMs for uncrewed systems could be useful in mitigating risks, for the purpose of scoping the analysis this paper will focus on the United States and China.

See, for example, the “Rotem” loitering munition, which has remote sensors, remote control, can be used for reconnaissance, and can be directed to return if it is not expended in an attack: https://www.iai.co.il/p/rotem.


34 Desjardins, *Rethinking Confidence-Building Measures*, 49.


50 A distinct adversary goal may be to collect “stimulative intelligence” by deliberately forcing and observing a reaction by an uncrewed system, whether it is autonomous (observing programming) or remotely piloted (observing training and doctrine).


One interviewed expert pointed out that such a measure may run afield of long-standing DoD policy—despite general policy not to deploy nuclear weapons on surface ships, attack submarines, or aircraft—to “not discuss the presence of nuclear weapons aboard specific ships, submarines, or aircraft.” See U.S. Department of Defense, “DoD Instruction 5230.16: Nuclear-Radiological Incident Public Affairs Guidance,” October 6, 2015.


53 Tong Zhao, “China’s Approach to Arms Control Verification,” 17.

54 Tong Zhao, “China’s Approach to Arms Control Verification,” 5.


Additional agreements covering uncrewed platforms could include:

- A ban on the carriage of nuclear weapons by uncrewed platforms.
- An agreement (or unilateral declaration) that defines areas where uncrewed platforms will only be operated unarmed in the interest of mitigating the risk of crisis escalation. While neither side is likely to agree on specific geographic areas where such restrictions would be in place on a permanent basis, agreement might be reached on pre-defined types of areas that could be announced by either or both sides’ militaries in the event of a crisis or heightened tensions, and such areas could be integrated into the planning and doctrine of relevant military forces.
- Additional specific conferencing and information exchange provisions focused on the interaction of uncrewed platforms.
- Provisions for communicating to the other side, via means such as lights, broadcasted information, or pre-established communication circuits, that a side’s uncrewed platform has “gone rogue” and is no longer under effective control.


