The Role of Clandestine Capabilities in Deterrence: Theory and Practice

U.S. Naval Postgraduate School (NPS)
Project on Advanced Systems and Concepts for Countering WMD (PASCC)
Grant N00244-16-1-0032
Final Report

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September 2017
Stanley Kubrick’s iconic black comedy Dr. Strangelove revolves around a piece of military technology known as the doomsday machine, which will automatically destroy all life on earth if the United States ever launches a nuclear attack on the Soviet Union. This includes even the unauthorized attack launched by the rogue General Ripper, which is underway when the Soviet ambassador reveals the machine’s existence. American General Buck Turgidson dismisses it as “an obvious commie trick, Mr. President” worrying that “we’re wasting valuable time” while “they’re getting ready to clobber us!” President Muffley finds the very idea of the machine madness, only to be told that the Soviets built the machine “when we learned that your country was working along similar lines, and we were afraid of a doomsday gap.” When the President denies this, the ambassador deadpans: “our source was the New York Times.” After the title character, Dr. Strangelove, reveals that the U.S. government had indeed investigated such a device, he delivers the film’s biting satirical punch line: “the... whole point of the doomsday machine... is lost... if you keep it a secret! Why didn’t you tell the world, eh?” The oversight is attributed in the movie to the Soviet Premier’s love of surprises.1

There can be much truth in jest. Kubrick’s exquisite vignette points to a very real problem in international relations: the challenge of clandestine military capabilities. In the modern era many elements of military power depend on secrecy for their battlefield effectiveness. Yet this secrecy makes them difficult to exploit for political purposes. Simply telling an adversary about an unanticipated source of military advantage is likely to be met with General Turgidson’s incredulity, or to just be dismissed as cheap talk. Actually proving a capability’s existence may lead to effective countermeasures that vitiate both its military utility and any political leverage it was supposed to provide. Keeping the capability concealed removes it from the calculus of other actors, making it useless for deterrence.

At the same time, clandestine capabilities pose difficulties within governments as well as between them. If a capability is kept secret in order to maximize wartime outcomes, leaders may end up like President Muffley, unable to integrate capabilities for strategy or to calculate their own bargaining leverage. In a not for attribution discussion, one U.S. analyst noted even in classified war games some capabilities were so tightly held that it was impossible to get all participants “read in” to the required compartments. As a result these capabilities only appeared as “magic faerie dust” in the war games, hardly conducive to developing a robust understanding of the capability.2 But if information on clandestine capabilities is shared too widely, it may end up on the front page of the New York Times. In short, clandestine military capabilities pose problems of information management, both externally and internally, and trade-offs between military effectiveness and political utility.

The basic issues raised by clandestine capabilities have long been of interest to scholars of international security. Many analysts have argued miscalculation about the balance of military power is one of the primary causes of war.3 Rationalist and bargaining models of war have turned this insight into a high art, putting private information about military strength at the heart of violent international conflict.4 More broadly, any research program or theory that depends on state calculations of relative power will be influenced by their decisions about clandestine capabilities.

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1 Full script of Dr. Strangelove available at http://www.visual-memory.co.uk/amk/doc/0055.html
2 Conversation with U.S. government analyst, January 2015.
4 The bargaining literature is vast. Widespread interest in the problem was kindled by James D. Fearon, “Rationalist Explanations for War,” International Organization 49, no. 3 (July 1, 1995): 379–414.
Clandestine capabilities can also influence long-term political interactions, akin to situations of “general deterrence.” The military balance sits in the background of every-day diplomacy, fashioning the grand strategies of rivals and friends even when crisis is not imminent. The trajectories of long-term great power competitions and alliance politics are shaped by the military balance, and are therefore conditioned by the relative importance of clandestine capabilities.

Beyond their obvious theoretical significance, there is a strong case that clandestine capabilities are becoming an increasingly salient part of modern military competition. The past three decades have witnessed a revolution in remote sensing, which is being fully exploited for military applications via the increased diversity, persistence, and sensitivity of sensors. Manned and unmanned platforms collect intelligence from the ground, air, sea, and space. Advanced data fusion technology can integrate different types of signatures into a holistic picture, often in real time. Prompt and precise munitions allow the fruits of this intelligence to be used against all classes of targets across the breadth of the globe.

Furthermore, many of the technologies cited above were developed for nuclear operations and retain their relevance for contemporary nuclear balances. If the international environment becomes more competitive in the years ahead, especially in East or South Asia, we may see the reemergence of great power nuclear competition. To the degree that such competition is characterized by clandestine capabilities, it may be unstable and dangerous.

The rising salience of clandestine capabilities is reflected in policymaker interest in the subject. David Ignatius reports that “Pentagon officials say they decided over the past year to reveal some formerly top-secret weapons programs because the disclosure would complicate Russian and Chinese military planning. But they say they have concealed other programs to preserve warfighting effectiveness in any future conflict.”

Deputy Secretary of Defense Robert Work has said publicly that “We will reveal for deterrence, and we will conceal for war-fighting advantage. There are a lot of things in the budget that we don’t talk about because we want to preserve that in case, God forbid, deterrence fails and we do come to a conflict of arms.” But the mechanics of how to navigating this trade-off are far from clear to Pentagon managers, with one high-level defense official telling us that managing clandestine capabilities “one of the truly difficult challenges for us in the 21st Century.”

Unfortunately, despite the gravity of clandestine capabilities for theory and policy, scholarship in security studies provides a poor foundation for grappling with their challenges. The bargaining literature has tended to regard the issue as either simple—because the military balance is relatively easy to observe, especially for states with sophisticated intelligence organizations—or hopeless, because a truly clandestine capability represents private information that is impossible to reveal without neutering it. Yet this bifurcation may not match reality.

For instance, are there ever conditions where rationalist pessimism is not justified—where a secret capability can be revealed and converted into political advantage? After all, new


7 Conversation with senior Pentagon official, August 22, 2016.
capabilities alter the bargaining space between states, and adjustments are rarely immediate and perfect. What might such conditions, if any there be, look like?

Moreover, is Deputy Secretary Work’s trade-off between signaling for political advantage and concealing for warfighting effectiveness always and everywhere sharp and immutable? What factors might drive variation among all these political military outcomes? Which factors are likely to loom largest in states decision-making about whether to conceal or reveal their clandestine capabilities? How will variation in the technical character of clandestine capabilities, the political nature of bargaining interactions, or the internal features of negotiating states influence the answers?

The purpose of this report is to provide some foundational tools for thinking about these questions rather than to provide any definitive answers. In particular, we make no claims here to be testing any theory or proposition. Our goal is more conservative: to stake out and define a phenomenon of interest, develop a conceptual scheme for its study, generate a number of hypotheses that seem deductively sound, and conduct a plausibility probe of the preceding contributions through a case study.

The report proceeds in that order. We begin by defining clandestine military capabilities and distinguishing them from similar features of military politics that do not meet our definition. We then discuss the treatment of clandestine capabilities in the extant security studies literature. The subsequent section lays out our framework for variation in political-military outcomes involving clandestine capabilities, which we use to make some initial deductions. A series of hypotheses about the causes of variation follow in the next section. Finally, we use an extended case study of strategic anti-submarine warfare during the Cold War and a shorter case study of stealth during the Cold War to demonstrate the utility of our framework and the plausibility of some of the hypotheses.

Defining Clandestine Capabilities

Clandestine capabilities are elements of military power that depend on secrecy for their effectiveness, usually because they exploit some enemy vulnerability that is in principle repairable if appropriate countermeasures are taken. The key feature of clandestine capabilities, from a conceptual point of view, is that successful countermeasures will sharply degrade the value of the secret asset in question. This characteristic is what poses the threat of a critical trade-off between exploiting clandestine capabilities for political purposes and retaining their military value. It is also what drives states to look for ways to signal capabilities without exposing them to countermeasures.

Not all military secrets are clandestine capabilities. Some hidden capabilities do not depend by their nature on secrecy for their effectiveness. For instance, new variants of atomic munitions do not become any less effective at destroying targets when their existence is revealed. A great many military capabilities do gain some operational benefit from covert development and deployment, yet do not experience a sharp drop-off in their effectiveness once they are discovered and countermeasures devised. The enemy might improve its fleet to match a new class of battleship, but this does not make the battleship disappear. To qualify as a clandestine capability, the right countermeasures must hold the potential to turn a successful engagement into a failure, or a turkey shoot into a tough fight, and be known to do so in advance.

Likewise, not all military signals are communication about clandestine capabilities. Some kinds of classic military signals, such as military parades or other public displays of new
hardware, are often intended as statements of national prestige. Other times capabilities are signaled so that their existence will be taken into account, without any fear that the capability could be degraded. The Soviets showed off their new ICBMs at May Day parades in part to demonstrate that they were keeping the pace with American building efforts. Decisions to signal or conceal might also have a purely domestic audience. Decisions to signals or reveal that are relevant to our study must involve genuinely clandestine capabilities as defined above.

Security Studies Literature on Clandestine Capabilities

Interest in military uncertainty goes back at least to Blainey’s concern with mutual optimism about the balance of power, specified by Fearon as private information about military capabilities that a state has an incentive to misrepresent. States can have an incentive, Fearon argues, “to withhold information about capabilities and strategy.” States “rarely publicize war plans” and “there is a trade-off between revealing information about…capabilities to influence bargaining and reducing the advantages of a first strike.” In this vein, Slantchev has stressed the importance of surprise attack capabilities, arguing that they can provide rational incentives for feigning weakness during strategic bargaining and can also lead to preventive war. Likewise, Dong Sun Lee connects preventive war to military strategies of maneuver that rely on deception and good intelligence capabilities opaque to outside observers. A number of formal models have illustrated the general link between uncertain military capabilities and violent bargaining failure. The most direct work on clandestine capabilities is therefore pessimistic about whether they can be signaled, while focusing narrowly on war plans and surprise attack.

The large majority of the literature, however, treats military uncertainty only indirectly. The tendency has been to define “a strong actor” as “one with a large expected war payoff.” Valuation of the issue (high), costs of fighting (low), probability of winning, and military capabilities (large)” are often “lumped together to produce an aggregate expected payoff from fighting (high), which in turn defines the actor’s type (strong).” Signals are given primarily by the refusal or acceptance of different sorts of peace terms, and communicate generic bargaining strength without differentiating its source. When the sources of bargaining strength are broken

8 Blainey, The Causes of War; Fearon, “Rationalist Explanations for War.”
out, the variable most often discussed is resolve, intentions, or the cost of war.14 Moreover, these studies have overwhelmingly focused on publicity as the signaling mechanism of interest.15

Fortunately, recent literature has begun to investigate signals in a clandestine rather than a public context. Secret threats can credibly signal because they allow irresolute adversaries who fear domestic audience costs to back down gracefully16; because they invoke reputational costs17; or because by changing perceptions about intentions they affect other aspects of a dyadic relationship.18 Secret military actions can be used to signal a desire to control escalation, and to credibly convey resolve or reassurance.19 Older literature on military deception emphasizes the battlefield value that comes from concealing clandestine capabilities, especially surprise attack.20 Newer work emphasizes the potential for deception in cyber-space, and its ambiguous effects on the offense-defense balance.21 Some of the deception literature also gives attention to a state’s political incentives to exaggerate or minimize it military strength.22

Unfortunately, the new research on secrecy and signaling follows the bargaining literature in its attention to resolve and intentions in lieu of signals about military capability. Much of the deception literature is operational in nature, focused solely on military trade-offs without reference to politics, and highlights concealment over communication. The work on strategic deception examines only false, rather than reliable signals.

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Even the arguments closest to our own approach share these limitations. Jervis’s Logic of Images remains the most thorough examination of secrecy and signaling, but largely concentrates on deceptive communication about strategic intentions.\(^23\) Axelrod has written on “resources for surprise” that are akin to our definition of clandestine capabilities: assets of military value that degrade rapidly after they are used, such as spies, double agents, counterintelligence, code-breaking, and the introduction of new weapons systems in battle.\(^24\) He evaluates the trade-off on when to “burn” these capabilities in purely military terms, with no attempt to assess political incentives. On the other hand, Lewis’s RAND note on “deliberate capability revelation” treats clandestine capabilities exactly as we define them.\(^25\) Our hypotheses about clandestine capabilities mirror some of his conclusions. Still, Lewis’ primary vision for signals about clandestine capabilities is one of deception, rather than reliable communication.\(^26\)

Finally, Carnegie and Carson study the familiar intelligence “sources and methods” problem, where states hesitate to reveal their private information for fear of damaging future collection.\(^27\) They argue that international organizations can alleviate this problem by authenticating private state intelligence, thus producing political benefits through increased international cooperation. But this important finding is of tenuous relevance to clandestine military capabilities, as no organization exists to validate military power, nor is one likely to appear.

In sum, uncertainty about the balance of military power has long been a central concern for scholars of war and peace. Uncertainty about war outcomes has been most studied in the bargaining literature, where they are generally conceived of as secret war plans or military surprise, and therefore impossible to signal. However, the field as a whole has devoted surprisingly little attention to the mechanics of how the specific kind of uncertainty caused by clandestine military capabilities manifests itself in political disputes, preferring instead to focus on means for signaling resolve, intentions, or generic bargaining power. Moreover, the field put most of its effort into studying signaling mechanisms, like publicity, that are less appropriate for credibly conveying military information. To the extent that military signaling has been studied, the emphasis has been on deception: either concealing true information or signaling falsehoods.

Yet there are powerful reasons to study reliable signals of clandestine military information. The bargaining literature underscores state incentives to share information as well as to misrepresent it, and the peaceful exploitation of bargaining advantage is as worthy of interest as the causes of war. It also makes sense to expand private information about war outcomes beyond the examples of war plans and surprise attacks that are extremely difficult to signal. There is no theoretical reason why every clandestine capability should have this property.

Moreover, realist theory suggests that states will be especially attentive to military signaling because it is difficult to reliably estimate the intentions of other states.\(^28\) States will always have reason to doubt even strong signals about private values like resolve or reservation

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\(^{26}\) See, especially, Ibid., 28–30.

\(^{27}\) Allison Carnegie and Austin Carson, “The Disclosure Dilemma: Nuclear Intelligence and International Organization” (unpublished ms., Columbia University, September 2, 2016).

price, especially if recent research calling into question the signaling value of publicity proves correct. A successful military signal, by contrast, could carry some proof of its own veracity, and help states distinguish bluffs from a genuine position of strength.

**A Framework For Variation**

The central challenge of clandestine capabilities is the trade-off they often present between military advantage and political leverage. We therefore propose a two-dimensional property space where military and political impact can each vary between zero and one. Values can fall anywhere along the continua, but for ease of exposition we treat both dimensions as binary. A military value of zero is a capability that has been completely neutralized by countermeasures after it was revealed to, or discovered by, the enemy; a value of one is a capability that is making (or holds the potential to make in wartime) its maximum possible contribution to the military balance, whatever that might be. Likewise, a political value of zero is a capability that exerts no influence on political decision-making abroad, while a value of one is of maximal impact for some relevant decision.

All clandestine capabilities are born in quadrant IV of the resulting matrix: they begin their lives as a military advantage unknown to foreign calculations, with no political impact. An example of this outcome was the initial reluctance to make full use of U.S. signals intelligence (SIGINT) capabilities in the coercive air campaign against North Vietnam. The U.S. National Security Agency (NSA) had developed a capability, code name COMBAT TREE, to interrogate the identify friend-foe (IFF) transponder on Soviet export model MiG fighter aircraft. This interrogation extended the range at which U.S. airborne radar could detect MiGs and at the same time made sure those radar returns were in fact MiGs and not friendly aircraft. This was a huge advantage but the NSA and U.S. military did not allow the active use of this capability for fear of compromising it, a policy that did not change until, after extensive debate, July 1967.

Conversely, all clandestine capabilities die in quadrant III of the property space. Eventually secrets leak, capabilities become obsolete, or attempts to exploit them are made and their effects degrade and attenuate. States are left with neither military advantages nor political leverage. One example of a clandestine capability that transitioned from birth to death fairly rapidly was the “Stuxnet” cyber attack on Iranian centrifuges, allegedly engineered by U.S. and Israeli intelligence. This ingenious bit of malware attacked zero-day exploits in the industrial control mechanisms for Iranian centrifuges, pushing them towards chronic fatigue and systematic failure, but in a gradual rather than a sharp and obvious manner. In addition to slowing the

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30 Marshall Michel, *Clashes: Air Combat over North Vietnam, 1965-1972* (Annapolis, MD: Naval Institute Press, 1997) p. 181 and Robert Hanyok, *Spartans in Darkness: American SIGINT and the Indochina War, 1945-1975* (Ft. Meade, MD: Center for Cryptologic History, 2002), pp. 255-258. The ultimate political impact of this capability is open for debate, as is the counterfactual of whether North Vietnam would have been susceptible to its earlier use. However, the change in the air war, in part due to COMBAT TREE, certainly troubled the North Vietnamese, making it at least a good example of a clandestine capability withheld for future use. On this point, see Axelrod, “The Rational Timing of Surprise.”

physical pace of uranium enrichment, it induced Iran to turn off its centrifuges for extended periods of time in order to diagnose what was wrong with them. Eventually, though, an anti-virus firm discovered the code, and Iran was able to fix its vulnerabilities, erasing any further value from the worm.

Between birth and death a clandestine capability might pass through two other phases of life. The first, in quadrant I of the table, is the vigor of youth: in this box states have, at least temporarily, the best of both worlds, retaining military advantages while influencing the decision calculus of other actors. The U.S. program to develop low observable or “stealth” aircraft may have been of this type. According to an August 1988 Central Intelligence Agency (CIA) report, the Soviets had probably known about U.S. stealth programs since the mid-1970s thanks in part to press leaks. Yet the report concludes the tight compartmentalization of the program for militarily significant data combined with the wild speculation in some of the press meant the stealth program was probably not well understood by the Soviets from the perspective of producing countermeasures. Indeed the report concludes, “Soviet knowledge of U.S. Stealth systems… has allowed the Soviets to better anticipate what offensive threats they will face in the future and possibly to focus research on counter low observable (CLO) systems. We have no evidence of a Soviet CLO system, however.”

Thus the Soviets knew something about the military advantage of U.S. stealth programs but not how to counter them.

Finally, a clandestine capability in quadrant II of the property space might be said to have reached middle age, in that certain inevitable trade-offs have been acknowledged, and perhaps a sense of decline has set in. This type of outcome reflects a deliberate attempt to gain political leverage at the cost of military advantage. A clear case of this outcome was the Reagan administration’s willingness to risk compromising U.S. SIGINT against Soviet air defenses following the downing of Korean Airlines Flight 007 in 1983. The administration played tapes of intercepted Soviet communications revealing an incident wildly at odds with the Soviet official story. This achieved a significant political effect with both U.S. allies and neutrals, even though revealing the capability could have allowed the Soviets to take corrective measures. The judgment of the Reagan national security team was that the capability at risk was a low level signals intelligence capability and the Soviet response would have been onerous- essentially reworking Soviet command and control of air defense.

Table 1: Political-Military Outcomes for Clandestine Capabilities

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<thead>
<tr>
<th></th>
<th>No Military Advantage (0)</th>
<th>Military Advantage (1)</th>
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<tbody>
<tr>
<td>Political Impact (1)</td>
<td>Middle Age</td>
<td>Youth</td>
</tr>
<tr>
<td>No Political Impact (0)</td>
<td>Death</td>
<td>Birth</td>
</tr>
</tbody>
</table>

34 Conversation with former intelligence official, May 3, 2017.
Three factors influence where any given clandestine capability will fall across these outcomes. First, outcomes will be heavily influenced by state choices about what box they would like to be in. States can choose to conceal (birth), reveal (middle age), or partially reveal (youth) their clandestine capabilities in an attempt to shape political interactions to their satisfaction. Second, whatever a state’s strategy, it can be implemented more or less effectively. Successful signaling requires that foreign actors receive and understand the message; successful concealment requires protecting military secrets from prying eyes. Failures of signaling implementation can put clandestine capabilities in a different cell than states intend.

Third, the political value of information derived from clandestine capabilities will depend on the contribution those capabilities make to the military balance. Some covert military assets will be of only minor military importance, and therefore not relevant for most political calculations; others will carry some weight in the military balance, but will not be sufficient to influence high political goals. By the same measure, some political objectives are not consequential enough to be worth taking risks with a decisive clandestine military capability. The political success of military signaling will thus ultimately depend on a “match” between a state’s military advantages and its political objectives.

**Hypotheses on Clandestine Capabilities**

In this section we propose hypotheses about factors influencing state signaling choices. These decisions will require assessing the military costs of releasing information about clandestine capabilities, the potential political benefits that might be gained by doing so, and intelligence resources suggesting how signaled information could produce the benefits in question without excessive costs. We conclude by categorizing the ways in which state signaling choices might fail.

**MILITARY COSTS.**

The costs of exposing secrets will vary with the military-technical characteristics of specific clandestine capabilities. A unique clandestine capability is one whose military impact is effectively irreplaceable if it is compromised, making its revelation for political purposes riskier. A capability whose effects could be readily duplicated or replaced in the face of enemy countermeasures, on the other hand, is one that is likely to be more useful for both signaling and fighting. For example, Hamas uses tunnels from Gaza to attack Israel during periodic clashes. Compromising the clandestine nature of any particular tunnel is not necessarily all that damaging, and might be sacrificed to prove a point. Even compromising the existence of a tunnel network does not compromise the unique value of tunnels—though the revelation of a major combat role for such tunnels might.

In contrast the United States is reported to have been able to exploit a vulnerability in the early 1980s Soviet nuclear command and control system known as Signal-M. This might have allowed the United States to disrupt Soviet nuclear launch commands. Such a capability was unique (and supremely valuable).

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The degree to which taking countermeasures against a clandestine capability is easy or difficult will also influence state decisions about whether to risk revelation. Several features of the innovation in question might influence adversary responsiveness. The speed with which countermeasures can be implemented will affect the temporal window in which military advantage might carry political weight. The expense required to undertake countermeasures might affect the degree to which they can be implemented across an entire force, or whether they can be implemented at all. The target’s technical and organizational skill will also influence the effectiveness of countermeasures.

For instance, apparently after the Soviet Union learned that the United States had penetrated its Signal-M command and control in the early 1980s, it was quickly replaced by the upgraded Signal-A—a relatively fast and inexpensive fix.\textsuperscript{37} Yet currently the U.S. military does not even fix known vulnerabilities in commercial software in a systematic way, indicating even “easy” fixes are sometimes difficult.\textsuperscript{38}

We hypothesize that the uniqueness of a clandestine capability and the difficulty of responding to it with countermeasures will influence a state’s incentive to reveal or conceal it. All else equal: the more unique a clandestine military advantage, the less likely states are to reveal them; the easier adversaries can respond, the less likely states are to reveal. We further posit that uniqueness probably carries more weight in state decision-making, since states will have a good idea about the uniqueness of their own capabilities, but will be more uncertain about their adversary’s ability to respond.

<table>
<thead>
<tr>
<th>More Likely to Signal</th>
<th>More Likely to Conceal</th>
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<tbody>
<tr>
<td>Clandestine capability more replaceable*</td>
<td>Clandestine capability more unique*</td>
</tr>
<tr>
<td>Target’s responsiveness lower*</td>
<td>Target’s responsiveness higher*</td>
</tr>
</tbody>
</table>

**Table 2: Military Cost Predictions**

*Prediction illustrated in case study

**Other Military Cost Predictions**

Uniqueness more influential than responsiveness for state signaling decisions

POLITICAL BENEFITS

We suggest that states assess the political benefits of signaling with reference to three factors. First, the character of the interaction matters. It is frequently argued that compellence is more difficult than deterrence for a number of reasons.\textsuperscript{39} There is some, albeit less, warrant from the


\textsuperscript{38} http://www.defensenews.com/story/defense/policy-budget/cyber/2015/06/24/mark-bowman-cyber-hygiene/29229859/

\textsuperscript{39} Reasons include, inter alia: the status-quo is a focal point bargaining equilibrium whose inertia requires especially credible threats to overturn; conceding involves reputational losses; compellent threats require credible assurance that coercion will cease if compliance is forthcoming. These claims have been made by a number of scholars, but most of them can be found in Thomas C. Schelling, *Arms and Influence* (New Haven, CT: Yale University Press, 1966), chap. 2.
literature to suggest that assurance of allies is easier than deterrence of adversaries. Assurance promises are said to depend on trust, which is more likely to develop in the context of repeated cooperative interactions, and so partners may require less in the way of a signal about clandestine capabilities to be reassured, or be more willing to trust their allies with sensitive information. In this context, one former senior government official has told us that allies are often satisfied if the United States just “shows a little leg” about sensitive military capabilities. One might therefore posit that signaling is likely to be increasingly common as it becomes easier, that is, as interactions move from compellence, to deterrence, to assurance.

Second, some political goals are easier to obtain than others. We distinguish between peacetime goals like general deterrence (the avoidance of crises) and shaping the target’s military, diplomatic, or grand strategy; specific concessions in a crisis, like deterring a war or compelling the surrender of some object in dispute; and wartime goals like the control of escalation and conflict termination.

Most of the literature addresses crisis behavior. We argue that the political payoffs in such situations are liable to be substantial and attractive, as they regard war, peace, and other major decisions of foreign policy. On the other hand, gains in one crisis might be reversed in a later showdown if the target state has taken military countermeasures in the interim that attenuate the clandestine capabilities that have been exposed. Moreover, to make a large political gain in a crisis, clandestine capabilities will have to be especially significant to military balances.

It is hard to predict how these incentives will net out. However, we hypothesize that crisis signaling of clandestine capabilities will be likely in certain fortuitous environments where a state has reason to believe that the political benefits from a crisis victory could be locked in. This might be because a state thought it could keep its military advantage after signaling. Or, it might believe it could change future bargaining situations: by turning a compellence problem into a deterrence problem, for instance, or by turning an adversary to be deterred into an ally to be reassured.

One hypothetical example of crisis signaling of real importance to policy makers concerned the basing mode for the MX ICBM during the late 1970s. Most MX basing systems were premised on a “shell game,” which by disguising the exact location of the ICBM amidst many empty shelters would make any attack extremely inefficient. However, decision-makers discovered that when the MX missile was based in a vertical mode, the missile could not be moved between shelters in shorter than twenty-four hours. They were worried that if the system was to lose its “preservation of location uncertainty” (PLU) the Soviets might reveal that they knew the location of the MX force in a crisis, making it vulnerable. The vulnerability was worrisome enough that a horizontal basing mode called MX-MPS was created that allowed for quick movement between shelters.

A parallel example was the apparent United States decision to reveal some of its intelligence capabilities to prevent an Indian nuclear test in 1995-1996. When U.S. satellites

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41 Interview with former senior government official, August 8, 2016.
42 As Axelrod points out in the purely military context, states have incentives to withhold resources that degrade after use until moments of high leverage, even if they face high discount rates. Axelrod, “The Rational Timing of Surprise.”
detected preparations of a test the U.S. Ambassador to India, Frank Wisner, confronted Indian leaders in December 1995 to warn them against the test. According to some sources, as part of this warning he showed the Indians some of the satellite images. There was no subsequent test in 1996, potentially indicating a successful political effect in crisis from capability revelation. Yet two years later the Indians were able to prepare for tests in ways U.S. satellites did not detect—essentially using countermeasures enabled by the prior revelation. The Indian tests thus came as a near-total surprise.

Third, military signals will be more informative in certain types of political interactions. Wartime signals with clandestine capabilities, of whatever political nature—escalation, de-escalation, war termination, etc.—are likely to be exceedingly difficult. The fog and friction of war is the “noisiest” environment for political signaling. Furthermore states will be strongly tempted to gain the political returns from their military capabilities through the simple expedient of military victory, rather than signaling. We expect that states will rarely attempt to signal clandestine capabilities on behalf of wartime goals.

In contrast, signals of clandestine capabilities will be more likely when they carry influential information beyond the short-run military balance, such as information relevant to long-term peacetime interaction. Signals could be informative about long-run military trends, the relative “constitutional fitness” of the target state for running arms races, or the intentions and resolve of the signaling state. They also provide an opportunity to increase the uncertainty of the target state in its evaluative apparatus, by producing unexpected surprise and confusion. Finally, a wider range of capabilities can matter for signaling purposes during peacetime interaction. Capabilities that are not decisive for a particular military balance, might nonetheless take on significance for technological or constitutional reasons. States are more likely to signal clandestine capabilities on behalf of peacetime goals because such signals can carry more information content.

For example, general deterrence will be meaningfully enhanced if target states are less willing to accept an immediate crisis situation until they feel they have a handle on the near term balance, the medium-term trends, and the long-term competition. The last phase of the Cold War was characterized by dawning Soviet realization of their inability to compete technologically with the United States indefinitely. Chairman Yuri Andropov recognized the pressures of U.S. force posture during peacetime, declaring in 1981 that “The US is preparing for war, but it is not willing to start a war. They are not building the factories and palaces in order to destroy them. They strive for military superiority in order to ‘check’ us and then declare ‘checkmate’ against us without starting a war.” Interviews with former senior Soviet military and defense industrial figures confirm the view that the Soviets were deeply pessimistic about long-term competition as they learned more and more about U.S. capabilities, including those like stealth that were clandestine.

45 See account of the tests in Jeffrey T. Richelson, Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea (New York: W.W. Norton, 2006).
Signals of clandestine capabilities can affect the target state’s behavior amidst such a competition by influencing its diplomatic tools and arming decisions. For instance, one of the U.S. goals in the late Cold War nuclear arms race was to get the Soviet Union to move away from a nuclear force based disproportionately in ICBMs (with a corresponding emphasis on counterforce attacks) towards a more balanced triad (with a less threatening retaliatory emphasis). As American nuclear capabilities, clandestine and overt, became more evident, this is exactly what happened—the Soviet Union improved the sea-based and mobile ICBM legs of its triad, as well as its early warning and C³ for launching its fixed ICBMs under attack (LUA).  

**Table 3: Political Benefits Predictions**  
*Prediction illustrated in case study*

<table>
<thead>
<tr>
<th>More Likely to Signal</th>
<th>Intermediate Value</th>
<th>More Likely to Conceal</th>
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<tbody>
<tr>
<td>Assurance</td>
<td>Deterrence</td>
<td>Compellence</td>
</tr>
<tr>
<td>Peacetime Goals*</td>
<td>Crisis Goals</td>
<td>Wartime goals</td>
</tr>
</tbody>
</table>

**Other Political Benefits Predictions**

Peacetime goals will often have multiple kinds of information content, e.g. long-term military trends, constitutional fitness, evaluative surprise, and state intentions.*

Crisis goals are more likely to result in signaling when states perceive an opportunity to lock in gains post-crisis.

Wartime signaling will be discouraged by fog, friction, and military incentives.

**INTELLIGENCE RESOURCES**

A state deciding whether to signal or conceal its clandestine capabilities must also have a theory describing how its private information could be converted into military or political benefits without excessive costs. Such a theory is usually based on intelligence resources: as the deception literature emphasizes, successful signaling requires the sender to understand the analytic apparatus of the target state. The channels from which it gathers and trusts information must be known if the signal is to be recognized at all. Intelligence is also required about the heuristics and theories the target state uses to understand the military balance, so that salient capabilities can be identified, appealing data patterns created for the target, and its perceptions monitored over time.  

States will thus be more likely to signal as their confidence in intelligence on the target state’s analytic apparatus increases, and that such confidence makes the strategy of partial revelation especially attractive. Better intelligence on the target’s information channels facilitates the deception necessary to make partial revelation work. For instance counter-intelligence operations can communicate just the right amount of information by using sources known to be

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penetrated, or codes known to be broken, but trusted by the target. Understanding the target’s analytic priors and biases is similarly helpful: the British protected their ULTRA code-breaking intelligence in World War II by coming up with cover stories for how their forces managed to be in the right place at the right time. One can imagine similarly demonstrating a contemporary clandestine capability to produce some effect, but with a fake cover story about its origins.

However, concealing clandestine capabilities also requires intelligence resources (or more precisely counterintelligence resources), if military advantage is to be retained. Information must be hidden from prying eyes, and possible leaks identified and patched, without hindering military effectiveness. States are more likely to conceal when they are confident their own analytic apparatus has not been penetrated. They are also more likely to conceal when clandestine capabilities can be tightly compartmentalized without sacrificing operational utility, or other means can be devised to reduce the friction between secrecy and military advantage.

### Table 4: Intelligence Resources Predictions

<table>
<thead>
<tr>
<th>More Likely to Signal</th>
<th>More Likely to Conceal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing knowledge about target’s information channels.</td>
<td>Increasing confidence in state’s own information security.</td>
</tr>
<tr>
<td>Increasing knowledge about target’s theories, heuristics, and analytic biases.*</td>
<td>Increasing confidence that friction between information security and operations can be minimized.*</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Intelligence Resources Predictions</strong></td>
<td></td>
</tr>
<tr>
<td>Increasing intelligence on target’s analytic apparatus makes partial revelation more likely.*</td>
<td></td>
</tr>
</tbody>
</table>

### FAILURE MODES

Thus far we have assumed that the political-military outcome for any given clandestine capability is largely a function of state strategy. But strategies may be poorly implemented, and states may end up in a different cell in table one than they intend. We argue the failure of state strategies for clandestine capabilities is largely a function of intelligence deficiencies. We identify four characteristic failure modes of interest.

*Mismatch failures* occur when a state has a poor understanding of the theories and heuristics its target uses to evaluate the military balance. This can result in a state trying to signal capabilities that its target does not care about; or in mistaking the political value of its military capabilities, aiming for political objects that are too important.

*Signaling misjudgment* occurs when a state reveals information about its clandestine capabilities that gives away too much, allowing its adversary to take effective countermeasures. Such misjudgments can occur when intelligence poorly analyses the responsiveness of the adversary, anticipates a capability being more replaceable than it turns out being, or has its political gains from signaling reversed following a crisis after the adversary fixes its problems.

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51 See discussion in Harold Deutsch, “The Historical Impact of Revealing the Ultra Secret,” *Parameters* v. 7, no. 3 (1977). Deutsch also highlights German failure to adequately protect their SIGINT successes.

52 Any failure mode is more likely when a state has an inferior intelligence organization to that of its target. But given the difficulty in specifying indicators for the skill of competing intelligence organizations ex ante, this remains a trivial prediction for the moment.
Signaling misapplication occurs when a state devises a signal that is not received or understood by its target. It is caused by a failure to understand the target’s information channels, or a poor assessment of the information the target’s analytic apparatus will find salient.

Penetration failures occur when a state’s clandestine capabilities are discovered by a target state from whom it is trying to conceal them. Though sometimes caused by inadvertent leaks, this type of failure is usually the product of a rival intelligence organization that proves superior in the intelligence-counterintelligence competition.

<table>
<thead>
<tr>
<th>Failure Mode</th>
<th>Intended Cell→Outcome Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mismatch</td>
<td>Youth, Middle Age→Death</td>
</tr>
<tr>
<td>Signal Misjudgment</td>
<td>Youth, Middle Age→Death</td>
</tr>
<tr>
<td>Signal Misapplication</td>
<td>Youth, Middle Age→Birth</td>
</tr>
<tr>
<td>Penetration*</td>
<td>Birth→Death</td>
</tr>
</tbody>
</table>

Clandestine Capabilities and Cold War Strategic ASW: Overview

In this section we use the case of strategic ASW during the Cold War to demonstrate the utility of our conceptual framework for clandestine capabilities and probe the plausibility of several hypotheses suggested above. This was an area in which the United States had, intermittently, serious and substantial advantages over its superpower rival that depended in part upon military secrecy.

The case is particularly useful for four reasons. First, it taps directly into the nuclear balance, widely recognized as the most significant element of military power during the Cold War. Second, because of the importance of survivable forces for nuclear deterrence, the vulnerability of ballistic missile submarines to attack was an especially salient military mission in determining the military balance. Third, as we will show below, the technology and tactics of strategic ASW contained several clandestine elements that made the expected results of such operations opaque. Indeed, much of the analytical community and the informed public during the Cold War simply had no clear picture of military possibilities in this area. Fourth, superpower strategic ASW constituted a long-term competition played out over decades. According to our proposition above, we are thus more likely to find decision-making in this area that contemplated options beyond simple concealment of clandestine capabilities.

This section lays out some of the basic operational and technical foundations necessary to understand ASW operations against nuclear submarines. The subsequent two sections divide the case into historical periods according to the state of undersea balance. Each section has four parts. We first sketch a picture of the undersea balance of power by laying out the technical, tactical, and operational innovations in each period in each side’s force structure and doctrine. Then we identify the clandestine capabilities that made the military balance uncertain. Next, we look for evidence relevant to our hypotheses regarding military, political, and intelligence incentives to signal or conceal clandestine capabilities. Finally, we make an estimate of clandestine ASW’s actual military and political impact: were American signals and secrecy effective, and why?

ASW BASICS: OPERATIONS AND ACOUSTICS
For analytic purposes, ASW operations can be divided into four phases, though they will sometimes blend together in practice. First, ASW platforms must use their sensors to search and detect submarine signatures in some area of ocean where submarines are believed to be located. Second, they must hold these signatures long enough to classify the targets as either false alarms or real submarines, and if the later, hopefully identify them by type, class, or even individual boat. Third, targets must be localized, or precisely located, often by handing off detection and classification data to different sensor platforms. Finally, ASW forces must obtain a shooting solution to attack the enemy submarine, which requires bringing appropriate weapons systems within range of the target.53

Two basic difficulties emerge. First, random search of wide ocean areas is extraordinarily inefficient, meaning detection is unlikely to occur unless sensors are “cued” in some way. Second, even if detected, the submarine may attempt to evade, attack, or call on friendly forces in order to break contact if it understands it is being prosecuted. Successful ASW therefore depends on finding methods to cue searching platforms and on avoiding counter-detection.

Cold war strategic ASW solved these challenges with passive acoustics: using sensors that collected the noises emitted by nuclear submarines; analyzing these signatures to detect, classify, and track targets; then, if necessary, handing contacts off to platforms that could reacquire, localize, and maintain contact with the targets, working up a firing solution for attack. Because the signatures that made the search problem manageable were collected passively, it became more difficult for submarines to recognize they were under surveillance. The ultimate success of passive acoustic strategic ASW, though, depends on three factors: the sound signature of the target, the sonar capabilities of the sensor, and the acoustic conditions of the ocean environment.

Sound occurs across a spectrum of frequencies, much like radio or radar. Submarines emit two kinds of sound signatures. Broadband signatures are sounds that occur across a spectrum of frequencies around which particular frequencies rise and fall in a random fashion around a mean. These signatures stem from the flow of water over the submarine’s hull or by propeller cavitation, and will increase with the speed of the submarine.54 Narrowband signatures are sounds that occur continuously at one or more specific frequencies, or “tonals.” They are caused by rotating machinery within a submarine or by the blade rate of its propellers; many of these tonals are speed independent.55 The interpretation of these signatures depends upon the capabilities of the sonar platform doing the listening to separate submarine signal from background noise. The most powerful means of doing so is narrowband signal processing (Low Frequency Analysis and Recording or LOFAR), aimed at isolating submarine tonals.56

Finally, the degree to which signals can be detected in ambient ocean noise and exploited for ASW depends on the temperature and pressure conditions of the seawater in which the

53 A good description of this process can be found in Donald C. Daniel, Anti-Submarine Warfare and Superpower Strategic Stability (Urbana, IL: University of Illinois Press, 1986), 19.
54 Cavitation occurs when submarine propellers drop local pressure below ambient water pressure sufficient to vaporize water, creating pockets or “bubbles” then expand, pop, and emit sharp sound pulses. Cavitation increases markedly in shallow water and with speed. See Tom Stefanick, Strategic Antisubmarine Warfare and Naval Strategy (Lexington, MA: Lexington Books, 1987), 268–70.
signature is produced. A very simple model of the ocean highlights the existence of a thermal layer, which traps sound generated above and below it. These sounds can be detected by a sensor within that layer at a range of 10-15 miles, called the *direct path*. However, sound emitted at a steep enough angle can penetrate the layer to the *deep sound channel*, where they carry relatively unimpeded for thousands of miles.\(^\text{57}\)

In sum, with the right sensor, ocean, and target conditions, passive acoustics held out the technical possibility for meeting the major challenges of ASW operations. As we show below, the United States Navy would develop strategic ASW into a powerful tool for influencing the nuclear balance during the Cold War. But the existence and extent of these capabilities was not always clear, to either outside analysts or to the adversary.

*Cold War Strategic ASW in the 1960s and 1970s*

During the first half of the Cold War, the United States developed a marked and asymmetric advantage over the Soviet Union in the undersea balance, including the capability to find and destroy Moscow’s sea-based nuclear force. However, this dominance eroded after the Soviet Navy changed its operating pattern for SSBNs. The extent of American ASW advantages was not initially well understood outside of select U.S. military and intelligence circles. American leaders chose to conceal their clandestine ASW capabilities for military effect, rather than attempt to exploit them politically.

Evidence suggests they did so in part for the reasons suggested above: they believed Moscow possessed the capability to implement countermeasures with a proper exertion of effort, and did not see a means of reacquiring the passive acoustic advantage once it lapsed. It seems likely, as well, that the Russian SSBN retreat to protected “bastions” was linked to an intelligence coup that revealed American clandestine capabilities. As a result, the ASW case was born in quadrant IV of table one and produced a considerable military advantage. In the mid-1970s, it shifted and died in quadrant III, after intelligence penetration revealed the basis of American passive acoustic capabilities and facilitated a Soviet response.

**THE UNDERSEA MILITARY BALANCE**

The American strategic ASW advantage stemmed from technical innovations in passive acoustics across three platforms; the shortcomings of the Soviet SSBN force and doctrine; and the integration of American passive acoustics into a successful operational concept.

The most important element of the U.S. Navy’s capability for strategic ASW was the Sound Surveillance System (SOSUS), a series of hydrophones attached to undersea cables that were laid across the axis of the deep sound channel.\(^\text{58}\) SOSUS used LOFAR signal processing to detect, classify, and track narrowband tonals from thousands of miles away, often across entire ocean basins.\(^\text{59}\) Simultaneously, the U.S. Navy developed a force of multipurpose nuclear attack

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submarines (SSNs) that were optimized for passive acoustic ASW.\textsuperscript{60} VP aircraft also participated in the passive acoustic ASW mission through the use of sonobuoys.\textsuperscript{61} Sonobuoys were airdropped buoy sensors for passive and sometimes active detection. P-3 aircraft for this mission entered service in force by the mid-1960s, and were based at forward locations adjacent to SOSUS installations.\textsuperscript{62}

In contrast, the capabilities of the Soviet submarine force the U.S. Navy was hunting were comparatively rudimentary. The Soviet Union was only able to achieve regular combat patrols with SLBMs after the introduction of the Project 667A Navaga (Yankee), of which thirty were built between 1968 and 1973, with regular patrols beginning in 1969. The Yankee carried sixteen R-27 (SS-N-6) SLBMs with a range of 1500 miles, requiring a long approach towards North America in order to achieve a firing position. However, Yankees were extremely loud relative to their American counterparts: double hulls and twin screws gave them large broadband signatures, while a lack of rafting and poor machining gave them easily discernable narrowband tonals from machinery and propeller blade rate. Finally, the entire submarine force suffered from low readiness, lack of training, and maintenance problems. Patrol rates were limited, with no more than 10-15\% of the force at sea most of the time.\textsuperscript{63}

The upshot of these force differences is that the undersea balance during the first part of the Cold War was deeply asymmetric, decisively favoring the United States. The U.S. Navy developed a “barrier” concept of operations, which integrated each element of the passive acoustic force structure to exploit strengths and cover weaknesses. In order to patrol within range of their targets, Soviet missile submarines had to endure prolonged exposure to SOSUS arrays placed increasingly far forward. SOSUS could detect, classify, and track incoming targets at long range, and then use this data to cue operational forces into “SOSUS probability areas.” These areas were many tens of square miles in area, but small enough to make the search problem manageable, particularly for the powerful bow sonars on SSNs and sonobuoys dropped by VP aircraft.\textsuperscript{64}

But U.S. dominance would not last forever. In 1973, the Soviet Union introduced the Project 667B Muerena (Delta) SSBN, armed with the R-29 (SS-N-8) SLBM. The SS-N-8 had a range of over 5000 miles, meaning that the Delta force could hit the entire United States from the adjacent and adjoining seas to the Soviet Union, or even from its docks. This allowed the Russian Navy to draw the Deltas back into “bastions” located in the Barents Sea, the Sea of


\textsuperscript{62} Ibid., 332–35.


\textsuperscript{64} Cote, The Third Battle, 25–26.
Okhotsk, and potentially elsewhere in Arctic waters. Such a deployment had several advantages. First, it allowed Moscow to protect its SSBNs with surface and air ASW forces in a geography where they possessed defensive advantages.\(^{65}\) Second, it was a much more difficult operating environment for American VP aircraft, which would be limited in their bases and subject to radar based interdiction by local Russian forces. Third, and most important, the shallow waters in some of the bastions had no deep sound channel, precluding the use of SOSUS.\(^ {66}\) By the mid-1970s the move to the bastions was complete, and the undersea balance had changed.

CLANDESTINE ELEMENTS OF THE UNDERSEA BALANCE

The American mastery of passive acoustic technology contained several clandestine elements that initially obscured the full extent of its dominance at strategic ASW. American SSNs acoustic advantage over their Soviet counterparts made them “uniquely able to collect and maintain this database of opposing signatures,” by covertly trailing new boats out of port.\(^ {67}\) The Soviets had no comparable capability, and no comparable experience working with narrowband signal processing, which made the degree to which tonals could be operationally exploited difficult to appreciate.

It is therefore doubtful that the Soviet Navy understood how vulnerable their SSBNs were to American clandestine capabilities for strategic ASW in the 1960s. Robert Herrick’s in-depth study shows that only modest attention was devoted to the problem of protecting Soviet boomers from strategic ASW before the 1970s; much of the writing that does exist on the topic seems like a transparent attempt to claim greater resources for the Soviet Navy’s surface fleet.\(^ {68}\) Similarly, the supreme importance of narrowband quieting against passive sonars, and the machinery rafting needed to achieve it, appears to have been overlooked in Russian technical circles. As one Soviet sub-designer noted of the Yankee, “in the scientific and technical field we were not prepared to achieve low levels of noise. In the scientific field we poorly appreciated the nature of underwater noise, thinking that a low-noise turbine reduction gear was made all would be in order.”\(^ {69}\)

HYPOTHESES ON MILITARY, POLITICAL, AND INTELLIGENCE SIGNALING INCENTIVES

The United States chose to conceal its advantages in strategic ASW. Not even American allies were read into such programs, at least outside of the very highest levels.\(^ {70}\) Available evidence suggests that the decision to conceal was consistent with the military logic we sketch above: the attenuation of military advantage after revelation may have appeared rapid and certain to American decision-makers, making the political-military trade-off sharp and fraught.

First, American clandestine capabilities for strategic ASW were unique and could not be easily replaced if countermeasures were taken. As Cote points out, SOSUS was “originally conceived as an intelligence asset.” Not only did approaching submarines inherently mean that

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\(^{65}\) These forces, at least in the 1970s, would be limited to “traditional” ASW methods from the Second World War based on active sonar. Surface ships were at this point too noisy to adopt passive techniques.

\(^{66}\) Cote, The Third Battle, 63–67.

\(^{67}\) Ibid., 49.


\(^{69}\) Polmar and Moore, Kenneth J., Cold War Submarines, 169.

Soviet nuclear capability was getting close to American shores, but in large numbers “such a submarine deployment was also considered a reliable source of warning of a larger, general attack.”

Negotiators likewise thought that the warning provided by SOSUS was a “vital element in our arms control equation with the U.S.S.R.” Since it provided the confidence to pursue other limitations, decision-makers worried about seabed disarmament proposals that might “entail an interpretation making the US Sound Surveillance System (SOSUS) illegal, with consequent severe impact on our antisubmarine warfare capability.” When it was thought that a particular “Soviet ‘demilitarization’ proposal would knock out SOSUS,” it was firmly rejected. The capability was simply too important to tamper with, and thus too important to risk in signaling.

Second, the responsiveness of the Soviet submarine force to American passive acoustic advantages might increase markedly with revelation. American military officials judged that their technological lead stemmed from their ability to appreciate both the pro-SSBN and anti-SSBN problems simultaneously. As Secretary of the Navy Paul Nitze testified to Congress in 1965, “We have had the advantage of training against our own submarine forces, which as you know, have been in the forefront of both development and operational know-how since World War II. Thus, our own peacetime opposition has been perhaps more effective than a real enemy would be.”

Likewise, the Navy’s head of research and development argued to Congress in 1965 that one cause of quiet American submarines was “that we had made such good progress in anti-submarine warfare. I think that without the ability to make good measurements on our own submarines and without having the stimulation to do it by knowing that that was an Achilles heel to the submarine, we would not have made that progress. That is, the quieting of your own submarines comes in many ways from a consciousness of the anti-submarine problem.” By implication, revelation that increased the adversary’s consciousness of the problem was to be avoided at all costs. After all, “There are no secrets or no real magic in the technology we have used” but rather “just a general overall attention to sound reduction, in every possible way.”

As Cote aptly summarizes, American leaders judged that the acoustic advantage was “evanescent, in that it was based mostly on dogged attention to engineering detail rather than any fundamental breakthrough.” Risking the sources of the American advantage—its appreciation for both halves of the ASW problem—by revealing its clandestine capabilities was just not worth the risk.

Intelligence resources also played a critical role in decisions about clandestine ASW signaling, just as we predict. The desire to keep American capabilities secret created internal information problems that resulted in operational friction, which the government then worked to resolve. Cote summarizes the dilemma of clandestine capabilities well: “The barrier strategy was premised on the availability of SOSUS cueing for SSNs and VP, and these techniques needed to

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71 Cote, The Third Battle, 47.
75 Cote, The Third Battle, 44.
76 Ibid., 45.
77 Ibid.
be practiced in peacetime, but unrestricted use of SOSUS in peacetime would in all likelihood reveal its capabilities to the Soviets.”

As the Nixon administration tried to decentralize tactical intelligence away from Washington and towards operators, one defense official asked about ASW: “What about the Sosus system—is that tactical intelligence or not? That should be left to the Services.” A State department representative quickly shot back: “That’s a warning system.” The solution, at least in the beginning, was to use SOSUS data “in such a way so as to mask the exact location of its arrays and their capabilities. For example, tactical forces used only passive techniques when they prosecuted SOSUS contacts of Soviet submarines, and many training exercises were conducted against either friendly or neutral targets.”

The intelligence behind ASW was thus heavily compartmentalized. In the Team B competitive intelligence experiment of the 1970s, ASW was removed as a topic on the insistence of Admiral Bobby Ray Inman, the director of naval intelligence, for fear of compromising the capability. A senior intelligence official, who was involved in supplying team-B with data, confirmed to us that Inman was worried, reporting that specific requests had been made for SSBN and SSN patrol areas. Similarly, Robert Jervis notes that when he became a consultant to CIA in 1977 security concerns prevented him from reviewing all major reports produced for the director, who had been his colleague at Harvard. He believes this was due to two particularly sensitive sources this would have required him to have accessed, one of which was intelligence supporting ASW operations.

All the classification in the world, though, was unable to stop Chief Warrant Officer John Walker from walking into the Soviet embassy in late 1967 and compromising American clandestine capabilities. Walker spied himself, and later led a spy-ring, that lasted for nearly two decades and compromised a mother load of secret military information to Soviet intelligence. Though the full extent of Walker’s spying is classified, it is known that at a minimum he provided Moscow with repair manuals to the KW-7 encryption machine and with many of the changing key codes used to decrypt its messages in the Navy’s Fleet Broadcasting system. This would have allowed the Soviets to read, among others, messages from SOSUS naval facilities and US SSNs at sea. As we argue below, this makes it highly likely that Soviet intelligence would have been able to glean information about American capabilities for strategic ASW that would have been previously unavailable to them by the late 1960s or early 1970s.

MILITARY ADVANTAGE AND POLITICAL IMPACT

Estimating the political value of American clandestine capabilities for strategic ASW is challenging, since the U.S. chose to conceal them and there was no war. Nevertheless, circumstantial evidence from the structure of Soviet naval programs and doctrines indicates that the undersea balance was unfavorable from their perspective and held considerable potential political value, even if that value was not deliberately exploited. The Soviet Union twice changed the structure of its submarine and SLBM building programs, more or less on the fly, while also

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78 Ibid., 47.
80 Cote, The Third Battle, 47.
81 Auten, Carter’s Conversion, p. 119.
82 Interview with former senior intelligence official, August 24, 2016.
83 Jervis, Why Intelligence Fails, p. 7. Authors have also had extensive discussions with Jervis on this question.
apparently restructuring their naval doctrine. The first change was a move to fast track the Yankee program and its potential to bring a secure second strike from the sea. The second change was the creation of the Delta program and the move to the bastions.

The first major change in Soviet naval programs occurred in early 1962. Previously, Soviet Premier Nikita Khrushchev had believed that Moscow’s strategic requirements could be satisfied with a small ICBM force of between 200-300 missiles, leading him to cancel investments in the Soviet bomber and SSBN forces. But by 1962 a number of factors made this position untenable: Soviet first generation ICBMs were expensive, few, and vulnerable; the Kennedy administration was engaged in a massive missile build up on land and at sea; and Washington had taken a tough line against Khrushchev’s saber-rattling in Berlin and other Cold War hotspots. In the first half of 1962, Khrushchev took a series of decisions that completely reoriented Soviet ICBM and SLBM programs, seeking to match the American build-up. A key part of this effort was the procurement of some counterpart to the American Polaris program.

Yet just a short while later, Soviet naval programs would undergo another rapid reorientation, with the introduction of long-range SLBMs and the move of SSBNs carrying them into the bastions. The SS-N-8 had a testing period twice as long as its three liquid fueled predecessors, the SS-N-4, -5, and -6s. The missile was initially tested at a 3000 nautical mile range in 1969 and then withdrawn from testing, before reappearing at increasingly longer ranges over the next several years.

The size of the SS-N-8 was enormous, which required a variety of changes in the Yankee hull to produce the Delta. These were so hurried and, from a U.S. perspective, inefficient that Western analysts were confused. When the Pentagon’s director of research and engineering, John Foster, was asked whether the Yankee hull could be modified to carry the SS-N-8, he replied, “It could probably be done, but our guys wouldn’t do it.” But Moscow did, and several years later, very highly placed U.S. intelligence sources would confirm that the Soviets had developed an entirely new doctrine that organized their entire fleet around the protection of their SSBNs in the bastions. By the mid 1970s, the Soviet naval literature was talking openly about the value of fixed hydrophone platforms like SOSUS, and warning ominously about the ability of American SSNs to trail and destroy Russian SSBNs if they were not properly protected.

Beyond their character, the timing of these changes is curious. The first American long-trail of a Yankee occurred in September 1969; about eighteen months after the Soviets gained the ability to read some American naval communications. Coincidentally or not, this is also when

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85 This number comes from Khrushchev’s son and from data about the originally scheduled production run for Soviet ICBMs. See Zaloga, The Kremlin’s Nuclear Sword, 2002, 266–67, n. 3.
86 Ibid., 76–81.
87 See chart, Pavel L. Podvig, ed., Russian Strategic Nuclear Forces (Cambridge, MA: MIT Press, 2004), 241. The addition of penetration aids may have also complicated development.
91 The story of this trail can be found in Sherry Sontag and Christopher Drew, Blind Man’s Bluff: The Untold Story of American Submarine Espionage (New York: Harper-Collins, 1998), 180–96. Note the frequent communications
the initial version of the SS-N-8 was withdrawn and the missile entered a period of delayed, incremental, and experimental testing. In the intervening period, the Soviets would probably have had the opportunity to observe a number of other submarine trails, as well as decode messages concerning SOSUS contacts that revealed the scale of its capabilities, its integration and synergy with VP and SSN forces, and possibly its location. This was corroborated by one senior intelligence official from the period, who argued that Walker did such damage precisely because he was doing decrypts of SSN trailing operations.

Perhaps prompted by this knowledge to its own investigations, or directly from other information provided by Walker, the Soviet Navy first began to show real appreciation for the importance of narrowband quieting of machinery about this time. The Project 671RT (Victor II) attack submarine was the first Soviet boat to introduce rafting techniques, and although this first effort was not wholly successful, the subsequent Project 671RTM (Victor III) shocked the American submarine community with the degree to which it had eliminated tonals. The keel for the first Victor II was laid in April 1971, which means that her design would have begun one to two years earlier, in exactly the same time frame.

Finally, as the quieter Victor IIs and IIs became available; Soviet Yankee operations began to change. The boomers were increasingly sent out with SSN escorts, in an effort to “delouse” any potential trailing American SSNs. According to one insider, the Soviets had been pulling “some of its best torpedo-armed nuclear-powered submarines out of the Mediterranean and deployed them to the western Atlantic, perhaps in an effort to provide protection for patrolling missile subs which until now have operated alone.”

These changes give us at least some warrant for estimating that the military advantages provided by American strategic ASW—essentially undermining a key prop in the Soviet Union’s secure second strike force—were substantial. It is uncertain whether or how this advantage might have been exploited for political purposes if Washington had chosen to do. However the potential, at least, was there.

Cold War Strategic ASW in the Era of the Maritime Strategy

THE UNDERSEA MILITARY BALANCE

In the late 1970s, the United States developed a new operational concept for holding Soviet SSBNs in the bastions at risk. These anti-SSBN operations were at the heart of a broader effort between the trailing sub and official Washington, and the strange behavior of the Soviet Yankee late in its patrol period.

American naval officers apparently obtained a Soviet chart of suspected SOSUS sites and “were surprised by the accuracy.” See Mark Sakitt, “Submarine Warfare in the Arctic: Option or Illusion?” (Stanford, CA: Center for International Security and Arms Control, May 1988), 31.

Interview with former senior intelligence official, August 24, 2016.

On the Victor II and Victor III, respectively, see Polmar and Moore, Kenneth J., Cold War Submarines, 159; Cote, The Third Battle, 66.

On construction start for the lead Victor II, see http://fas.org/man/dod-101/sys/ship/row/rus/671.htm; on typical lead times between submarine design and construction see Podvig, Russian Strategic Nuclear Forces, 269–70.

Sontag and Drew, Blind Man’s Bluff, 299.

Cote, The Third Battle, 65.

A senior intelligence official, among the most cautious and circumspect of those we have talked to about the undersea balance, told us that before the Soviets moved to the bastions “we could have taken out the entire deployed fleet on a signal.” Interview with former senior intelligence official, August 24, 2016.
known as the “Maritime Strategy” during the Reagan administration, though they predated that concept, which also had bureaucratic and political elements unassociated with the strategic ASW mission. Essentially, these operations would renew earlier attempts at continuous peacetime trailing of Soviet SSBNs, and combined them with a new attempt at wartime attrition of the Soviet boomer force in its home waters. The wartime task could be accomplished either by setting up an ASW barrier directly outside SSBN homeports and picking the subs off as they went out to sea, or if they deployed before such a barrier could be established, searching for them in their deployment areas and attacking them over the course of a conventional war. Both tasks would depend most heavily on the American SSN force, though the latter problem might be assisted by land or carrier-based air ASW, if considerable local Soviet air-defenses could be overcome.

Several technical innovations in ASW held the potential to assist an American campaign in the bastions. Los Angeles and Sturgeon class submarines equipped with powerful bow sonars, towed arrays of SOSUS like hydrophones for long-range detection, and on board LOFAR processing came into the force. The airborne ASW community profited from new DIFAR sonobuoys, while the ASW helicopter with an active, dipping sonar was also introduced to the fleet. If their ships could operate, this provided another asset that could be cued to quickly prosecute and attack contacts. Finally, looking to the future of the competition, the last American attack submarine approved during the Cold War was explicitly designed for a campaign in the bastions. The Seawolf class had speed that enabled high tactical search rates, a quiet torpedo, an eight tube multi-shot capability, and a huge magazine: all designed for a target rich bastion campaign where the limiting factor for operational efficiency would have been weapons load-out rather than crew fatigue.

However, the Soviet Navy also possessed formidable advantages in a bastion campaign. To begin with, by 1980 the Delta program was complete at thirty-five long-range SLBM platforms, in addition to forty odd shorter-range nuclear SLBM launchers of earlier generations that would still have to be accounted for in a war (if not necessarily in the bastions). Two new SSBNs, the Project 667 BDRM Delfin (Delta IV) and the Project 941 (Typhoon), began to enter the force at a slow rate in the mid-1980s, with a half dozen of each procured by the end of the

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100 Cote, The Third Battle, 64–65, 73–74.
102 On the third generation American nuclear attack submarines, see Polmar and Moore, Kenneth J., Cold War Submarines, 267–78. On signal processing, see Cote, The Third Battle, 49.
103 On sonobuoys, see Holler, “The Evolution of the Sonobuoy from World War II to the Cold War,” 336–40. On the evolution of traditional ASW, whose primary role was defense of aircraft carriers, see Cote, The Third Battle, 52–56.
104 On the Seawolf, see Polmar and Moore, Kenneth J., Cold War Submarines, 307–3011.
Cold War. The Delta IV was the first Soviet boomer to substantially quiet its narrowband tonals, while the Typhoon was designed to operate under the Arctic ice. A fleet of SSNs that was some seventy boats strong could potentially escort the boomers, although only about twenty Victor IIIIs were quiet. Looking to the future, the new Project 971 SSN (Akula) had achieved quieting levels impressive enough to defeat SOSUS, at least initially, though only five were procured before the competition’s end. Surface ASW forces could also contribute to counter-ASW against American forces in the bastions, and in an era of surface ships with towed arrays and ASW helicopters, the effectiveness of these platforms could no longer be dismissed out of hand. Furthermore, the Soviets might be able to prepare the maritime terrain in advance by laying mines and placing SSBN decoys.

The powerful U.S. surface fleet, though, would find operations close to the Soviet Union difficult. The biggest problem was Soviet land-based Naval Aviation (SNA). Aided by space-based surveillance capabilities, SNA bombers threatened to launch radar-guided anti-ship missiles from beyond range of aircraft carrier defenses and in numbers likely to overwhelm them. Such a capability made it very dangerous to operate carriers within range of SNA bases for very long. And airborne ASW would also have to contend with air defenses in the bastions, either from Soviet surface warfare groups or land-based tactical fighter squadrons. The contribution of any American platforms other than SSNs towards strategic ASW in the bastions was uncertain at best.

Estimating the character of the undersea ASW balance during the era of the Maritime strategy is therefore very difficult. Contemporary analysts were almost uniformly pessimistic about an ASW war of attrition in the bastions. But many under-recognized factors favored the Americans. The Soviet SSBN force was mostly loud and even the quietest of its escorts faced an acoustic disadvantage vis-à-vis Los Angeles boats. The search problem was drastically limited by shallow water, ice, or excellent sonar conditions unfavorable to deployment. For these reasons, the Delta force in fact only deployed to bastions in the Barents Sea and Sea of Okhotsk, each of which had disadvantages.

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107 On Akula’s quieting, and the steps the U.S. Navy took to combat it, see Cote, *The Third Battle*, 69–70, 76–78.
111 Classic criticisms include Ola Tunander, *Cold Water Politics: The Maritime Strategy and Geopolitics of the Northern Front* (London: SAGE Publications Ltd, 1989), 61–65; Daniel, *Anti-Submarine Warfare and Superpower Strategic Stability*, 147–56; Sakitt, “Submarine Warfare in the Arctic.” By far the most searching and sophisticated analysis is found in Stefanick, *Strategic Antisubmarine Warfare and Naval Strategy*. However, Stefanick is careful to condition his findings on precisely the factors discussed below.
113 Ibid., 42–43. See also Polmar and Moore, Kenneth J., *Cold War Submarines*, 176.
114 Podvig, *Russian Strategic Nuclear Forces*, 302. The Barents had superb “bottom bounce” sonar conditions for hunting SSNs. Cote, *The Third Battle*, 73. Only the northernmost quarter of the Sea of Okhotsk was shallow water with favorable sonar conditions for the defender, far away from the SSBN base, and the Soviet Far East had little support from SNA forces. On sonar conditions see Stefanick, *Strategic Antisubmarine Warfare and Naval Strategy*, 42–43. On geography and supporting forces, see See David E. Hoffman, *The Dead Hand: The Untold Story of the
Most importantly, though, was whether it was correct to anticipate the worst case version of the anti-bastion operation as just stated: an SSN only assault against pre-deployed and well protected SSBNs with little possibility for outside help. If American SSNs could surge into the bastions before most Russian SSBNs escaped, the problem would resemble the barrier strategy of the earlier period much more closely, rather than a search problem. And to the degree that the SNA threat to American carriers could be reduced—either by surprise attack on SNA bombers or by finding a way to defend against them—airborne ASW forces might be able to play a role in any search problem that appeared.

CLANDESTINE ELEMENTS OF THE UNDERSEA BALANCE
Adding to the difficulty of evaluating a strategic ASW campaign in the bastions was the degree to which American capabilities for such an undertaking were clandestine. It is not evident whether the Soviets recognized that the pessimistic analysis highlighted above might not hold. For instance, their subs were still overmatched in terms of sonar-performance, even in the shallow waters they had retreated to defend.\(^{115}\) It is also not clear whether Walker’s revelations had made the Soviet Navy cognizant of the American ability to acoustically “fingerprint” Soviet submarines, which had the possibility of greatly complicating attempts to decoy American SSNs with faulty bastion targets.\(^{116}\)

American capabilities were also considerably enhanced by secret intelligence of which the Soviets were unaware. These intelligence coups were largely SIGINT, but also included “some very significant HUMINT penetration of senior echelons of the Soviet leadership.” They persuaded the Navy by 1981 that Russian naval doctrine had indeed reoriented towards SSBN protection, and thus birthed the maritime strategy. This intelligence also provided data on Soviet command and control, plans for the use of reserve forces, and access to after action reports on naval exercises, all of which could be used to tailor American campaign plans.\(^{117}\)

Strategic ASW received further essential support from SIGINT interceptions of Soviet naval communications. Some of these occurred through reported cable tapping operations in the Sea of Okhotsk and Barents Sea, while others may have occurred through satellite interception.\(^{118}\) Combined with cryptography, this intelligence allowed Navy Operational Intelligence to replace its daily report on open ocean Soviet submarine deployments with “in area/local area submarine operations and…Soviet submarine readiness.”\(^{119}\)

HYPOTHESES ON MILITARY, POLITICAL, AND INTELLIGENCE SIGNALING INCENTIVES
In the era of the Maritime Strategy, the United States chose to signal its clandestine capabilities rather than conceal them. These capabilities were generally signaled through a series of military exercises designed to demonstrate the American potential for accomplishing the key tasks of an anti-SSBN campaign in the bastions, without giving away critical secrets—the youthful quadrant

\(^{115}\) This statement fails to hold for the Victor III-Sturgeon dyad, where there was no American sonar advantage. This would have been a relatively small proportion of all potential engagements in a bastion campaign, however. See Stefanick, Strategic Antisubmarine Warfare and Naval Strategy, chart, 49.


\(^{117}\) Ibid., 80, 79.

\(^{118}\) On cable tapping operations, see Sontag and Drew, Blind Man’s Bluff, chaps. 10–11.

I of our diagram above. Some specific capabilities were deliberately revealed, even at the risk of Soviet responses—the middle-aged quadrant II. But other capabilities remained concealed, never leaving their birthplace in quadrant IV.

Cote notes that “on at least three occasions during the 1980s, the entire American attack submarine force was flushed out of port and sent to sea in a matter of days” and “one message that was probably received by the Soviets concerned the possibility that their SSBNs would lose a race to the Barents with American SSNs.”

CNO James Watkins testified before Congress about a worldwide SSN surge in 1984. As he would later put it to the same committee, “The Soviets expect us on warning to surge SSNs. They know we are going to the bastions. They know we can get inside their knickers before they can find us, and they don’t like it.”

Exercises demonstrating other aspects of the bastion campaign were also conducted. From at least 1983 forward, the Navy carried out ASW exercises under the Arctic ice, including the overt trailing and mock sinking of Soviet boomers. Similar moves were made in the Pacific, most notably in 1983 when a three carrier task-force ran 24-hour a day operations off of the Soviet SSBN base on the Kamchatka peninsula, probing Soviet air defenses, conducting ASW, sending groups off from the main fleet to evade Soviet surveillance, and even violating Soviet airspace.

All of these exercises revealed American capabilities for conducting key elements of an anti-SSBN campaign in the bastions, but without immediately suggesting countermeasures or obviously giving away military secrets. However, the Navy would move to a more overt signaling posture in the mid-1980s. The most significant element of this posture was a decision to have CNO Watkins testify to Congress in open session about the sources of the American acoustic advantage over the Victor III. Despite its quieting, Watkins reported, “what we also learned was that where we had the towed array that covers the low-frequency band it was effective every time.” The lesson was that towed arrays were being accelerated into the fleet “so that we can go after propeller blade rates and the other things we have to get on a quiet submarine.”

By revealing both the continuing success of American SSNs against the quietest Soviet submarines and the specific tonals that were being exploited, Watkins sent a powerful signal about American capabilities—and also opened the door to Soviet countermeasures.

This was part of a more general strategy of talking about American anti-SSBN operations in public. In the first part of the 1980s, most public statements about the Maritime Strategy were oblique. As John Mearsheimer notes in his famous criticism of the strategy, the early versions of the Maritime Strategy presented in public emphasized horizontal escalation and offensive sea control, without mentioning the ASW aspects. However, by 1985, the Secretary of the Navy John Lehman was giving off the record interviews where he stated that Soviet SSBNs would be attacked “in the first five minutes of a war.” In 1986, the Maritime Strategy was rolled out

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120 Cote, The Third Battle, 76.
121 Stefanick, Strategic Antisubmarine Warfare and Naval Strategy, 93.
123 David E. Hoffman, The Dead Hand, 64–65.
124 Cote, The Third Battle, 69.
126 Stefanick, Strategic Antisubmarine Warfare and Naval Strategy, 96.
publicly to much fanfare in a series of articles by top naval leadership in the journal *Proceedings*, with the anti-SSBN campaign as its centerpiece.\(^{127}\)

Why did the United States decide to signal—increasingly overtly over time—its clandestine capabilities for strategic ASW during this period? Consistent with our hypotheses above, the technical features of the undersea balance now made revelation more attractive.

First, the unique role that SOSUS and ASW more generally played in strategic warning had dissipated. Large nuclear forces on each side had convinced the superpowers that any war would be conventional in its initial phase, which meant that Soviet hopes depended heavily on a quick and decisive campaign on the central front, giving Moscow little reason to compromise strategic warning with its naval forces. The bastion strategy meant there was no longer any technical reason to quickly move SSBNs forward prior to a war, and thus, that American long-range sensors detecting them were no longer unique national assets. In contrast, those aspects of American capabilities that were most unique—its intelligence penetrations—were never signaled in any substantial way.

Second, American decision-makers had come to revise their view about the effects of signaling ASW capabilities on their adversary’s responsiveness. Whereas earlier Washington feared that the Soviets might be able to undo its precarious acoustic advantage, by the 1980s the appearance of Akula made it clear that Moscow had already made the critical adjustments needed to approach acoustic parity. As Admiral Kinnard McKee testified to Congress in 1986, “Eventually, U.S. and Soviet submarine capabilities will converge. Then….It will be blind man’s bluff with other submarines….at some point, no one’s going to be able to find a submarine with anything.”\(^{128}\)

At the same time, turning the entire Soviet SSBN fleet into an Akula-like force would be a massive undertaking, especially if it involved re-engineering boats already in service. Even looking forward to future acquisitions, the earlier American judgment that acoustic improvement was essentially a matter of doggedly pursuing incremental engineering improvements was confirmed by the Sturgeon program, whose first boat had been noisier than expected, not because of a design flaw, but “due to a large number of minor imperfections in equipment” requiring “very tough—and costly—quality control at the subcontractor and shipyard levels.”\(^{129}\) Two additional decades of watching the Soviet Navy had raised real questions about whether it was organizationally, technically, and politically capable of a fleet-wide quieting program.

As Cote notes, “The Soviet Navy clearly had more trouble than did the U.S. Navy in winning similar battles with its own shipyards, which in the Soviet system were part of other independent and powerful central ministries.” A massive campaign of improvements would also have to compete with the Soviet land-based ICBM force, which even during the historic decisions to alter SSBN force in the 1960s had been politically favored. Cote’s summary is apposite: there was at least “some evidence that the cost of achieving and maintaining acoustic parity for the bulk of its submarine force might exceed what the Soviets were willing to pay, both financially and politically.”\(^{130}\)

In short, by the 1980s, most of the American advantages in strategic ASW—the continuing extent of its SSNs’ acoustic dominance, even in shallow waters against high-end

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\(^{129}\) Ibid., 72.

\(^{130}\) Ibid.
Soviet SSNs; their potential to beat Soviet boomers in a race to the bastions; and the possibility that airborne forces might be able to support an ASW campaign—were no longer irreplaceable intelligence assets whose security could not be risked. The clandestine SIGINT and HUMINT sources closest to such a description were never signaled directly, and were signaled only obliquely through military exercises. At the same time, the Soviets had demonstrated that they knew how to respond to American submarine quieting, but also that the process would be difficult, expensive, and time-consuming. Our hypotheses suggest that states will more commonly signal less unique capabilities that are more difficult to counter, which is what we observe in the case.

Finally, American leaders clearly perceived the potential to gain some of the more diffuse political advantages that signaling clandestine capabilities can bring in a long-term competition. For example, displaying American capabilities could channel Soviet resources in inefficient directions over the long-haul and shape Soviet force posture in a way beneficial to the United States. In defending the “diversionary theory” of the Maritime Strategy noted above, Admiral McKee testified to Congress that a forward-deployed attack submarine force “provides the fleet commander with offensive and defensive leverage….It gives him the ability to dictate where the opposition must commit forces to protect themselves….forces them to commit resources to ASW forces that they would rather put in other places, and reduces their tactical flexibility…. Finally, an attack submarine can alter the entire strategic posture and it has. The Soviet sea-based deployment posture is based on his concern for the opposition of U.S. submarines….We would like them to continue to have to deal with that. The bottom line is leverage.”

The U.S. decision to signal was also made in part because U.S. intelligence had skillfully understood the Soviet cognitive architecture. As Rosenberg argues, it was growing familiarity with the Soviet Navy’s priorities, fears, and mode of thinking that led to the creation of the Maritime Strategy and incentivized the U.S. signaling effort.

And at some level, the Soviet Union got the message. Classification prevents the discussion needed for firm conclusions, but it is at least interesting to note that those with classified access make similar statements about the Russian mindset. Cote bluntly points out that “there is considerable evidence that the Soviets themselves believed [an anti-SSBN strategy] would be effective….The contrast between [analytic] skepticism and Soviet behavior is striking because the latter clearly behaved as though the skeptics were wrong.” David Rosenberg argues that “The Soviets understood the implications of [public] statements [about the strategy] and exercises more quickly than many Americans, who only began to comment in detail on the implications of forward operations of carrier battle groups and strategic ASW in Soviet home waters after Admiral Watkins’ article was published.”

Though regarding the later public unveiling of the Maritime Strategy as political propaganda, Soviet military writing certainly took note of the early American signals. Russian analysts of the United States coded the Reagan administration’s military policy as a break from the past; a strategy focused on “direct confrontation,” in part through nuclear superiority that aimed at a “disabling” counterforce strike. The role of a strategic ASW campaign for such a strategy was quickly noticed. In 1982, Admiral Yashin argued that a new American naval policy

131 Ibid., 71.
133 Cote, The Third Battle, 72–73.
sought “to be in a position to threaten to attack the Kola peninsula in the Arctic where the Soviet
Northern Fleet is based,” and also noted the importance of the 1981 naval exercises. Rear
Admiral Rumyantsev argued in 1983 that “achieving superiority at sea would be impossible to
imagine without developing the forces and resources of submarine warfare.” The main mission
of American SSNs during a war would be “combating enemy submarines, primarily missile
submarines, in combat patrol areas.” He argued that American SSNs “are now being introduced
into the Arctic regions, including the Barents, Greenland, and Norwegian seas” and drawing
attention to yearly American ASW exercises off the coast of Norway.135

MILITARY ADVANTAGE AND POLITICAL IMPACT
A final judgment on the military value of American clandestine capabilities for strategic ASW is
impossible on our present evidence. Any evaluation of the undersea balance during the 1980s
must be subject to the serious uncertainties discussed above.

But we have every indication that American naval leadership felt very confident in their
ability to execute a challenging mission. The commanding officer of the Pacific Fleet in the mid 1980s, Admiral David Jeremiah, has said spoken of the ability “to identify by hull number the
identity of Soviet subs, and therefore we could do a body count and know exactly where they
were. In port or at sea. If they were at sea, N3 [Director for Operations] had an SSN … [on
them], so I felt very comfortable that we had the ability to do something quite serious to the
Soviet SSBN force on very short notice in almost any set of circumstances.” Similarly, Vice-
Admiral Thomas Wilson argues that, in retrospect, “The knowledge that the Soviets had [was]
that we were very good at our [operational intelligence] mission and therefore good at our
operational mission of war at sea—ASW, protecting the carrier, projecting power….[Eventually]
they realized we were good at finding them, [and] attacking them if necessary.136

The political effects of signaling about the undersea balance are difficult to disentangle
from those of the larger strategic nuclear competition: the Soviets were under competitive
pressure from many different sources during the 1980s, so teasing out the causes of their
reactions must necessarily be tentative. But at least three Soviet decisions from the period might
plausibly have a specific connection to information gleaned about American strategic ASW
capabilities.

First, Ola Tunander has suggested that the increasingly provocative Soviet submarine
behavior in Swedish waters during the 1980s may have been intended as a counter-signal to the
American Maritime Strategy. Soviet diesel and midget submarines were frequently spotted in
positions where they were obviously scouting Swedish military vulnerabilities. These were
coupled with belligerent political statements to the Nordic countries. Tunander argues that the
combination was intended to create a counter-threat to NATO operations in the bastions.
Moscow was intimating that it was prepared to launch a ground invasion of Norway by crossing
Sweden during war, which would make it impossible to operate the carrier part of the Maritime
Strategy and also provide a larger patrol area and better defense for Soviet SSBNs. At the same
time, it created a peacetime constituency within NATO for restraint in the region. Of course, if
Tunander is correct, any real effort to prepare to outflank the SSBN campaign on land would

(Summer 1998): 88, 90, 92.
have required shifting important ground forces to the North and away from the Central Front—precisely one of the American aims noted above.  

Second, there is much evidence that the Soviet Union had received a powerful signal about its poor constitutional fitness for high-technology competition with the United States during the 1980s, including from the undersea struggle. The Soviet defense budget was being shifted away from procurement, operations, and readiness, and heavily towards the long-range R+D needed to keep the pace technologically with the United States. The change in Soviet naval operations was especially marked. Ship construction and delivery slowed, training was significantly reduced, and exercises outside of Soviet home waters were almost entirely curtailed. Speculatively, it is also worth noting that the Soviet program in land-based mobile missiles, whose future was an uncertain implication of the SALT II negotiations in the late 1970s, was proceeding ahead by 1982. Together, these changes would be consistent with a Soviet Navy that had learned something of the fearsome capabilities possessed by its adversary, and was restructuring its forces towards enhanced competition and different areas of competition.

Third, another part of the Soviet strategy for easing the burdens of competition at the end of the Cold War was to roll out a number of arms control proposals. Naval arms control, and in particular arms control in the far North, was conspicuous in its salience. In 1986, Politburo member Yigor Ligachev suggested that large scale exercises be banned from the North, Norwegian, Barents, and Baltic Seas, and that Northern Europe be declared a nuclear free zone. Gorbachev built on these proposals in 1987 during a speech in Murmansk, calling again for turning Northern Europe into a “zone of peace” and reducing military activities in all of the Northern Seas. More specifically, he suggested arms control for ASW forces, pre-clearing of any major naval exercises, and also the invitation of foreign observers to such exercises.

Stealth in the Cold War: Overview

In this section we use the case of stealth technology during the Cold War to probe further the plausibility of strategies of partial revelation as well as the critical importance of intelligence and counterintelligence. Stealth was a vital component of the U.S. response to Soviet efforts to change the strategic balance during the second half of the Cold War. It is sometimes referred to as a major part of the “second offset” strategy to counter Soviet quantitative military advantage.

As with ASW, the stealth case is useful for multiple reasons. It taps into the nuclear balance, as stealth made U.S. air-breathing nuclear forces more likely to penetrate Soviet air defenses and to do so undetected, making surprise more likely. Second, it was a highly clandestine capability, with multiple distinct compartments associated with stealth programs. Third, as with ASW, stealth was a long term competition over many decades.

This section begins by discussing the technology of stealth. It then examines the case in three historical periods, with the focus on the strategies pursued by the United States in terms of revelation and concealment.

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137 Tunander, Cold Water Politics, chap. 9.
139 Rosenberg, Soviet reactions, 82
141 Conversation with former military officer, April 17, 2017.
“Stealth” is a rubric that captures the application of two distinct but related sets of technologies to reducing the ability of sensors to detect a platform (typically an aircraft or missile). The first set of technologies are those that reduce the radar cross section of a platform, essentially making an aircraft appear “smaller” to radar observation. The second set of technologies are those related to emission control of the platform, reducing the ability of observers to detect sound, heat (infrared), or other electromagnetic emissions from the aircraft.

Radar cross section (RCS) is a measure of the effective area (in terms of square meters) of a target for the reflection of radio frequency energy. RCS varies significantly based on a number of factors, with the shape of the target facing the radar emitter and the frequency of the radar being perhaps paramount. The shape of the target determines how different frequencies of radar reflect off the surface, with certain shapes causing radar to scatter in directions other than back towards the radar. Higher frequency radars, which provide the highest fidelity resolution on what and where a target is, are typically the most vulnerable to this phenomenon.

In addition to shaping, RCS can be reduced by the use of materials that absorb radio frequency energy. This could include either the actual components of the platform (using wood rather than metal for example) or a coating (e.g. radar absorbing paint) or some combination. For aerodynamic applications radar absorbing materials are typically secondary to shaping in terms of contribution to lowering RCS. In theory some exotic applications, such as generation of a plasma sheath around an aircraft, could increase the contribution of radar absorption to reducing RCS but no system using these properties has been confirmed to exist.

Reduction of RCS makes active radar search for a platform much more difficult but mobile military platforms often generate emissions that can be passively detected. For example, military jet aircraft will produce infrared emissions from the jet engine and exhaust as well as the friction heating of the skin of the plane. Jet aircraft likewise produce sound that could be potentially detected. Aircraft seeking to maintain situational awareness may also emit their own radar and radio frequency communication emissions, which can also be detected.

Stealth therefore includes technologies and techniques for emissions control (EMCON). For example, the design of jet exhaust systems in stealth aircraft typically maximizes the cooling of exhaust through various means (such as by circulating coolant around the exhaust system). Any radar or radio communications on stealth aircraft must be limited by operational procedure (e.g. not communicating in certain geographic areas) and/or technical design of the system for low probability of intercept through various means.

Stealth and Strategic Reconnaissance, 1956-1974: Fade from Black
The origins of U.S. stealth program lie with strategic reconnaissance and the first high altitude spy plane, the U-2. While the U-2 initially flew high enough and fast enough to avoid anti-aircraft fire as it overflew the Soviet Union, the emergence of radar guided Soviet surface to air

143 See Jones as well as discussion in Special National Intelligence Estimate 11-7/9-85/L Soviet Reactions to Stealth, August 1985 (declassified October 1999) pp. 3 and 9-12.
145 See Jones as well as Soviet Reactions to Stealth p.3.
missiles (SAMs) began to cast doubt on its survivability.\textsuperscript{146} The U.S. intelligence community knew the window for U-2’s utility was closing.

This realization led CIA to initiate Project Rainbow, a program to explore reducing RCS for U-2 and U-2’s planned successor, known as Oxcart. Beginning in 1957, Rainbow quickly led to a variety of ways of reducing RCS but the practical challenges of making an aircraft using these means were numerous.\textsuperscript{147} Rainbow was also tightly compartmentalized, with access strictly controlled. For example, at Strategic Air Command (one of the main consumers of strategic reconnaissance intelligence) only the Director of Intelligence was read in to program and even then he was only given a basic overview.\textsuperscript{148}

In parallel to Rainbow, CIA began an electronic intelligence program to better understand and map Soviet air defense radars. This program, run jointly with the Air Force, used a variety of novel techniques, including the reflection of certain Soviet radars off the moon, to map the growing Soviet air defense challenge. In addition, the program developed a capability to manipulate Soviet radar returns to produce “ghost” aircraft. Notably future Secretary of Defense William Perry, who at the time was at defense contractor Sylvania’s Electronic Defense Laboratories, was involved in this effort almost from the beginning.\textsuperscript{149}

Despite the efforts of Project Rainbow, it was clear existing design and manufacturing technology was not able to make the Oxcart aircraft known as A-12 (and its successor the SR-71 Blackbird) sufficiently stealthy to evade evolving Soviet air defense.\textsuperscript{150} The emergence of satellite reconnaissance alleviated some of the need for manned aircraft to overfly strategic targets, but satellites could not provide all the reconnaissance the United States needed. This led the Air Force to modify a target drone, the Ryan Firebee, to become a reconnaissance drone that incorporated some stealthy elements. The new drone, called the Fire Fly, was ready by 1962.\textsuperscript{151}

Fire Fly was thus in place by the time of the Cuban Missile Crisis and, given the threat to the U-2 posed by air defenses over Cuba, some in the National Reconnaissance Office (NRO) pushed for it to be used in the crisis. Yet the Chief of Staff of the Air Force, General Curtis LeMay, scrubbed a Firefly overflight as “... the Air Force did not want to tip the Soviet Union to the presence of this super-secret capability.” The reasoning, according to historian Thomas Ehrhard, was simple: “This was a highly classified project and the exposure of the drone program over Cuba could have given the Soviets advanced warning of its capability.”\textsuperscript{152}

Fire Fly (later redubbed Lightning Bug) was still insufficiently stealthy to avoid the expanding capability of Soviet model air defenses so an even more exotic stealthy drone was built. This drone, the D-21, “… was not just classified, it was a compartmentalized NRO program so secret that even Skunk Works engineers working in the Fort Knox-like SR-71 assembly building were restricted from viewing the D-21 by a hangar bulkhead dubbed ‘Berlin

\textsuperscript{147} See CIA, “Rainbow Program-Phase II,” November 27, 1957 (declassified April 1999).
\textsuperscript{148} CIA Memorandum, “R Clearances, USAF Intel. Officers,” August 1, 1957.
\textsuperscript{149} See Poteat and William Perry, My Journey at the Nuclear Brink (Stanford CA: Stanford University Press, 2015).
\textsuperscript{150} On the successor to U-2 and stealth, see David Robarge, Archangel: CIA’s Supersonic A-12 Reconnaissance Aircraft 2nd ed. (Washington DC: Center for the Study of Intelligence, 2012).
\textsuperscript{152} Ehrhard, both quotations on p. 8.
Wall West.” Yet the technology for drone operations was still immature, as was stealth, so this program was not a success. 153

Over the next decade the intelligence community, especially CIA and NRO, shifted heavily towards satellites to provide strategic reconnaissance. This culminated in the termination of CIA and NRO involvement in air breathing strategic reconnaissance, stealthy or otherwise, in 1974. The Air Force’s Strategic Air Command continued to operate the SR-71, which was no longer viewed as particularly clandestine. 154

Hypotheses on Clandestine Capabilities

In the late 1950s, stealth was a key component of air-breathing strategic reconnaissance. With satellites not yet widely available, stealthy aircraft (manned or not) offered the only form of responsive coverage of strategic targets, particularly critical Soviet and Chinese nuclear sites. Augmented by the CIA program to map and manipulate Soviet air defenses, stealthy aircraft made a very nearly unique contribution to warning of major military developments.

Yet stealth was a wasting asset- even as Project Rainbow explored concepts for reducing RCS it was clear existing technology for stealth would not outrun the expansion of Soviet air defense. China would remain vulnerable to stealthy aircraft for a while but even that did not seem like an indefinite opportunity. Thus the adversaries would eventually “fix” the vulnerability stealth exploited whether the capability was revealed or not. At the same time the proliferation of satellites made the contribution of stealthy aircraft much less unique.

This combination meant stealth was initially concealed and tightly compartmentalized (late 1950s- early 1960s). Yet in just over a decade the intelligence community decided operating the SR-71 could be done overtly by the Air Force, allowing NRO and CIA to divest the platform and focus on satellites. A unique but wasting asset merited intense protection for only a relatively brief period.

Stealth and Strike, 1974-1980: Back to Black

Yet even as stealth for reconnaissance waned as a clandestine capability it was about to be reborn as a critical element of potential strike assets. In 1974 a Defense Science Board study noted integrated air defenses were becoming so capable U.S. aircraft might not be sufficiently survivable to provide critical tactical or strategic strike in critical cases such as the defense of the Fulda Gap in Europe. At about the same time, Director of Defense Research and Engineering Malcolm Currie called for renewed efforts at radical innovation. Robert Moore of the Defense Advanced Research Projects Agency (DARPA) proposed a new effort for “high stealth aircraft,” which, with Currie’s support, DARPA began to pursue. 155

By January 1975 DARPA had issued development contracts to two firms, McDonnell Douglas and Northrop, for a manned fighter size aircraft that would “…be essentially undetectable at an operationally useful range.” Lockheed, the designers of the A-12 and SR-71 had not been invited to compete as Lockheed had not built a fighter sized aircraft in decades and, crucially, DARPA was unaware of Lockheed’s previous stealth work. 156

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153 Ehrhard, p. 10.
156 Ibid. p. 153.
even after clandestine capabilities are no longer effective internal information management can
remain a challenge.

Lockheed’s management nonetheless heard about the DARPA program and sought to
erenter it. CIA granted Lockheed permission to share information on the A-12 with the director of
DARPA and, apparently impressed, he allowed Lockheed to join. Exploiting new computer
technology to model radar returns, Lockheed eventually won the competition with the stealthiest
model.\(^{157}\) DARPA transferred leadership of the program to the Air Force, where in 1976 it
became known as HAVE BLUE. Lockheed built two test aircraft and began to work on reduction
of other emissions, making HAVE BLUE an EMCON testbed in addition to reduced RCS.

Notable in this was the evolution in the classification of the program. DARPA, which
frequently works with academic and non-defense contractors, was not experienced with highly
classified programs. The initial studies from McDonnell Douglas and Northrop were only
Confidential, the lowest level of classification. Only after more finished proposals were in from
those two plus Lockheed did DARPA decide to classify the program Top Secret (but not in a
special access compartment). When the program transitioned to the Air Force as HAVE BLUE it
become a special access program.\(^{158}\)

Even as Lockheed progressed with HAVE BLUE, in 1978 DARPA chose to have
Northrop pursue another aspect of stealth. As part of the Battlefield Surveillance Aircraft-
Experimental (BSAX) program, Northrup developed a test aircraft which not only made
advances in reducing RCS but also had a low probability of intercept (LPI) radar. LPI radar uses
various EMCON techniques to minimize the probability an adversary could detect the use of
radar. Northrup eventually built a test aircraft known as TACIT BLUE.\(^{159}\)

In parallel to these developments, the administration of President Carter was considering
the future of U.S. manned strategic bombers. The B-1, under development and intended to be the
next generation U.S. bomber, was not stealthy, making it dependent on some combination of
speed, jamming, and potentially low altitude flight to penetrate Soviet defenses. This approach
seemed less and less effective given the continuing improvement in Soviet air defenses.
Moreover, the new technology of cruise missiles offered a plausible alternative.\(^{160}\)

Crucially, President Carter selected William Perry as the Director of Defense Research
and Engineering (DDRE), the senior technologist in the Pentagon. Perry, as noted, had been
involved in efforts to manipulate Soviet air defense radars since the late 1950s so he understood
the potential of stealth. This may have contributed to the administration’s decision to cancel B-1,
which came in 1977 after the success of HAVE BLUE.\(^{161}\) It subsequently launched the
Advanced Technology Bomber (ATB) program, with the goal of producing a strategic bomber
with low RCS and other advanced EMCON features. As with HAVE BLUE the ATB program
was highly classified.

\(^{157}\) Ibid. p. 153.

\(^{158}\) See David Aronstein and Albert Piccirillo, *Have Blue and the F-117A: Evolution of the "Stealth Fighter"


\(^{161}\) Certainly some senior Carter administration officials claimed as much. After the Cold War, Carter’s National
Security Adviser Zbigniew Brzezinski noted “When our administration canceled the B-1 bomber program, we knew
we would be attacked by political opponents who were unaware of… stealth technology. Both developments
rendered nearly obsolete everything about the B-1…” Quoted in Ben Rich with Leo Janos, *Skunk Works: A Personal
Yet even before the creation of ATB, rumors about stealth had begun to circulate. In 1975, when DARPA’s initial efforts had not been compartmentalized, the press had reported on some aspects of the program. Even in 1977, when stealth had transitioned to compartmentalization as HAVE BLUE, a well-connected journalist was able to report on the initial flights of Lockheed’s prototypes. According to a subsequent Congressional investigation a major press article on stealth was withheld from publication in 1978 at the request of the Pentagon. As a result from 1977 to 1980 there was little press reporting on stealth.

This changed almost overnight in the summer of 1980, when several news sources reported on stealth. William Perry then reached out to the author whose 1978 story had been withheld and agreed to update him on stealth, ostensibly as a “damage limiting” measure responding to the recent leaks. Perry and Secretary of Defense Harold Brown then gave a press conference on stealth, again allegedly as part of an effort to limit further speculation about stealth. Apparently both the commander of Strategic Air Command and the Chief of Staff of the Air Force disagreed with this course of action.

Almost immediately after these revelations there was considerable speculation the Carter administration chose to reveal stealth as a means to bolster its defense credentials in the 1980 presidential election. This was of particular importance given the criticism from Ronald Reagan’s campaign about the decision to cancel the B-1 bomber. A Congressional investigation concluded the revelation was “done to make the Defense Department and the administration look good in an election year…” Yet this revelation, whatever its source, did not result in a victory for the Carter campaign.

**Hypotheses on Clandestine Capabilities**

The 1970s transition of stealth from strategic reconnaissance to tactical and strategic strike changed the calculus about the technology. A technology that had become less unique and valuable with the advent of satellite intelligence was once again of critical value for a different application. As hypothesized this technology was once again held in a highly compartmentalized fashion. Stealth had returned to the “birth” quadrant—military utility with no political benefit.

Yet the 1970s era of stealth for strike highlights domestic level factors in the management of clandestine capabilities not previously addressed in our hypotheses. The first is the role of bureaucracy in managing clandestine capabilities. DARPA, the crucial driver of the revival of stealth, was not accustomed to running highly classified programs, which meant the initial stealth efforts were not compartmentalized. This surely contributed to the leaking of information about stealth to the press.

The second domestic factor is the role of politics. In our hypotheses we have focused on political utility of clandestine capabilities in the international context. Yet the alleged revelation of stealth by the Carter administration highlights the potential domestic political utility of clandestine capabilities. While the Carter administration, if the allegations are true, did not achieve its political objectives it is nonetheless clear there could have been electoral benefit.

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164 Ibid.
165 Ibid., p. 7. It is worth noting that the House and its committees were dominated by Democrats, reducing the political incentive to target the Carter administration.
Stealth and the Strategic Balance, 1981-1989: Showing Black to the Reds

The revelation of stealth by the Carter administration, though perhaps cueing the Soviets to the existence of the program, did not compromise the technical aspects. Moreover, it merely affirmed discussion of stealth in the press for years. The impact in terms of both compromising the military utility of stealth and increasing its political utility were probably minimal.

Yet the risk of program compromise was real. The Soviets had very substantial human intelligence successes, as with those that compromised earlier strategic ASW efforts. At a summit meeting in July 1981 between the recently inaugurated Ronald Reagan and French President Francois Mitterrand, the French revealed extensive evidence on Soviet intelligence collection on technology. The so-called Farewell Dossier was derived from a French human intelligence source inside Soviet technical intelligence (KGB’s Line X).  

This French intelligence confirmed long held suspicions of some in the U.S. intelligence community of Soviet efforts. Yet it also created an opportunity. With extraordinarily complete knowledge of who Soviet intelligence officers focusing on technical issues were and what their collection priorities were, which included stealth, the United States government was able to tailor a strategic deception and counterintelligence campaign against them.

This campaign, which began in early 1982, required extensive coordination between CIA, FBI, and the military counterintelligence organizations with very senior U.S. government officials meeting regularly to discuss the campaign, which seems to have had three major parts. The first and simplest was for the United States and many of its allies (once informed) to expel the bulk of Soviet intelligence officers engaged in technical espionage.

The second part of the campaign was apparently to tailor the focus of other U.S. counterintelligence efforts to protect sensitive programs such as stealth. In 1984 a combination of electronic surveillance and the use of two Russian speaking FBI agents posing as Soviet intelligence officers allowed the FBI to arrest and convict an engineer at Northrup seeking to sell intelligence on stealth.  

A U.S. Air Force officer, approached by Soviet intelligence, became a double agent pretending to provide the Soviets with information on stealth. This led to the arrest and expulsion of the senior Soviet air attaché in Washington.

The third, and most complex, part of the campaign was to feed the Soviets faulty technology and false data about U.S. programs. Citing unclassified sources, one of the chief architects of this campaign for CIA claims “[t]he Pentagon introduced misleading information pertinent to stealth aircraft, space defense, and tactical aircraft.” This required further use of double agents and the careful selection of “feed material” to provide the Soviets. Some of this

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168 Weiss; and conversation with former military officer, April 17, 2017
171 Weiss.
feed material would have to be genuine to convince the Soviets, while the rest would still have to be plausibly misleading.  

The U.S. effort was aided in this respect by understanding of Soviet organizational and technical factors. On the organizational side the United States understood the existence of a separate military service for strategic air defense would create a strong demand for intelligence on stealth— it was after all this service that would have to face the challenge of stealth. On the technical side CIA’s recruitment of Soviet radar expert Adolf Tolkachev probably aided in tailoring feed material as it provided insight into the state of the art for Soviet radar.

Hypotheses on Clandestine Capabilities

The 1980s period of stealth underscores the utility of deception and the importance of intelligence resources in the management of clandestine capabilities. The U.S. counterintelligence campaign appears to have prevented compromise of any key technical aspects of the stealth program. At the same time the strategic deception and use of feed material probably helped convince the Soviets of U.S. stealth capability while potentially compromising Soviet counterstealth programs. This section of the case seems to be a successful attempt at partial revelation, convincing the Soviets stealth was a powerful capability while misleading them on how it worked. Success was predicated on strategic deception and counterintelligence.

Preliminary Conclusions

The foregoing is far from dispositive but we believe it provides four preliminary conclusions. First, clandestine capabilities are of central importance to understanding world politics of both the 20th and 21st century. The story of shifting military and political utility around strategic ASW in the Cold War could very easily be retold, we suspect, about offensive cyber operations today. The decision to reveal NSA penetrations of North Korean networks in order to attribute the Sony hack was likely a modern equivalent of the decision to play NSA tapes of Soviet air defense in the downing of KAL flight 007.

Second, while more systematic research needs to be done on U.S. decision-making, the ASW case seems consonant with our hypotheses. The outcome drifted during the 1960s to the 1970s, from birth to death, with adjustments by the U.S. potentially moving it back towards the youthful and middle aged outcomes in the 1980s. Likewise decisions about revelation and compartmentalization seem conditioned by perceptions of uniqueness of the capability and the ease of Soviet response.

Third, the salience of clandestine capabilities are principally in the realm of long term competition and general political benefit for deterrence. While some easily replaceable capabilities, such as the NSA intercepts in the KAL 007 case, have been revealed in crisis to achieve political advantage, most were not. Instead, we see policymakers grapple with the need to mount deception operations (as in some of the Maritime Strategy exercises) to demonstrate capability while zealously protecting the capabilities. Yet over the longer term sufficient

172 Conversation with former military officer, April 17, 2017 and conversation with former senior intelligence official May 3, 2017.
173 For an overview see James Quinlivan “Soviet Strategic Air Defense: A Long Past and an Uncertain Future,” (Santa Monica, CA RAND Corporation, 1989).
revelation appears to have had substantial impact on the Soviets views. The same seems to be true of stealth, though closer examination of available Soviet sources is needed.

Fourth, much more should be done. A broader universe of cases is needed to draw conclusions. More also needs to be done on strategic deception and counterintelligence, an understudied topic in itself. Finally, our work is almost entirely from the U.S. perspective and we need to draw on non-U.S. experts to confirm whether these hypotheses have any portability.