Target Hardening and Terrorist Signaling: The Case of Aviation Security

Justin V. Hastings
University of Sydney, New South Wales, Australia

Ryan Chan
University of California, Berkeley

Introduction

What is the nature of the relationship between hardening a target and the value that a terrorist group derives from attacking it? While increasing security measures around a target type appears to drive terrorists to seek out softer targets in the aggregate, terrorist groups continue to try to attack harder targets with different modes of attack, including with suicide bombers. We first use a simple expected value framework to think about how the expected value of attacking a hardened target varies under two understandings of how terrorist groups think about attacks – a violence-based approach, where terrorists are presumed to be maximizing the physical damage they expect to do to the target, and a signaling-based approach, where terrorists are presumed to be maximizing the symbolic value they expect to derive from the attack. We argue that, if it is proper to understand terrorist attacks (or at least ‘terrorist spectaculars’) as costly signals of terrorist strength or determination, hardening a target actually increases the expected value of attacking a target (relative to its value before hardening), even if the attack is more likely to fail. This would explain why terrorists continue to attack some hardened targets, even if their odds of successfully destroying the targets are infinitesimally low.
We go on to explore this understanding of terrorist attacks on hardened targets by examining the evolution of aviation security, and tracing how al-Qaeda’s views of airplanes and airports as targets have changed since 9/11. The Richard Reid shoe bomber plot, coming soon after the 9/11 attacks, was viewed as a failure by al-Qaeda. As aviation targets were hardened with increasingly onerous security measures, al-Qaeda began to see even attacks that did not result in detonation as successes, in large part because of what they signaled about al-Qaeda’s abilities (to get past state-imposed security checkpoints), and the ability of al-Qaeda to impose costs on the US and other countries (in the form of defensive counterterrorism measures) even in the absence of explosions. We close with a discussion of theoretical and policy implications.

**Hard Targets and Costly Signaling**

The question of whether terrorism ‘works’ is the subject of an ongoing debate that has largely focused on whether terrorism allows groups to achieve their political or other objectives (or is counterproductive in this respect), or whether terrorism serves as a form of communication between a terrorist group and its adversaries or supporters. Terrorism ‘works’ if it communicates the message that groups want. If terrorism is a form of communication, the question arises as to what the group is attempting to signal by its violence, and how it is attempting to communicate this message. The idea that terrorist attacks are a form of costly signaling has a long tradition in the study of political violence. Because talk is cheap, violence, which is inevitably costly to the terrorist group in terms of planning, money, time, personnel, and potential backlash from the population, serves as a way for terrorist groups to credibly communicate (to the state, to their own constituency, and to the adversarial
population) their determination, abilities, and/or the resources they have available to
them. Almost by definition, the terrorist group is militarily weak, so violence is
designed to help the group look stronger than it is already is. From the reactions of the
state, the group’s constituency, or the adversarial population, the group might be able
to create a ‘self-fulfilling prophecy’ in which it does actually become more powerful,
as the state overreacts and drives the constituent population into the group’s arm, or
moves closer to accomplishing its goals, as the state changes its beliefs about how
powerful or determined the terrorist group is.6 Terrorist violence thus serves as a way
to send a credible message ‘that the state would be better off striking the necessary
bargain today’,7 rather than trying other, less conciliatory measures, and that the
terrorist group itself is capable and dedicated.

Costly signaling occurs, in other words, because everyone does not have
perfect information about the terrorist group, giving the terrorist group the chance to
impose its own view on both sides’ understandings. Kydd and Walter argue that
terrorist violence is a way to resolve uncertainty among either the enemy (population
and state) or a terrorist group’s constituency about the group’s power, resolve, or
trustworthiness. Attacks signal the group’s ability to impose unacceptable costs on the
enemy (or defectors in its midst), to provoke an overreaction from the enemy, or to
aggrandize itself relative to other terrorist groups on its side.8 While the explanatory
power of uncertainty in terrorist violence is perhaps overrated,9 the question then
becomes one of how the terrorist group can most effectively resolve this uncertainty
about its power, resolve, or trustworthiness, given the very real constraints on its
resources. How, in other words, can the terrorist group get the most ‘value’ out of its
signal in a given attack?
More valuable targets, however defined, are often more difficult for terrorists to attack due to the defensive measures put in place by the state (or the defenders). Suicide bombing and hardened targets are interrelated. Because of the symbolic value of a suicide attack, the cost of the attack to the terrorist group, and the ability of suicide attackers to penetrate levels of security impenetrable to traditional bombs, terrorist groups tend to use suicide attacks selectively and strategically, and rarely against members of their perceived constituency (such as coreligionists).\textsuperscript{10} The LTTE, for example, claimed that it only attacked political and military targets with suicide bombers, while Hamas has mostly unleashed suicide bombers against Israeli targets in waves during critical times in peace negotiations with Israel, and has rarely attacked targets in Gaza or the West Bank with suicide bombers.\textsuperscript{11} Lightly defended, soft targets are by and large not worth the cost to the terrorist group of a suicide attack, since they can be attacked by normal means. Berman and Laitin, for instance, find that, of the 17,405 Palestinian attacks in Gaza and the West Bank during the Second Intifada between September 2000 and July 2003, there were only eight deaths due to suicide bombings, while during the same period, Israel proper (which was much harder for Palestinian groups to reach) saw 401 deaths from suicide bombers out of 730 total attacks, suggesting that Palestinian groups were reluctant to use suicide bombers unless they had to.\textsuperscript{12}

The literature on the effect of target hardening has generally not focused on the question of what makes a hardened target valuable, or examined the direction of the causation very closely. Are targets that are inherently valuable to the state (and thus the terrorist group) – such as military headquarters or political leaders – more likely to be hardened, or does the act of hardening a previously soft, civilian target (such as shopping malls) somehow make the target more valuable to the terrorist
group? Instead, target hardening is often used as a starting point for some other question, and as such is simply assumed to have the effect of reducing the probability of a successful attack (or escape after an attack) and/or reducing the damage done in a given attack. This presumably leads to a reduction in the probability that a terrorist group will attack a hardened target, and increases the probability that terrorist attacks will be diverted to other, easier to attack targets, or at least that they will attract suicide bombers instead of conventional bombers. For their part, Enders and Sandler find that there is a substitution effect when targets are hardened, with terrorists shifting to new tactics or to softer targets in the face of a lower probability of success against hard targets. Recent work has shifted the focus from variation in the mode of attack and location to types of targets attacked, given hardening. Brandt and Sandler find that over the past several decades, terrorists have increasingly favored business and then private party targets over military and official targets as the latter two targets have become more difficult to access. The assumption, therefore, is that hardening targets leads to some amount of deterrence.

As a result of the assumption of the connection between target hardening and terrorist success (or failure), the literature has thus focused on the optimal allocation of defensive resources to harden different sets of targets. Proactive counterterrorism measures (such as preemptive strikes or military action) that are too heavy-handed can alienate the population and drive it into the hands of a terrorist group, while weak proactive responses can encourage a terrorist group to engage in more attacks. To avoid ‘backlash’ attacks, policing and defensive security measures (such as hardening targets) are often preferred, while intelligence can be used to determine whether the terrorist group has maximalist objectives or is more reasonable. The assumption of many governments struggling to figure out whether the terrorist groups they face are
maximalist or minimalist in their objectives appears to be that hardening targets will
give counterterrorism benefits (such as decreasing the probability of success in attack)
with little of the downsides, such as triggering recruitment, of violent or
concessionary measures.\textsuperscript{20}

Yet defensive measures themselves may have costs over and above the costs
to other targets now subject to diverted attacks. Mueller and Stewart, for example,
look at the security measures taken in aviation security, and come to the conclusion
that measures such as Federal Air Marshals and full body scanners are not cost-
effective as counter-terrorism measures. Given the full body scanners’ cost, for
instance, according to their calculations and (rather generous) assumptions about the
effectiveness of the scanners, the machines would have to be “solely responsible for
disrupting or deterring more than one $26 billion attack with a body borne explosive
every two years that otherwise would have been successful.”\textsuperscript{21}

While Mueller and Stewart focus solely on the monetary cost of reducing the
risk (probability) of a successful terrorist attack, there is also the relationship between
those counterterrorism measures and the viewpoint and behavior of the terrorist group
itself. Hardening a target does not necessarily mean that the value to the terrorist
group remains constant; instead, hardening the target could actually raise the target’s
value to the terrorist group. This point has not gone unnoticed, although it is not the
major focus of very much of the literature: Libicki et al. mention in a footnote that it
is possible that al-Qaeda may choose targets in such a way as to force states to spend
obscene amounts of money hardening them, although it would be impossible to tell
this from analyzing a single attack,\textsuperscript{22} while Frey and Luechinger point out that
increasing the marginal cost of attacking a target increases the marginal benefits that
accrue to a terrorist group that attack the target.\textsuperscript{23} In terms of strategic interaction
between target-hardening defenders and terrorist groups, a number of analysts find that the effort an attacker is willing to put in may track with increasing defensive actions, resulting in an ‘arms race’ where attackers and defenders attempt to outdo each other and leading to sub-optimal welfare for both. In the next section, we use an expected value framework to explore the possible connection between the state’s defensive counterterrorism measures and a terrorist group’s behavior, and more specifically the relationship between hardening a target and the value of the signal that the terrorist group sends by attacking the target.

**An Expected Value Approach to Hard Targets and Costly Signaling**

We think in terms of the concept of the expected value of terrorist attacks in large part because the US government itself refers to its defensive counterterrorism strategy as one of deterrence, implying that it thinks of terrorists as ‘rational’ and engaging in something approaching a cost-benefit analysis when planning their attacks, such that actions by states might actually have an effect on their behavior. In deterrence by denial, of which target hardening is the primary example, the defender attempts to raise the costs of attacking a target high enough, or decrease the probability of successfully doing damage low enough that the terrorist group gives up in frustration. The expected value framework is useful in representing how changes in probabilities and costs imposed on terrorists as part of a deterrence-based counterterrorism strategy might affect their calculations. In taking this approach we assume that terrorists are operating as utility-maximizing rational actors. While terrorists certainly often operate for reasons that are more visceral than the archetypal *homo economicus*, thinking of terrorism as costly signaling actually allows us to incorporate certain behavior that would otherwise be viewed as irrational – such
suicide attacks that have almost no hope of succeeding in inflicting damage against hardened targets – because they are so dissociated from the terrorist group’s ostensible goals or are actively counterproductive in achieving them. Terrorist acts that do not bring a group closer to achieving its long-term goals may still be rational in achieving signaling goals or short-term objectives.

In the standard economic understanding of crime, as laid out by Becker, the simplest calculation for the expected value derived by a criminal for a given offense is the value derived by the criminal (assuming the offense is committed successfully) times the probability of success plus the value derived from being caught (that is, the value minus the cost of punishment) times the probability of being caught and convicted. If the resulting value is positive, the criminal will probably commit the offense. Otherwise, he or she will not. In terrorism terms, this equation could be expressed as $E(Y) = pY + (1 - p)(Y - C)$ which simplifies to $E(Y) = Y - (1 - p)C$ where the expected value that the terrorist organization derives from a terrorist attack is the value $Y$ if successful minus the probability of failure (here $1 - p$ since we are using $p$ as the probability of successful detonation) times the cost of failure $C$. The problem in applying the criminal paradigm directly to terrorism is that terrorist organizations willing and able to carry out suicide attacks against an adversary with which they are already at war (unlike criminals, who presumably suffer no harm from the state if they choose not to commit a crime) have no particular reason to care about whatever ‘punishment’ could be meted out by the adversary state after the fact. If we take $C$ to be the cost, in terms of time, effort, and money, of training and equipping a suicide bomber, the terrorist group bears cost $C$ regardless of whether the operation is successful or not. If the operation fails, and the bomber is captured, he still cannot be used.
again, although there may be costs for the terrorist group in terms of intelligence the state is able to glean from the detainee.

It would be better, then, to assume that the costs that factor into a terrorist organization’s calculations are in fact the costs, in terms of money, time, operational planning, and personnel, associated with planning and executing the attack. These costs do not change based on the success or failure of the attack although, as we will see, they may change based on what the terrorist group is attempting to accomplish. If we assume sunk costs, then the expected value of an attack for a suicide bombing-capable terrorist group is $E(Y) = p(Y - C) + (1 - p)(-C) = pY - C$. This is the same as the expected utility function proposed by Mehlkop and Graeff in modeling the behavior of criminals who might be willing to commit a criminal act if the reward and probability of success are high enough, even if there is certainty about being caught and punished.29

The state engaging in terrorist deterrence can try to decrease the terrorist organization’s expected value from the attack to basically zero in a number of ways. First, it can seek to decrease the probability of success to very low values. Second, it can seek to increase the cost to the terrorists of carrying out a successful attack (by making it more difficult for them to raise money, meet to plan, obtain explosives, etc.). Third, it can seek to decrease the value of the target to the terrorist organization.

Hardening a target – physically hardening the ‘soft’ parts of the target, increasing surveillance, making it more difficult to access vulnerable areas -- is theoretically supposed to increase the probability of a terrorist group being apprehended, increase the cost to the terrorist group of planning and carrying out the operation, and decrease the value to the terrorist group of the target (by limiting the damage done to the target even by a successful attack). A hardened target is supposed to deter a terrorist group
in large part because none of the variables at play have moved in favor of carrying out the attack. If \( pY < C \), in other words, the terrorist group is generally deterred.

The strategy a counterterrorist a terrorist attack depends to a certain extent on what the terrorist group itself views as being the purpose of the attack. Here we can think of two divergent approaches to thinking about terrorist attacks against a particular target: the violence-based approach, and the costly signaling approach. We should note here that we do not claim that a terrorist group values a given attack only in its ability to inflict damage on the adversary, or only in its ability to send a costly signal. Clearly inflicting actual damage is the preferred way for any terrorist group to send a costly signal, and the reality is that most terrorist groups probably operate with a combination of both. Instead, we think of each approach as an ideal type that allows us to explore the implication of target hardening on terrorists’ understanding of the value of targets.

In the violence-based approach, the assumption is that the purpose of the attack is to kill as many people as possible, or at least do as much damage as possible to the target. If the attack succeeds, the terrorist group derives \( Y - C \) value from the attack. If it fails, the terrorist group eats the cost of the attack \((-C)\). The implication of an all-or-nothing goal for the terrorist group is that it makes sense to proliferate the number of security checkpoints that a terrorist must pass through before he (or she) hits the target. If the probability of passing through each checkpoint \( i \) to get to the target after \( n \) checkpoints is \( p_i \), then the probability of passing through all checkpoints is \( p_n = \prod_{i=1}^{n} p_i \). If the probabilities of passing through each checkpoint are independent, then the probability of a terrorist group succeeding in accomplishing its goal drops very quickly. Presumably the cost of getting through a proliferating number of checkpoints also increases, so that the marginal cost of getting through checkpoint \( i \) (
$ΔC_i$) can add up quickly, with the cost of getting through all checkpoints as $C_n$. The value of attacking a target is essentially zero while passing through each checkpoint up until successful detonation (at which point it spikes), with the terrorist group deriving little or no value from getting past some, but not all, of the checkpoints. This results in an expected value of $E(Y_n) = \prod_{i=1}^{n} p_i \cdot Y_n - C_n$.

The terrorist group, in other words, derives little or no value from failure. From this perspective, the primary effect of proliferating checkpoints, each of which presents the terrorist group with the possibility of failure, is to decrease the eventual probability of the terrorist group successfully detonating the bomb at the target and causing death and destruction and to increase the cost to the terrorist group of attacking, resulting in a zero or negative expected value.

The United States Transportation Security Administration’s own description of its security strategy implicitly assumes a violence-based approach to terrorist attacks, by explicitly referencing the idea of ‘layers of security’ multiplying the probabilities that terrorists will be stopped before detonating on an aircraft.

We use layers of security to ensure the security of the traveling public and the Nation’s transportation system. Because of their visibility to the public, we are most associated with the airport checkpoints that our Transportation Security Officers operate. These checkpoints, however, constitute only one security layer of the many in place to protect aviation. Others include intelligence gathering and analysis, checking passenger manifests against watch lists, random canine team searches at airports, federal air marshals, federal flight
deck officers and more security measures both visible and invisible to the public.

Each one of these layers alone is capable of stopping a terrorist attack. In combination their security value is multiplied, creating a much stronger, formidable system. A terrorist who has to overcome multiple security layers in order to carry out an attack is more likely to be pre-empted, deterred, or to fail during the attempt.\(^\text{30}\)

A costly signaling approach to hard targets, on the other hand, suggests that terrorist groups do not necessarily see attacking hard targets as all or nothing. The point of violence for many, even most terrorist groups is not only the violence itself, but the propaganda value of the costly signaling that comes from the violence. This is the ‘propaganda by deed’ originated by terrorist groups in the nineteenth century and continued until the present day.\(^\text{31}\) The specific target of a terrorist group may or may not have any military value, but it and the attack itself have symbolic value to the terrorist group, and the terrorist group may derive some value from an attack even if it does little or no damage, inasmuch as the attack may signal, in Walter and Kydd’s phrasing, ‘resolve’ or ‘strength,’ highlighting their continued existence in the face of state crackdowns.\(^\text{32}\)

Seen from this angle, the attack as costly signal has multiple outcomes from which the terrorist group can derive value. The distribution of value is not simply binary, moving between zero value (in the case of a failed attack) and everything (in the case of a successful detonation or killing, for example), but is set along a continuum, where different kinds of failure have different value to the terrorist group.
An attack that results in no detonation still has value, for example, if the terrorists have shown that they can successfully assemble and place a bomb that could have gone off, or that they can get past multiple layers of security put in place by the government. To be sure, this understanding is applicable for the most part for established terrorist groups with demonstrated operational capabilities. Al-Qaeda’s ‘failures’ have signaling value precisely because the group succeeded so spectacularly in the past, on 9/11. Groups that have demonstrated no such capacity may not derive much value from close failures.

We can apply this logic to terrorists attempting to get through multiple checkpoints set up in front of a target on the way to a successful detonation: the value of failure (at the $m$th checkpoint) is less than the value of ultimate success, but still greater than zero. We can represent this as $0 < \sum_{i=1}^{m} \Delta Y_i < Y_n$ where $\Delta Y_i$ is the marginal value that the terrorist organization derives from getting past a given checkpoint. The expected value of an attack on a target with $n$ checkpoints (with the $n$th checkpoint defined as a successful detonation at the intended target) is thus

$$E(Y_n) = \sum_{i=1}^{n} \left( \prod_{j=1}^{i} p_j \cdot \sum_{j=1}^{i} \Delta Y_j \right) - C_n$$

where the first term on the right side of the equation is equal to the sum of expected payoffs for getting past a succession of checkpoints and the second term the total cost associated with planning and executing an attack on checkpoint $n$. The value that a terrorist organization derives from getting up to checkpoint $m$ (where $m < n$) is a function of the number of checkpoints that the group successfully passes through, and the marginal value associated with getting through each checkpoint.

There are several implications of the costly signaling approach for terrorist attacks on targets. First, as long as $Y_j$ increases in large enough increments to offset
the decrease in $p$ across checkpoints, it is possible for the expected value of an attack on a target with more checkpoints to be higher than the expected value of an attack on a target with fewer (or no) checkpoints, even if the probability of successfully detonating at the target is significantly lower in the first instance, and even if the total values to the terrorist group of the hardened and non-hardened targets are identical. Proliferation of checkpoints, in other words, can cause a target to become attractive to a terrorist looking for a way to send a signal about its capabilities. Second, if we assume that there is still positive marginal value to the terrorist group before hitting the $n$th checkpoint, there is an expanded menu of outcomes from which the terrorist group can derive value, up to and including detonation at the target. Proliferation of checkpoints essentially means proliferation of targets with some value. This does not mean that terrorist group will necessarily strive for ‘failure,’ however. Given that suicide bombers are used so rarely against soft targets, the primary cost to the terrorist group in conducting an operation against a hardened target would appear to be the cost in terms of time, training, equipment, and personnel of creating an adequately equipped suicide bomber (the loss of whom is also a cost). Once a target is sufficiently hardened to require a suicide bomber, further increasing the number of checkpoints may only slightly increase the marginal cost to the terrorist group of carrying out an attack. Aiming to fail, in other words, is not significantly less costly to the group than going for the whole payoff. If the government, assuming a violence-based understanding of terrorist motivations, sets the level of hardening for a target at a level where the cost of reaching the target just exceeds $\prod_{i=1}^{n} p_i \cdot Y_n$, then if the costly signaling approach is actually a more accurate depiction of terrorist motivations (and the group has a higher expected value from attacking a hardened target than attacking a non-hardened target), the initial cost of carrying out a suicide attack may be high for
the terrorist group, but insufficient to deter it, inasmuch as its attack’s expected value is positive as long as it is going for a successful detonation at checkpoint \( n \). If the costly signaling approach is correct, in other words, there are costs to an unending proliferation of defensive security measures at potential terrorist targets.

**Target Hardening and Aviation Security: Al-Qaeda’s Post-9/11 Attacks**

In this section, we explore the application of the signaling approach to target hardening in aviation security by looking at a series of attacks on aviation targets attempted or successfully carried out by al Qaeda or its affiliates in the years since 9/11. Aviation is an attractive ‘typical’ case for study for several reasons. First, from either a violence or costly signaling understanding of terrorist behavior, aviation presents an enticing target to terrorists. From a violence perspective, bombs of more than minimal size that are set off aboard planes in midflight tend to bring the entire plane down, guaranteeing a certain (relatively large) number of deaths, while planes that are hijacked and flown into buildings (as happened on 9/11) can become extremely large bombs, resulting in the deaths of more people than would be possible with any other non-CBRN attack. But aviation targets are also attractive symbolic and/or economic targets, inasmuch as they are both symbols of a country’s modernity and economic wellbeing, and subject to disproportionate economic damage due to the susceptibility of air travel to disruption and, in the US, the hub-and-spoke structure of the nation’s aviation system, resulting in cascading failures after an attack at a hub.

As a case, aviation is also useful because aviation targets have been subject to progressive hardening since 9/11, with successive introduction of the Transportation Security Administration (in the US), behavioral detection officers, air marshals, X-rays and hand checks for checked baggage, explosive trace detection, ‘enhanced’
patdowns, extreme limitations on liquids, and full body scanners. The proliferation of checkpoints in the same general category of targets allows over-time comparison of how the same (general) terrorist organization’s view of aviation targets has changed in the past ten years.

In this section, we thus look at three major al-Qaeda-related plots against aviation targets – Richard Reid’s ‘shoe bomb’ plot in 2001, Umar Farouk Abdulmutallab’s ‘underwear bomb’ plot in 2009, and the cargo plane plot of 2010. The plots took place during a period of increasingly strict aviation security measures. If the costly signaling approach is correct, we would expect to find three related results in the presence of the dramatic increase in aviation security since 9/11. First, there should be an awareness by al-Qaeda of the state’s efforts to harden aviation targets and the costs that are imposed on the population, and what an attack signals about al-Qaeda. Second, the value to al-Qaeda of failure close to the target should have increased as the number of checkpoints has increased. Finally, the menu of potential ‘successful’ outcomes as claimed by al-Qaeda should have expanded as aviation has become an increasingly hardened target.

Richard Reid (2001)

On December 22, 2001, Richard Reid unsuccessfully attempted to blow up American Airlines Flight 63 by igniting explosives that he had hidden inside the soles of his shoes. The flight had originated in Paris and its final destination was Miami; however, due to the attempted attack, it was escorted to Boston by F-15 fighter jets.\(^{34}\) Reid had actually intended to board a different flight from Paris to Miami on December 21, 2001. He purchased his original ticket with cash and did not check any bags.\(^{35}\) However, on the day of his flight, Reid was identified for additional screening,
apparently due to suspicions about the authenticity of his British passport (which Reid had obtained in Belgium three weeks prior). Although he ultimately was cleared to fly, the extensive questioning caused him to miss his flight.\textsuperscript{36} When Reid came back the next day, he was once again identified as a suspicious passenger. Reid was swiped with a metal detector wand, and his carry-on bag was hand-checked. This time, he made it onto the plane in time.\textsuperscript{37}

Two hours into the flight, some of the passengers reported smelling smoke. Hermis Moutardier, one of the flight attendants, walked the aisles to identify the source and noticed Reid trying to light a match. Moutardier reprimanded Reid, and he assured her that he would stop. A few minutes later, however, Moutardier once again spotted Reid bending over his seat and trying to light a match. As she moved closer, she realized that he was not trying to light a cigarette but rather was attempting to detonate his shoe. As Moutardier tried to hold him back, Reid pushed her away, but was eventually sedated and restrained by Moutardier and a team of passengers and flight attendants.\textsuperscript{38}

Following Reid’s arrest, US officials linked Reid with al-Qaeda.\textsuperscript{39} Although Reid penetrated security and boarded the plane, Al-Qaeda’s never touted the plot as a success. Al-Qaeda as an organization did not formally take responsibility for the attempted bombing in its aftermath, although during a military tribunal after his capture, Khalid Sheikh Mohammed claimed he orchestrated the shoe bomber plot, testifying that, ‘I was responsible for Shoe Bomber Operation to down two American airplanes.’\textsuperscript{40} This does not mean that al-Qaeda was happy with the outcome of the operation. In fact, Mohammed perceived Reid as ‘trouble,’ a liability who had been forced on him when Reid’s previous handler, Mohammed Atef, was killed in a US military strike in Afghanistan. ‘I was given all his crap,’ Mohammed stated to the FBI.
When Mohammed first met Reid, he told him to shave, to which Reid replied, ‘I’ve been a drug dealer.’ Mohammed was shocked by Reid’s amateurism, stating, ‘Whether you are picked up for being a drug dealer or a terrorist, you still end up in jail.’

From Al-Qaeda’s muted response following the attack and Mohammed’s negative recollection of his experience working with Reid, the value that al-Qaeda derived from the failed plot appears to have been minimal. In fact, given the rather low quality of the suicide bomber actually used and what it signaled about al-Qaeda’s diminished strength just a few months after the nearly flawless 9/11 operation, Richard Reid’s failure might even be viewed as a liability for al-Qaeda. At the time of the Richard Reid plot, aviation security awareness in the US was heightened due to the 9/11 attacks just months before. The proliferation of security checkpoints that would characterize the years to come, however, had not yet come into existence. The Transportation Security Administration had been created by statute in November 2001, but the first TSA administrator was not confirmed until January 2002, and TSA remained a part of the Department of Transportation until the creation of the Department of Homeland Security in 2003. Given that security checkpoints around aviation targets, and the institutional arrangements to support them, had not yet begun to proliferate, either in reality or in the eyes of al-Qaeda, it seems that al-Qaeda’s primary understanding of success was still centered around causing massive physical damage (with its follow-on economic effects), as it had with 9/11.

The next eight years saw a fundamental change in the nature of aviation security policy in the US and many allied countries (notably the United Kingdom). Following the Richard Reid plot, passengers were forced to begin taking off their shoes for examination. Particularly after it was transferred to the Department of
Homeland Security in March 2003, TSA drastically expanded pre-existing programs or introduced new programs to station federal air marshals on aircraft, x-ray and hand-check checked baggage, check travel documents, remotely monitor the behavior of passengers in airport terminals, and maintain massive traveler no-fly and watch lists.\textsuperscript{42}

Security measures began to proliferate even more visibly after August 9, 2006, when British authorities arrested 24 suspects in connection with a terrorist plot to blow up at least seven transatlantic flights with liquid explosives.\textsuperscript{43} The suspected bombers had had planned to smuggle the explosives onto the plane by hiding them in their carry-on luggage. The hydrogen peroxide-based liquid explosives were to be disguised as beverages and the detonators as batteries and flashbulbs.\textsuperscript{44} The disruption to air travel and the changes to security procedures in the wake of the failed plot were massive: in the days after the arrests, thousands of flights entering or leaving London were cancelled, passengers were delayed for days (requiring tents to be set up at the airports), and British Airways cancelled 1280 flights and absorbed costs of £40 million.\textsuperscript{45} The US and the UK initially banned any carry-on liquids at all, later ‘relaxing’ the regulations to permit up to three 100-ml bottles in 1-lite plastic bags. If 9/11 was the catalyst for the growth of the global aviation security regimen, the liquid bomb plot was the accelerant, showing to al-Qaeda not only how the US and its allies reacted to even failed bombing plots, but also that the proliferation of security procedures themselves had costs for al-Qaeda’s adversaries.

\textit{Umar Farouk Abdulmutallab (2009)}

Three years later, al-Qaeda (specifically al-Qaeda in the Arabian Peninsula) tried again. On December 24, 2009, Umar Farouk Abdulmutallab, a twenty-three year
old Nigerian man, boarded Northwest Airlines Flight 253 for Detroit in Amsterdam. In the middle of the flight, Abdulmutallab left his seat for twenty minutes to use the bathroom. He returned to his seat, told his seatmates he had an upset stomach, and covered himself with a blanket. As the flight prepared to land, Abdulmutallab attempted to ignite an explosive device, containing 80 grams of pentaerythritol tetranitrate (PETN)—enough to blow a hole in the side of the plane. However, the device, which had been sewn into his underwear, failed to fully detonate. Instead, witnesses heard popping noises similar to firecrackers, smelt a burning odor, and saw Abdulmutallab’s pants leg and an airplane wall catch on fire. Crewmembers and passengers restrained Abdulmutallab and put out the fire.

Abdulmutallab had taken a roundabout path, passing through security in a number of airports before eventually arriving in Detroit. On August 4, 2009, he arrived in Yemen, where he enrolled at the Sanaa Institute for the Arabic Language and met with AQAP leaders. On December 7, he flew to Addis Ababa, Ethiopia and stayed there for two days. From there, he flew to Accra, Ghana on an Ethiopian Airlines flight, arriving on December 9. On December 16, at the KLM office in Accra, Abdulmutallab purchased a Lagos-Amsterdam-Detroit ticket for US$2,831 in cash with a return date of January 8.

On December 24, he took a one-way flight from Accra to Lagos, Nigeria on Virgin Nigerian Flight 804. When he landed, his passport was scanned ‘on entry’ at 20:08, according to Nigeria’s Information Minister, and scanned a second time at 20:35 as he boarded his flight to Amsterdam. His US visa, which was not set to expire until June 2010, was also successfully scanned, without triggering any objections from the Advance Passenger Information System. Nigeria’s Information Minister explained that Abdulmutallab was ‘able to connect that fast because he was not
checking in any luggage. The head of Nigeria’s Civil Aviation Authority added, ‘The passenger did not check in any baggage but was spotted with a shoulder bag. He went through a normal screening and check-in process. Although Nigeria possessed four full-body scanners, Abdulmutallab only encountered a metal detector and x-ray screening machine.

Abdulmutallab then took KLM Flight 588 to Schiphol Airport in Amsterdam, landing early Christmas morning, before transferring to Northwest Flight 253 to fly to Detroit. At Schiphol, he also passed through security without any trouble. Dutch authorities stated that Abdulmutallab had carried a valid Nigerian passport and held a valid U.S. visa, and that his name did not appear on any Dutch list of terror suspects. He reportedly also underwent a ‘security interview and check and did nothing unusual in his three-hour stopover.’ In total, Abdulmutallab had passed through security in three airports (Accra, Lagos, and Amsterdam) immediately before getting on the flight for Detroit, and, if Addis Ababa and Sana’a were included, five airports all told.

Cargo plane plot (2010)

As with the liquid bomb plot, defensive security measures again proliferated in the wake of the Abdulmutallab plot: the UK and the Netherlands announced plans to make full body scans compulsory, and the US government ordered hundreds of full body scanners in response to the attack. In the autumn of 2010, the US government began implementing more widespread use of full body scanners and started physically intrusive patdowns of passengers (regardless of whether they went through the full body scanners or not).

On October 28, 2010, the US and several other countries began frantically searching arriving flights after receiving an intelligence tip from Saudi Arabia that al-
Qaeda may have placed bombs on cargo flights (Mazzetti and Worth, 2010). Early on the morning of October 29, police officers at the East Midlands Airport in the United Kingdom identified a suspicious package in the hold of a UPS cargo plane that had arrived from Cologne, Germany. The package had been carried on a passenger plane from San’a, Yemen to Dubai, United Arab Emirates, before being transferred to Cologne on a cargo plane. It contained an HP LaserJet P2055 printer with a cartridge that appeared to have been physically altered, having protruding wires and traces of white. However, after forensic experts tested the package with explosives-detection equipment and utilized sniffer dogs, they concluded that the printer did not contain any explosives, and the flight was allowed to continue on to Chicago via Philadelphia.

Meanwhile, at the Dubai International Airport, another suspicious package containing an identical printer was found onboard a FedEx cargo plane, and triggered explosive detectors. The package had already travelled on two separate Qatar Airways planes—from San’a to Doha, Qatar, and then from Doha to Dubai. The printer cartridge in the Dubai package contained 11 grams of PETN, and was wired to a circuit board from a mobile phone without a SIM card, indicating it was a time bomb.

When officials in the UK heard of the Dubai package, they requested the police double-check the packages on the UPS plane. After re-examining the printer, officials uncovered a hidden device, which indeed tested positive for explosives. It was also designed to be set off by a timer, which would have sent an electric charge to a light-emitting diode that would have triggered an acid igniter in a plastic syringe. The syringe would, in turn, detonate the 14 ounces of PETN.
Following the discovery of the bombs, President Barack Obama and other officials suspected that (AQAP) was responsible. One week later, AQAP issued an official statement claiming responsibility for both bombs. Unlike with Richard Reid, al-Qa'eda was not shirking responsibility for this plot.

Al Qaeda in the Arabian Peninsula’s perspective of the attacks

An examination of al-Qa'eda in the Arabian Peninsula’s statements and materials produced after the 2009 and 2010 plots reveals how AQAP justified the plots and their choice of hardened aviation targets, how it evaluated the plots’ success (or failure), and whether the escalating aviation security measures since 9/11, and especially since the liquid bomb plots of 2006, have had any effect on their perception of aviation targets. If a violence-based understanding is correct, we would expect the failure of either plot to kill anyone to play some role in al-Qa'eda’s evaluation of its efforts. If the costly signaling understanding is more applicable, we would expect al-Qa'eda’s statements to reflect an awareness of defensive measures, and an evaluation of the role they play in changing al-Qa'eda’s thinking about (and valuation of) hardened aviation targets. This is indeed the case.

First, in stark contrast with Richard Reid, who killed exactly as many people as Umar Farouk Abdulmutallab, Abdulmutallab was lionized in subsequent al-Qa'eda statements. Four days after Abdulmutallab was arrested, AQAP issued a statement to claim responsibility for the plot, calling Abdulmutallab ‘heroic.’ Al Qaeda continued to reinforce the bravery of Abdulmutallab in statements they issued throughout 2010. In an audiotape released in January 2010, Osama Bin Laden compared Abdulmutallab’s heroism to the heroism exhibited by the 9/11 suicide bombers. Two months later, in another audiotape, Sheikh Abi az-Zubeir Adel al-
Abbab of AQAP stated, ‘O Muslims, we must ponder the act of our brother, the hero [Christmas Day bomber] Omar al-Farooq [Abdulmutallab] al-Nigeri, who suffers for the pains of the Muslims, as he didn’t enjoy food or water, and his eyes hadn’t enjoyed sleep until he avenged his brothers.’ Likewise, in the Summer 2010 edition of *Inspire*, AQAP’s online English magazine publication, a contributor writes, ‘It is true that ‘Umar al-Fārūq and his brothers Nidāl Ḥassan and Shahzād were imprisoned, but they have become heroes and icons that are examples to be followed.’

Second, al-Qaeda argued following both the 2009 and the 2010 plots that the pervasiveness of security institutions in the US since 9/11 exacerbates the fear that spread among the American population when terrorists partially penetrate the security apparatus. On March 17, 2010, Sheikh Anwar Al-Awlaki issued a message to America, challenging the US to reflect on how their lives have been changed by terrorism. He started by asking, ‘Do you remember the good old days… when you were oblivious to any threats?’ Moreover, in an interview, al-Qaeda spokesman Abu Basir declared that some of the ‘fruits of the operation’ were, first, ‘the fear which has spread throughout airports and security institutions has revealed to American people that its security institutions are not to be counted on’ and, second, ‘delivering fear to the American people and creating a balance in fear and that security is not something that the government of Obama can control.’

Mirroring Al Qaeda’s post-attack statements following the 2009 plot, statements issued after the cargo bomb plot also reflect Al-Qaeda’s belief in the ability of a failed attack that nonetheless bypasses security measures to spread fear. Yahya Ibrahim, for instance, states that the ‘success of the operation’ would be based on ‘the spread of fear that would cause the West to invest billions of in new security procedures.’ And according to Shaykh Ibrahim Al-Banna, the former intelligence
chief of AQAP, the cargo bombs, despite their failure to detonate, ‘succeeded in striking fear in the hearts of the disbelievers.”

Third, al-Qaeda has recognized the immense costs to the US of increasing security measures around aviation targets, and has expanded its declared criteria for success to include forcing the US to sink even more money into aviation security, thus burdening the US and its allies economically. Notably, burdening the US economically through attacks on hardened targets does not require any actual dead bodies. After the 2009 plot, for instance, Al-Awlaki claimed, ‘Our brother Omar Farouk has succeeded in breaking through the security systems that have cost the US government alone over $40 billion since 9/11.” Several days later, Al-Awlaki issued another statement, reiterating America’s inability to defeat terrorism with money. He observed, ‘The US has spent billions to protect its airlines but they couldn’t prevent Umar Farouk.” Abu Basir issued a similar statement: ‘All praise is due to Allāh, the operation of ‘Umar al-Fārūq – may Allāh hasten his release – is a strong blow to the coffin of the American economy and is a slap in the face of the American security apparatus.”

Statements issued after the cargo bomb plot reinforce how al-Qaeda derives value from the penetration of the U.S.’s expensive technological defenses and the forced implementation of even more costly security measures. In AQAP’s third issue of Inspire, their Head of Foreign Operations contends that passing its bombs through security measures will force the U.S. to ‘spend billions of dollars to inspect each and every package in the world.’ The article continues:

For the trade between North America and Europe air cargo is indispensable and to be able to force the West to install stringent security measures sufficient
enough to stop our explosive devices would add a heavy economic burden to an already faltering economy. We knew that cargo planes are staffed by only a pilot and a co-pilot so our objective was not to cause maximum casualties but to cause maximum losses to the American economy.89

Significantly, levying economic costs is juxtaposed with the imposition of physical costs. Causing the U.S. to spend money on defensive measures is not of small value to al-Qaeda, and proliferating security measures around aviation targets can, given aviation’s importance to Western economies, actually provide more value to al-Qaeda than a plot to kill people would.

There is also evidence that Al-Qaeda derives value from the (increasing) ratio between al-Qaeda’s costs in planning and carrying out attacks on aviation targets, and US costs in attempting to stop al-Qaeda’s attacks through defensive measures. The indirect costs that come from attempting to harden targets against al-Qaeda attacks are among the primary desired outcomes of its plots against aviation targets. Following the 2009 plot, Al-Awlaki repeatedly pointed to the high ratio of US defensive security costs to al-Qaeda’s expenditures.

9/11, the war in Afghanistan and Iraq, and then operations, such as that of our brother Omar al-Farouk, which could have not cost more than a few thousand dollars, end up draining the US Treasury [of] billions of dollars, in order to give Americans a false sense of security.90

Moreover, he drew attention to a memo authored by US Secretary of Defense Donald Rumsfeld which noted ‘the cost-benefit ratio is against [the US]! Our cost is billions
against the terrorists’ costs of millions.\textsuperscript{91} Al Qaeda was even more explicit in highlighting its favorable cost-benefit ratio after the cargo bomb attack. Ibrahim stated:

‘This supposedly ‘foiled plot,’ as some of our enemies would like to call, will without a doubt cost America and other Western countries billions of dollars in new security measures. That is what we call leverage….three months of work for a team of less than six brothers would end up costing the West hundreds of thousands, if not millions, of hours of work in an attempt to protect itself from our packages of death.’\textsuperscript{92}

Al Qaeda can use minimal inputs — spending only US$4200 on the cargo bomb plot — to generate massive value by forcing the U.S. to spend billions in response.\textsuperscript{93} In general, as US spending on defensive measures has risen and checkpoints have proliferated, al-Qaeda has come to the conclusion that hardened target attacks that fail to result in detonations can cause nearly as much economic damage, and produce just as much propaganda value, as those that do. Whether or not this is empirically true, the proliferation of security checkpoints around aviation targets augments al-Qaeda’s perceived ‘bang for its buck’, in both propaganda value and economic damage for a given attack. Airports and airplanes can be attractive targets, in other words, because the state’s defensive measures maximize value for the terrorist group relative to the cost of its plots.

Fourth, in situations where the number of security checkpoints is proliferating, al-Qaeda’s menu of successful outcomes in attacks against hardened targets has expanded to include not only successful detonations, the imposition of economic costs,
and increased relative cost ratios, but also showcasing its ability to outmaneuver defensive technology and pass through checkpoints, up to and including detonation.

Through its post-attack statements since 2006, al-Qaeda has shown an acute awareness of the various layers of airport security, in terms of both the sheer number of checkpoints and in the technology used, and has moved away from detonation as the ultimate (and only) definition of success. In the 2009 plot, for example, AQAP spokesmen pointed out how many security checkpoints Abdulmutallab successfully breached at not just one, but five, international airports. They also noted that ‘all the devices and modern advanced technology’ failed to detect the bomb. For his part, Anwar al-Awlaki reflects on how the layers of airport security have multiplied since 9/11 (thus imposing costs on the US population).

I remember a time when you could purchase an airline ticket from the classified section of your local or college newspaper and use it, even though it was issued to a different name, because no one would bother asking you for an ID before boarding a plane. No long lines, no elaborate searches, no body scans, no sniffing dogs, no taking off your shoes and emptying your pockets. You were a nation at ease.

Al Qaeda’s awareness of aviation security measures extends beyond passenger aircraft (and their bevy of potential casualties), as illustrated by the cargo bombs plot. In fact, AQAP was aware of the layers of security the cargo packages would encounter prior to attempting the attack, and was confident that its bombs would pass through all layers (which they did). As the Head of Foreign Operation writes:
We have researched the various security systems employed by airports. We looked into X-Ray scanners, full body scanners, sniffing dogs and other aspects of security. The resulting bomb was a device that we were confident that, with the will of Allah, it would pass through the most stringent and up-to-date security equipment…The packages were inspected at the FedEx office (the deliverer reported to us that there was no checking at the UPS), they passed through the X-Ray machines at Sana’a airport, and went through the other procedures required by cargo companies. Both devices were not detected.\textsuperscript{97}

Notably, al-Qaeda here conflates security measures for passenger planes with those for cargo shipments. Even though a plot to bomb cargo planes is specifically taking advantage of the smaller number of checkpoints for cargo shipments, al-Qaeda is attempting to derive propaganda value from getting past the security measures imposed on aviation as a whole, including on passenger aircraft. To back its claims of technical ingenuity, following the cargo bomb plot, Ikrimah Al Muhajir, a member of AQAP’s ‘explosives department,’ wrote an entire article on the technical aspects of the operation, explaining how the plotters were able to pass through metal detectors, explosive trace detection, X-ray machines, and visual inspections in constructing the laser printer toner cartridge bombs.\textsuperscript{98} The more checkpoints al-Qaeda is able to demonstrate that it has compromised, the more capable the group appears. As security checkpoints proliferate, in other words, al-Qaeda’s ability to demonstrate its ingenuity also increases.

The expanded menu of successful outcomes is directly shown by AQAP’s own definitions of success following the cargo bomb plot. In his article, Ibrahim
stated, ‘The success of the operation was to be based on two factors: The first is that the packages pass through the latest security equipment. The second, the spread of fear that would cause the West to invest billions of dollars in new security procedures.’ While it is important not to read too much into AQAP’s exclusion of physical destruction from its list of operational goals – clearly the group put in the time and effort to create bombs that were supposed to detonate – the group’s statement does suggest that the existence of extensive security measures has presented it with opportunities for success short of detonation. Indeed, it is hard to imagine that AQAP would have created and released the November 2010 special edition of *Inspire*, devoted entirely to the cargo bomb plot, if it placed no value in anything but detonation.

The purported value of penetrating all security layers is also, according to al-Qaeda statements, only marginally less than that of successful detonation at the target, suggesting that al-Qaeda’s cumulative value curve in the presence of multiple levels of security is concave, not, as the violence-based approach would suggest, heavily convex. As Ibrahim explains, ‘It is true that blowing up the planes in the sky would add to the element of fear and shock but that would have been an additional advantage to the operation and not a determining factor of its success.’ Likewise, the Head of Foreign Operations notes that, ‘In our discussions prior to the operation we set the passage of explosive devices from any airport as a benchmark of success. For us, blowing up the planes would have made us very pleased but according to our plan and specified objectives it was only a plus.’ Al Qaeda in essence has incentives to continue to attack targets protected with a plethora of defensive security measures because the security measures themselves are nearly valuable as ‘targets’ as the final (hardened) target itself.
Conclusion

While using a single case study, even over time, to investigate the plausibility of a theory has severe limitations, our findings in this article suggest a number of theoretical and policy implications. In theoretical terms, the debate about the effectiveness of proactive versus defensive counterterrorism policies may be misguided. There are significant downsides to defensive policies. If we see terrorism and counterterrorism as a series of messages sent between a terrorist group and its adversaries, particularly the state, defensive measures such as hardening targets are part of those strategic communications, and the reactivity inherent in target hardening itself sends signals to the terrorist group, even if no one directly dies from the state’s policies (as with military action). Defensive measures themselves can be provocative to terrorist groups, drawing them into an ‘arms race’ with the state that the state cannot win, since the terrorist groups are deriving value regardless of whether their attacks on hardened targets result in substantial casualties. While some targets, such as political figures or embassies, are inherently symbolically valuable targets, it is possible for the state to unintentionally inflate the value of some targets by proliferating security measures around them. One interpretation of al-Qaeda’s shift in its perceptions of aviation since 9/11 is that it did originally have a violence-based understanding of attacks on aviation, with the imposition of maximum casualties as the very definition of success (and indeed, with no or few checkpoints, a violence-based understanding and a costly signaling understanding are functionally the same). However, when al-Qaeda saw the disruption caused by Richard Reid and later the liquid bomb plot, both directly and through increasing security measures, it moved
toward a costly signaling understanding of aviation targets. Target hardening, in other words, can increase the attractiveness of signaling attacks.

Our article also has policy implications. With regard to aviation security in particular, given al-Qaeda’s shift in its perceptions since 9/11, in retrospect the creation of the Transportation Security Administration in the US was a mistake. In addition, the reactive nature of much of aviation security since then, notably the increasing restrictions imposed after every failed attack, have not communicated the messages that many policymakers seem to think, and have aided terrorist groups in communicating theirs. The obsession of many countries with technological defensive solutions in aviation security, such as biometric passports, watch lists, and full body scanners, has put them in an arms race with al-Qaeda (and other terrorist groups) that has merely put aviation targets more firmly in the cross-hairs for those seeking symbolically meaningful ‘spectacular’ attacks.

More generally, while there is some benefit in hardening a target, inasmuch as it decreases the probability of a successful attack, or raises the cost to a terrorist group of attacking, after a certain point, the marginal benefits of such a policy decrease rapidly, and any additional costs are borne by the state and its citizens, not the terrorists. This is not only because of the probable increasing marginal costs of hardening the target relative to the risk reduction\textsuperscript{102}, but also because of the rise in the symbolic value of the target to terrorist groups. States as a result should think long and hard about whether they want to start down the path of hardening a previously soft, unremarkable target.

A wise policy would involve choosing the lowest hanging fruit in terms of defensive measures (such as, in the 1960s, the introduction of metal detectors in airports), and then devoting more resources to intelligence and disrupting terrorist
organizations’ command and control, training, and logistical networks at strategic points before they get to the targets. The idea of the importance of intelligence in counter-terrorism is not new (having been discussed extensively in both the European and American contexts): intelligence gives counter-terrorists insights into the structure, behavior, and reasoning of terrorist groups and allows effective proactive measures. Our findings suggests that an emphasis on intelligence is also important because it avoids needlessly heightening the value to the terrorist group of any particular target, while at the same time it decreases the terrorist group’s ability to attack that target. Unlike excessively hardened targets, as long as intelligence operates within the bounds of law in a democratic society, it can only make terrorists’ jobs more difficult.


Hoffman and McCormick (see note 5), 247.

Ibid.

Ibid.


Berman and Laitin, (see note 2), 12; Hoffman and McCormick (see note 5), 262.

Berman and Laitin (see note 2), 23.


Berman and Laitin (see note 2).


Brandt and Sandler (see note 1).


19 Hoffman and McCormick (see note 5); Abrahms (see note 3); Arce and Sandler, "Terrorist Signalling and the Value of Intelligence" (see note 5); Daniel G. Arce and Todd Sandler, "Terrorist Spectaculars: Backlash Attacks and the Focus of Intelligence," Journal of Conflict Resolution 54, no. 2 (2010): 354–73.

20 Frey and Luechinger (see note 9).


23 Frey and Luechinger (see note 9).

24 Todd Sandler and Kevin Siquiera, "Games and Terrorism: Recent Developments," Simulation & Gaming 40, no. 2 (April 2009): 164-92; Zhuang and Bier (see note 15); Bier, Oliveros, and Samuelson (see note 15).


27 Abrahms “Why Terrorism Does Not Work” (see note 3).


30 Transportation Security Administration (see note 25).


32 Kydd and Walter (see note 4).
33 Jason Seawright and John Gerring, "Case-selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options," *Political Research Quarterly* 61, no. 2 (June 2008): 294-308.


37 Stark (see note 36).


42 Transportation Security Administration (see note 25).


51 Lipton and Shane (see note 47).

52 David Cutler, "TIMELINE-Where was Abdulmutallab?" Reuters, January 12, 2010.


56 Childress (see note 54).


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Dodd, Milmo, Norton-Taylor, and McGreal (see note 71).


Al-Awlaki, “Sheikh Anwar Al-Awlaki Message to the American people” (see note 82).


Al-Malahem Staff (see note 83).

90 Al-Awlaki, “Sheikh Anwar Al-Awlaki Message to the American people” (see note 82)

91 Anwar Al-Awlaki, “Western Jihad is Here to Stay” (see note 87)

92 Ibrahim (see note 84), 15.

93 Ibid.


95 Al-Qaeda in the Arabian Peninsula (see note 78), 2.

96 Al-Awlaki, “Sheikh Anwar Al-Awlaki Message to the American people” (see note 82).

97 Head of Foreign Operations (see note 89), 7.


99 Ibrahim (see note 84), 15.

100 Ibid.

101 Head of Foreign Operations (see note 89), 7.

102 Mueller and Stewart (see note 21).


105 Gregory F. Treverton, Intelligence for an Age of Terror (Cambridge, UK: Cambridge University Press, 2009).