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Complexity, Lethality, and the Perverse Imagination: Modelling Nonstate Actors' Means of Attack

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ABSTRACT

In the pursuit of security, state actors presume a linear relationship between the lethality and complexity of various means of attack. They deploy resources and research programs to overcome the inherent or “analytic” complexity of increasingly lethal means of their own (think of programs to develop nuclear weapons and other highly lethal munitions), and they impose security, legal and regulatory regimes to increase the imposed or “synthetic” complexity opponents must overcome to appropriate or adopt the means they develop. Nonstate actors such as terrorists overcome the challenges of complexity by imaginatively seeking new ways to operate in an alternative high lethality/low complexity space. The perversity of their imagination allows them to conceive of means of attack beyond the pale for state actors, leaving states initially unprepared to defend against them. Car bombs, vehicle ramming and small arms attacks on dense crowds, and iconic attacks such as 9/11 are examples of nonstate actors successfully operating in the high lethality/low complexity space. Successful attackers will continue to do so in ways that state actors fail to imagine and protect against, especially when the prevention of low-complexity attacks traditionally falls on local governments with fewer resources, and they employ means that do not have especially suspicious signatures. The deployment of weaponized drones against crowds and other soft targets may indicate one of the evolutions of this operational space. State security requires fully understanding the imagination of the nonstate actor, but good governance requires balancing the necessary thinking and preventive measures with the freedoms of a state not burdened by such a perverse outlook.

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Some terrorist or mass casualty attacks shock and confound us for reasons beyond the death and carnage they wrought. The 9/11 attacks are one of the best examples: hijacked commercial airplanes full of victims and jet fuel rained down from the sky, toppled two of the world's tallest and most iconic buildings, destroyed a portion of the Pentagon and killed thousands of people. It is hard to think of another way terrorists could have killed so many people so quickly and in such a horrifying fashion. One way to think of what happened on 9/11 is that beyond the shock of an attack on noncombatants in a civic space, substate actors upended what we assume is a steady and basically linear

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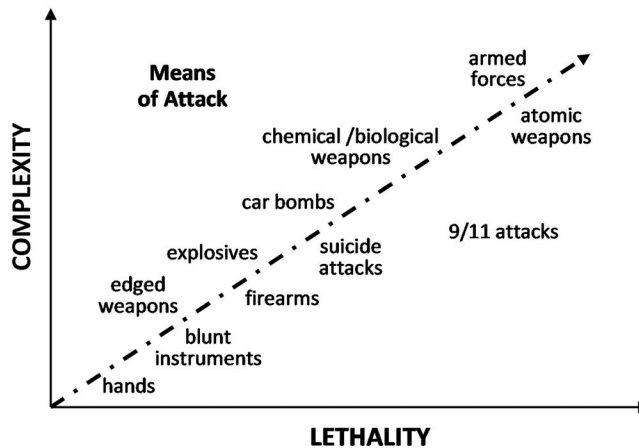


Figure 1. The prevailing linear relationship between the complexity and lethality of means of attack.

relationship between the complexity of a means of attack and the lethality it yields. At its deepest and most intuitive roots, we assume this relationship exists because destruction requires unleashing latent energy, and the methods necessary to unleash it on a range of suitable targets become more complex and demanding as an attacker's aspirations grow. This logic bears itself out in most methods of attack: it takes a more effort and coordination to kill more people than fewer, and as means more become lethal, they also become more complicated to execute (Figure 1).

But 9/11 reminds us that every once in a while, we are shocked and surprised by a gross deviation from this relatively comforting and predictable linear relationship, with its related ability to deploy deterrents and countermeasures accordingly. For the price of basic flying lessons, boarding passes and box cutters, terrorists were able to avail themselves of an extraordinarily lethal means of attack and use it to great effect. It took considerable planning and coordination for the attack to succeed, granted, but its results went far beyond the investment in people, training and equipment it required. To achieve the same results by adhering to the linear relationship above would require the efforts of a small standing army.

This research note will explore how these deviations from linearity are an essential feature of the most successful terrorist attacks. It will draw a theoretical distinction between two types of complexity, analytic and synthetic, that apply to all the relevant actors: one is the inherent complexity of an act, and the other is the complexity we impose on it via regulation and security measures in order to prevent its propagation. It suggests that states will naturally occupy the space where highly complex and lethal means are at their disposal (think of their armed forces), but argues that the very nature of state security, which involves solving successively more complex problems to deliver increasingly lethal threats, breeds an inherent tension between the two types of complexity that does not apply to the terrorist. After developing four conceptual zones of complexity and lethality, it identifies the high lethality/high complexity space as the one naturally sought by state actors, which rely on research, development and resources to get there. In contrast, substate actors and terrorists, deprived of the wealth and resources available to a state, use creativity, ingenuity and a perversity of the imagination to enter the high lethality/low complexity space.

We conclude that the simplest and most lethal attacks by substate actors are made possible not by advances in their ability to master analytic complexities, by this perversity of the imagination. It habitually places state actors at a disadvantage because they do not reliably occupy the same mental space as their terrorist opponents, and a civil society that is structured to anticipate and deter the worst types of attacks would become one where this perversity enters people's consciousness as fear and paranoia, to its great detriment.¹

Two Concepts of Complexity

We can think of the complexity of any violent attack in two distinct ways that allow us to compare how state and substate actors view the challenges and opportunities they afford. Philosophers of metaphysics distinguish between qualities that are inherent in something by its nature, and qualities that something has because we imbue them with it.² “Police officers are law enforcement” is an example of an analytic statement, and “Mary is a successful police officer” is a synthetic one. This distinction might not carry over into the study of terrorism with the precision desired by philosophers, but it can still be usefully applied to the complexity of a means of attack:

- *Analytic complexity* can be thought of as how *inherently* complex a process is. Splitting atoms to harness their explosive energy and delivering the device that does so to an intended target will always be harder than finding a rock or stick to use as a weapon, which is harder still than attacking someone with your bare hands. Piloting an airplane into a building will always be more complex than walking into one with a gun, even if a terrorist is convinced that it is not as hard as it may first seem. A way to think of analytic complexity is as a ranking of means of attack from least to most complex, assuming there was no regulatory, security or legal regime to affect the difficulty of the undertaking. Advances in technology may make analytic complexities easier to overcome, but it does not make something less inherently complicated.
- *Synthetic complexity* is how complex a means of attack is because people and their systems have made it so. Regulation is an example of synthetic complexity: gun control takes a simple economic transaction and makes it harder for some people and impossible for others. On the other side, industry lobbyists such as the National Rifle Association push back against synthetic complexity for the sake of economic interests. Some would argue that personal freedoms matter too, and this can be seen as a moral or political argument against certain synthetic complexities. One of the efficiencies of an unregulated market is that it will seek to overcome the analytic complexity of delivering a product that is in sufficient demand, and then, resist or reduce the synthetic complexities that impede or regulate it. In terms of routine activities theory, reducing the suitability of a target by hardening it or introducing a capable guardian, adds synthetic complexity to an attack. What weapons and materials manufacturers will and won't sell to whom, the laws around who can own them, and the means by which we guard them from theft—as well as the efforts we put into investigating misappropriation—are all ways in which we add synthetic complexity to an endeavor, on top of simple defensive and deterrent

measures. Finally, investigative and intelligence authorities such as CIA, FBI and local police departments create synthetic complexity by seeking and following up on leads about possible terrorist planning and activity, forcing terrorists to conduct their planning clandestinely, with the complications this entails.

The Analytic/Synthetic Paradox of State Security

There is an inherent tension in state security, in that states have an interest in overcoming analytic complexities to avail themselves of the most powerful means of attack and defense possible, and then, find themselves seeking to impose synthetic complexities on delivering these means, in order to prevent them from being appropriated by their opponents. In this way, states gain an advantage by using their extensive resources to master analytic complexities, and then, maintain them by introducing synthetic ones.

The paradigm case is the atomic bomb. The effort that the United States put into developing it was unprecedented in harnessing science in the name of state security, and its success hastened the end of the most horrific war in human history. Then, two things happened. First, the means became more accessible to a range of nations as the analytic complexity of making atomic bombs was overcome by their own advances in science and technology or, alternatively, other nations' ability to appropriate existing ones by espionage or agreement. As a result, a longstanding and high-stakes arms control regime was formulated to limit the ability for unstable or dangerous nations to obtain atomic weapons. In addition to regulatory regimes, atomic weapons are safeguarded using a physical security apparatus of extraordinary strength and complexity. Together, arms control and physical security aspire to be an insurmountable web of synthetic complexity to control the proliferation of nuclear weapons.³

The same type of tension can be seen in the development of chemical and biological weapons, and to a lesser extent it can be seen in the storage and regulation of the commercially available precursor chemicals that can be used to make powerful explosives (e.g., the ammonium nitrate fertilizer, nitromethane and diesel fuel used by domestic terrorists to destroy the Alfred P. Murrah federal building in Oklahoma City in 1995).⁴ We can therefore think of states as entities in constant tension with themselves as they seek hard power: they spend their time overcoming analytic complexities in the ways they amass and deploy force, while constantly imposing synthetic complexities on these means so as not to lose the superiority that comes with them. If history is any indication, synthetic complexities are never as robust as their analytic counterparts. The former succeed as a result of cooperation, vigilance and all of the other factors that keep regulatory regimes in place, or that make physical security systems formidable, but the latter can only be surmounted by science and engineering.

The Four Conceptual Zones of Lethality and Complexity

Figure 1 can be divided into four zones, two of which adhere to our intuitions about the relationship between lethality and complexity, and two of which require further discussion (Figure 2). One of them is the zone in which the scope and contours of state power and substate terrorism are decided.

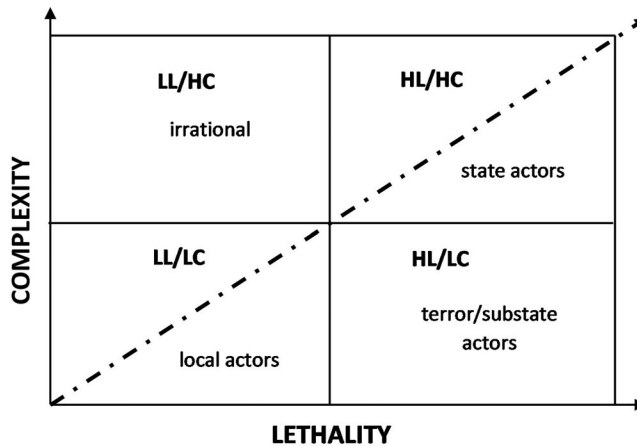


Figure 2. The four quadrants of the complexity/lethality relationship.

1. **Low lethality/High complexity (LL/HC).** It is difficult to work in this zone, irrational to seek it out and actors seek to place their opponents in it whenever possible. Routine activities theory goes far in explaining the logic: security and countermeasures can make a means of attack much more complex than it would otherwise be, maybe insurmountably so, and harden targets to the point the even a highly complex attack would cause very little damage. The defensive measures around foreign embassies in hostile nations come to mind as illustrative. Releasing a biological weapon that is easily defeated by a vaccine or cure is another example. As a trope in popular culture villains devise extremely sinister and complex ways to kill a captured hero that are easily defeated, in a case of art taking pains to contrast itself with life for the sake of fantasy (think of the old Austin Powers movies which invoke this trope when the hero's nemesis says "I'm going to place him in an easily escapable situation that would allow an overly elaborate and exotic death").⁵
2. **High lethality/High complexity (HL/HC).** This zone is the natural ground of governments and other well-funded sovereign or autonomous entities. In the broadest sense, a nation's standing armed forces are the best example of an extremely lethal but extraordinarily complex enterprise. Within this enterprise, these forces employ highly complex, lethal subsystems. The economic, industrial and scientific power of a nation is what makes such an enterprise possible. The closer a substate comes to engaging in a sustained conventional high complexity/high lethality enterprise, the closer it is to becoming an actual state; the large and effective militia of Muqtada al Sadr or the forces of the Taliban in Afghanistan help illustrate this point, as does the rise of ISIS. A political theorist might say that one of the defining features of a state is that it claims sovereignty by exerting a monopoly on the use of highly complex, highly lethal forms of force to protect citizens from external threats or increase the size of its domain.
3. **Low lethality/Low complexity (LL/LC):** The means that fall into this category are the ones most often used by individuals or small groups in the civic space, and

lone wolf terrorists. Common criminals of all types, people who commit everyday acts of violence, and the police who respond to them all principally do so using means that are fairly straightforward and uncomplicated, but there are limits to the effects. Aggressors may kill one or more people, but they don't possess the means to do so *en masse*, and they are likely to soon run up against factors such as physical exhaustion, the escape of potential victims or the response of authorities before they can make much progress. As simple endeavors, these incidents can occur anywhere a motivated offender exists. Notable examples are the lone wolf actor in London who hit pedestrians with a sedan and stabbed a police officer to death outside Parliament before he was shot by police in 2017, and the recurring mass knife attacks in China.⁶ Occurring with regularity, and often targeting the elderly, children and commuters, a recent random attack killed seven people, most of them older women, in China's Liaoning province in December 2020.⁷

4. **High lethality/Low complexity (HL/LC).** These are the holy grail means of attack sought by substate actors. State actors use science and innovation and complex systems to overcome analytic complexity, then, impose synthetic complexity on these means to prevent their appropriation by opponents or untrustworthy allies. Terrorists lack these resources and find themselves looking for the alternatives that would place them in this zone instead, where lethality is a product of something other than mastering complexities using state resources. How terrorists succeed at this is discussed below.

The Complexity Contest

With fewer resources and less access to technology, substate actors view complexity as something to surmount through creativity and ingenuity. For example, improvised explosive devices were set off to great effect by insurgents in Iraq using cell phones and the infrared technology found on garage door openers.⁸ Military forces imposed complexities on these methods by jamming radio frequencies,⁹ conducting reconnaissance along travel routes in advance of the main effort, and redesigning vehicles to better withstand blasts, sending insurgents back to the drawing board to overcome these defenses with new creative solutions and technical assistance from foreign governments aligned with their goals, such as Iran.¹⁰

There are at least two ways to disrupt this cycle. The one preferred by states is to introduce continuous iterations of evolving complexity while using the state's superior resources to attrit less well-resourced and adaptable opponents as they react to them. This may not always work; the duration of Iraq insurgency indicates it is a costly, time-consuming strategy. Another way to break out of the cycle, the one available to terrorists, brings us back to the observation made at the beginning of this article that attacks are particularly shocking. It is breaking the cycle by overcoming synthetic complexity and increasing lethality through a perversity of the imagination. If an attack is perverse enough in its conception, state actors may fail to foresee and account for it due to their moral and bureaucratic natures. Security forces may have even foreseen and planned for the next logical step in terrorist efforts to master or reduce complexity, but some means of attack—such as 9/11 or the ones discussed below—could be two or more steps ahead or worse, a quantum leap.

Examples of the Perverse Imagination

The history of terrorism is a history of the perverse imagination affording opportunities for attack that opponents failed to anticipate. Suicide bombings (and the introduction of women as bombers), truck bombs and brutal attacks of all sorts on public crowds demonstrate how simple combinations of willpower and means can thwart antiterrorism measures with deadly results.¹¹ Others go much further than the state expected. Four notable mass killings illustrate the way in which perversely bringing every advantage of simplicity and lethality to its logical conclusion produced an attack that met little resistance and that achieved complete success.

- The 1983 early morning suicide attacks on the US Marine barracks and French peacekeeping compound in Beirut, Lebanon is a particularly notable example of a HL/LC attack because it was directed not at civilians, but at a vastly more powerful combat force, and yet it was able to achieve complete surprise. Two synchronized truck bombs claimed the lives of 305 victims, to include 241 US service members and 58 French peacekeepers.¹² The forces at the Marine compound were aware that such an attack was possible; sporadic artillery fire had been aimed at the installation, but the idea that a sole person driving a truck could mount a devastating suicide attack as Marines slept did not register enough with the peacekeeping forces to take meaningful countermeasures. Two men driving trucks in an attack against an adversary that failed to anticipate a suicide attack on their living quarters were not only able to successfully achieve a kill ratio of over 150 to 1 with very little skill and equipment, but greatly accelerated the collapse of the Multinational Forces' peacekeeping mission in Lebanon. Their withdrawal fueled the rise of Hezbollah.¹³
- A 2016 Bastille Day truck ramming attack in Nice, France killed 84 people, 14 of whom were children and injured 458.¹⁴ Driving a truck into a crowd to kill spectators at an event is a compelling example of a high lethality/low complexity attack born of a perversity of the terrorist imagination. It is rare for truck suicide bombings to kill as many people, and there came a point where a person planning a terrorist attack realized there was no need outfit a truck with explosives at all, which adds considerable complexity to an attack and makes its planning much harder to go unnoticed. The truck itself could be used as a weapon when deployed against a suitable crowd, with the minimal complexity of obtaining and driving a truck. A subsequent attacker in New York City simply rented one from a hardware store in the hours before staging a similar attack on people using a recreation path, killing eight people. Nothing was unforeseeable about such a mechanism of attack, and police in Nice had blocked access to the spectator area with vehicles which the truck was able to easily push aside. After the New York City attack, the police department barricaded nearly all the vehicle entrances to the path in a matter of a two days. Still, the question remained: why did it take an actual attack to bring this about, when the city was an undeniable target and the means of attack were so simple? One answer may be that the city was not thinking perversely enough, or could not muster the motivation act based on where such an imagination led.

- In October of 2002, the Bali nightclub bombings in Indonesia claimed the lives of 202 victims and wounded over 200 others. Although the attacks happened in Indonesia, the targets were principally young Westerners: 111 of the dead were Australian and British, and others were from Sweden, Switzerland, Denmark and France. Three quarters of the victims were between the ages of 20 and 40, and the vast majority had been on vacation. A recording allegedly of Osama bin Laden said the attacks were in retribution for Australia's support of the US's war on terror. The attack consisted of a backpack suicide bomb inside of a club that both inflicted damage and forced the patrons out onto the street, where they were met with a tremendous car bomb placed next to an open air nightclub. The attack was a perversion of the imagination because it not only attacked civilians on vacation, but it attacked them in a different country than their own at a time and place few would have anticipated. It took the method of the car bomb and backpack bomb and deployed them against Westerners at a place where the attack was completely unexpected, the victims were acutely vulnerable, and the targets were non-Western businesses (with the accompanying non-Western victims as well) rather than something more foreseeable such as a Western hotel chain. Indonesia's emergency medical response was overwhelmed, people had to be flown great distances to cities such as Perth and Darwin for burn treatment, and victims were placed in hotel pools to provide them with some relief from their injuries.
- The mass casualty attack on concertgoers in Las Vegas in 2017 is the most devastating example of a high lethality/low complexity small arms domestic attack. One man, armed with rifles and ammunition available for legal purchase anywhere in the United States, and outfitted with "bump stocks" that accelerated the weapons' rate of fire, shot from the 32nd floor of a hotel room down into an open air concert a few hundred meters away. He fired over 1,000 rounds of ammunition at thousands of people, and was able to kill 58 of them and shoot an additional 413. Barring the conversion of semi-automatic weapons to effectively automatic ones using these retrofitted stocks, the weapons and tactics were out of any nation's basic infantry handbook. Officials closed their investigation unable to identify a motive for the attack,¹⁵ serving to highlight the opaqueness of the perverse imagination. The effects of this type of were approached by the 2016 Pulse Nightclub shooting in Orlando, where 49 people were killed. Both were instances of people using commonly-available rifles and ammunition to indiscriminately kill people in densely-packed crowds in a way that was hard to take seriously anticipate and defend against due to how depraved it was. Lastly, the 2012 murder of 20 children and six adult staff in the Sandy Hook Elementary School in Connecticut should be considered in this category. The perversion of the attacker's imagination was undeniable; a lone young adult with a rifle was successful because his child victims were between six- and seven-years old, could offer no resistance and the nation is wholly unprepared to harden its elementary schools to resist attacks from determined riflemen.

These examples afford us another way to think of asymmetric warfare beyond a divergence of strategies and tactics that play to the unique features and capabilities of

state and substate actors. Conventional warfare can be characterized as conflict between two forces employing HL/HC methods, but asymmetric warfare (or terrorism), in certain cases, can be considered an attempt by the nonstate actor to occupy the HL/LC space by developing initially unforeseeable tactics that are beyond the pale of opponents whose thinking is shaped by prevailing, less perverse norms.

State vs. Federal and International Zones in U.S. Terrorism Prevention

In the United States, the division of labor in providing security from various threats is not perfectly agreed upon or distributed, but certain basic features prevail. These features also generally fall along the divides witnessed in [Figure 2](#), and this division is something attackers exploit. LL/LC threats are ones we commonly expect local and state governments to handle, such as common crimes, violence perpetrated by people suffering from mental illness, and acts that can be described as violations of state criminal law. HL/HC threats are typically the domain of the federal government, often in concert with its international partners, whether it's containing the threat of WMD proliferation or dealing with an entity such as ISIS.

The perverse imagination succeeds because the footprints and traces of its HL/LC work do not appear in either of these spaces. Using pressure cookers to make primitive bombs that are placed on the overhead racks of commuter trains, or left at the feet of a crowd at a marathon, do not produce precursor signatures that government entities at any of these levels can reliably detect as suspicious. One of the key features of the HL/LC attack is that its means are so conventional as to be unremarkable unless put in the specific context of the intended attack, which is unlikely.¹⁶ Buying pressure cookers or having a box cutter in carry-on luggage were unremarkable acts at the time, as is renting a truck or driving one down the street at night on Bastille Day. Even if the U.S. government were to take a sudden interest in these activities, there would be no obvious place to quickly nest it. Insofar as government is designed to divide labor according to scale and complexity, a perversity of the imagination not only upends our sensibilities about means and threats, but also our well-established bureaucratic safeguards.

Implications of the Framework for State Security

The idea that there is something conceptually distinct about the violence of terrorism is not new. The argument here allows us to look at the issue in a new way, however, by showing how its apparent perversity is a response to the need for substate actors to occupy a space in the phenomenology of attack that overcomes the state's dominance in the adjoining ones. The complexity/lethality framework offers a logic model that allows us to systematically evaluate the state of terrorist attacks and predict what the possible courses of action may be for the next wave of them, including quantum departures from attempts to master complexity. It suggests that security requires state actors to be conversant with the perverse imagination of the terrorist or substate actor, and not only with their past acts, but the imaginative trajectories of their future ones.¹⁷ It

requires a certain type of government imagination to do this, one that is difficult to bureaucratize in practice. It is also hard to translate such a bureaucracy's findings into the proceedings of the rest of a nation's security efforts, and to operationalize them in ways that do not deeply affect the nation's public spaces when taken seriously. It suggests the terrorist/substate penchant for the HL/LC space will remain its principal advantage.

As technology trickles down from military and industrial to consumer markets and eases the challenges of analytic complexity, the HL/LC threat continues to evolve. The most obvious proximate concern may be the use of drones to deliver explosives over large, unprotected crowds at concerts, stadiums and other gatherings.¹⁸ Drones are legal, affordable and able to carry heavier and heavier payloads per dollar. The terrorist imagination will find a way to use them in attacks that go beyond the simple and well-known conceit of attacking soft targets in the open, and bring them to times and places where their use is unforeseen, shocking and particularly effective. Other relatively simple means of attack lurk on the horizon, are bound to be lethal and effective, and yet we have no idea what they might be. In this way, we can reliably predict the character of the evolving terrorist threat, but we may well be at a loss to correctly predict its particulars.

Conclusion

Recent history may prove instructive. The attack on the U.S. Capitol on 6 January 2020 by thousands of people seeking to halt the democratic process of certifying the electoral votes for a new president will be the subject of official investigation and public debate for some time to come. That a mob of citizens was able to storm and breach the most sacrosanct legislative building in the world's most powerful democracy and come minutes away from capturing members of congress left some people thinking the only way it could have happened is if the security officials responsible were grossly negligent, and perhaps conspiratorially so. But that the capitol and its democratic processes had proven sacrosanct in our modern memory may have precisely encouraged the vulnerability that left it susceptible to such a crude but brutal form of attack. Attacks on the sacrosanct define perversity, and the perversity of people's imagination had reached a fever pitch in certain quarters of America in a way that made no sense to the more rational actors working in public safety and government. President Trump's rigged election conspiracies seemed facile and childish, just so much theater, and the idea that seizing the capitol would accomplish anything seemed utterly ridiculous and incomprehensible. With enough distance from the attack we may come to conclude that it was made possible by the same type of unexpectedly perverse thinking that puts state actors at a disadvantage as they anticipate and prepare for threats that they are conditioned to think adhere to a linear pattern of complexity, lethality and escalation.

One of the goals of civil society is preventing people from having to live in a perverse world, think in perverse terms and live in fear of the worst and most violent outcomes in their everyday lives. Doing so produces its own traumas even if an attack never happens, and fatigue invariably sets in when it does not, leaving a population vulnerable once again: people will seek any opportunity to relieve themselves of such a mental burden. Defending the U.S. Capitol from the next mob attack has already come to seem overwrought to some. This is what makes

terrorism such a potent means for substate actors. It employs means that can accomplish two things at once, in outsized proportion to their investments: the mass killing of people, and doing so in a way that reminds survivors that the only way they secure themselves is if they are willing to anticipate and react to every possible threat, and their opponents won't hesitate to act on the most unthinkable ones. One response by the state may be to accept that once an attack reaches its execution stages, the most perverse ones will be hard to stop and will likely be successful. The emphasis can then be placed on upstream interventions that reduce radicalization and are more likely to bring potential attackers to the attention of authorities.

Urban living and patterns of socialization will inevitably bring people together in large crowds that are hard if not nearly impossible to protect from determined attacks, especially if attackers are willing to defy norms in selecting their methods. It is beyond the scope of this paper to assess the feasibility of upstream interventions to prevent radicalization and detect attacks of all kinds in their planning phases, but such a focus avoids the fruitlessness of a strategy that requires defenders to harden every possible target to deter attacks as a primary strategy. A layered approach to prevention is certainly the most effective,¹⁹ but if we consider what would be required to secure all of the nation's—or the world's—open air sports and concert venues from drone attack, for example, we may conclude that horrifying acts of perversity, however lethal they may be if these upstream interventions fail, are an acceptable price to pay for affording the people of a nation lives that are not filled with a constant reminder of the depths the human mind is capable of sinking to.

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