



How to witness a drone strike

Michael Richardson¹

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Abstract

Witnessing is crucial to public engagement with war, but the remote violence of drones presents distinct challenges: its victims are largely invisible to Western publics; operations are cloaked in secrecy; and promises of precision targeting, accurate surveillance, and legal monitoring obscure the brutalities of the system. With so many barriers to witnessing, remote warfare tends to remain on the periphery of political debate and has not occasioned widespread resistance. Yet the means for witnessing drone warfare exist; the question is how they might be leveraged to make remote war more accessible and contestable. This article analyses the high-profile drone strike that killed 10 civilians in Kabul on 29 August 2021 to consider the limits and possibilities of witnessing drone strikes, alongside the database of conflict monitor Airwars and the aesthetic practice of the research agency Forensic Architecture. It argues that witnessing drone strikes requires assembling new conceptual techniques with long-standing practices of media witnessing and human rights testimony. It is not a manual or primer but rather maps four critical, analytical, and ethico-political trajectories demanded by the problem of how to witness a drone strike: lived experiences, violent mediations, infrastructural scales, and aesthetics.

Keywords Drone warfare · Witnessing · Aesthetics · Remote war · Assemblage · Mediation

“A righteous strike”

On 10 September 2021, the *New York Times* published a video investigation of a drone strike that had killed 10 people in Kabul on 29 August amidst the withdrawal of US troops and personnel from the country (Aikins et al. 2021). Combining on the ground interviews, smartphone footage from the scene, forensic analysis of security camera footage and satellite maps, and expert commentary on the blast site, the investigation showed that the target of the strike—Zamairi Ahmadi—was a technical engineer working for an American aid organisation. Seven children were among the others killed. Three days after the strike, US General Mark Milley, Chairman of the Joint Chiefs of Staff, had declared it “a righteous strike” against members of ISIS-K, the group responsible for a suicide bombing at the Kabul Airport that killed 13 Americans and 170 Afghans a few days earlier. But as the *Times* investigation showed, the strike was like so many others in the twenty years of lethal surveillance of

Afghanistan: reliant on atmospheric remote sensor surveillance without verification from the ground.

That day, 43-year-old Ahmadi had driven his white Toyota Corolla on a circuitous route through Kabul, which the *Times* marked on a satellite map of the city (Fig. 1): collecting a colleague and his boss’s laptop before arriving at the offices of Nutrition and Education International, an aid organisation headquartered in Pasadena, California. Security camera footage showed Ahmadi going about his daily work (Fig. 2). What the military claimed were containers of explosives, were shown to be containers of water, filled to take back home where there was a breakdown in supply. Colleagues and family members attested to the impossibility of Ahmadi’s association with ISIS-K and to the brutal horror of the strike, the devastation of losing so many children. Weapons’ experts verified that there was no evidence of a secondary explosion at Ahmadi’s home beyond the car’s fuel tank, which might have given credence to the military’s claim that the car contained explosives. What likely killed 10 innocent people was correlation, coincidence, and the lethal logic of remote warfare itself: a white Corolla, proximity to an alleged ISIS-K safehouse, and movement that a suspicious and jittery military interpreted as threatening through its own warped matrix. Carefully assembled into

✉ Michael Richardson
michael.richardson@unsw.edu.au

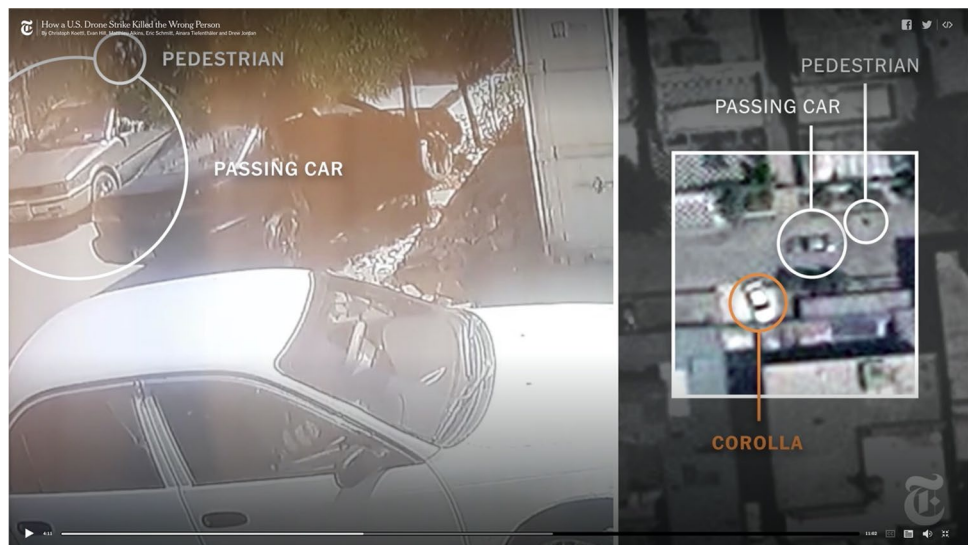
¹ School of the Arts and Media, UNSW, 231C Robert Webster Building, Kensington 2052, Australia





Fig. 1 Screenshot showing Ahmadi’s movements from *New York Times* Investigation: “In U.S. Drone Strike, Evidence Suggests No ISIS Bomb” © New York Times (2022)

Fig. 2 Screenshot showing CCTV camera footage from *New York Times* Investigation: “In U.S. Drone Strike, Evidence Suggests No ISIS Bomb” © New York Times (2022)



a persuasive 10-min video that enabled publics and policymakers around the world to witness the violence of the strike, the *Times* investigation pushed the US military to accelerate its own. On 17 September, the Pentagon acknowledged that the strike had been a mistake and that almost everything they had claimed about Ahmadi and his movements was wrong. Later, on 19 January 2022, the *Times* used the Freedom of Information Act to obtain raw footage from three unmanned aerial systems involved in the operation, providing a rare glimpse inside the visual apparatus of infrared and full-motion optical video available to military drone

operators. The visibility of the strike, the detailed and well-resourced investigation and sustained media scrutiny, and the public attention that followed all combined to produce a rare instance when the violence of drone war was brought home to American and other Western publics.

In Afghanistan and the neighbouring Federally Administered Tribal Areas of Pakistan, at least 13,500 drone strikes have been conducted since the first Hellfire launched from an unmanned vehicle at a live target on 14 October 2001, according to The Bureau of Investigative Journalism (TBIJ), although their figures for Afghanistan begin only in 2015.



No one knows the total number of civilian deaths, but estimates of several thousand in Afghanistan and Pakistan alone are likely on the low end. No one knows because very few have been closely investigated by Western media or the US Department of Defence, and the communities wounded by such strikes often lack the resources to make their lived experience visible and legible to wider audiences, particularly when disclosures by the Pentagon are sparse and sparingly published, particularly in the Trump era. Survivor testimonies collected by human rights groups, whistle-blower reports, the advocacy of Drone Wars UK, Code Pink, the ACLU, and artists, activists, and protesters have played crucial roles in maintaining critical attention on drone war despite its tendency towards invisibility. So too have new conflict monitoring agencies such as Airwars and Syrian Archive, which use open-source investigation techniques to collate, verify, assess, and publish imagery, accounts, and geolocation data of military violence using social media, local journalists, and other sources to make on-the-ground knowledge more accessible. Occasionally strikes such as Kabul in 2021 or the wedding procession in Haska Meyna in 2008 become “rogue intensities” that grab the interest of distant publics (Kaplan 2018: 36). But such instances are rare, despite the best efforts of critics, communities, and NGOs. Drone strikes and the apparatus that makes them possible remain shrouded in discourses of precision and largely unwitnessed by Western publics, even as remote warfare has become the major strategic approach of the US and other advanced militaries. To put this in the frame of this special issue, it is much too unusual for the drone wars of the Middle East and Africa to feel like ‘my war’ for American, British, and Western European publics. These are, in many ways, wars that thrive on the absence of participation.¹

The murderous strike on 29 August was different. It took place in Kabul, rather than in a remote location. The target was an aid worker, employed by an American organisation. Children died, and their family could speak directly to their loss. Reporters and photographers could visit and document the site in the immediate aftermath. Media coverage found an engaged audience, right when the war in Afghanistan was back in the public eye. But beyond this happenstance, the investigation also reveals how much the media witnessing of conflict has transformed. New visualities have emerged from the expansion of access to satellite imagery that followed the loosening of American restrictions on its sale in the 1990s and the growing popularity and capability of civilian drones, combined with the rise of geolocation and mapping as techniques of media and human rights investigation (Herscher 2014; Gray 2019). New aesthetic practice have also arisen, driven less by traditional media like the *Times* and more by entities such as the investigative research agency Forensic Architecture, which uses architectural mapping, modelling, planning, and presentation techniques to reveal state and

corporate violence (Fuller and Weizman 2021; Weizman 2017). Yet, the technics, networks, and infrastructures of remote warfare remain unwitnessed or only faintly visible. And despite some notable exceptions, the families and communities that survive strikes or lose loved ones do not figure as prominently or as powerfully as they should, nor are they listened to with the seriousness their experiences demand.

How to witness a drone strike (I)

In this article, I argue that witnessing drone strikes requires assembling new conceptions and techniques with long-standing theories and practices of media witnessing (Frosh and Pinchevski 2009) and human rights testimony (Givoni 2016). Witnessing war is a vital task, bringing distant and often unimaginable violence to the domestic sphere. To witness is to become responsible to the event (Peters 2001), even if in its hyper-mediatised form it often takes the form of spectatorship (Boltanski 1999; Chouliaraki 2006). In prosaic terms, witnessing makes claims about the meaning and significance of an event, not just in the instance of witnessing itself but in how events take on meaning through the belated bearing of witness and the testimony this act produces—even if the claims of testimony are always and necessarily contestable (Schuppli 2020). Witnessing a drone strike must remain an incomplete task, since human witnesses can only ever offer an incomplete and subjective perspective, forensic analysis depends on intimate access to the site of violence, and the technical apparatus of drone warfare will likely remain shrouded in military secrecy. While the US military occasionally conducts its own investigations, as it did in Kabul, much remains obscured through the national security classification of systems, personnel, and processes. Media witnessing enabled by journalistic investigation and the proliferation of user-generated content provides crucial insight, but while the former is limited by resources and access, the latter often require verification or corroboration to obtain authority and can be extractive by virtue of its intermediary position (Ristovska 2021).

Taking the strike that murdered 10 people in Kabul as an inflection point, this paper asks how to witness a drone strike at a critical juncture in the development of drone technologies. With the twenty-year anniversary of the first lethal strike recently passed and the departure of the US from Afghanistan after nearly two decades of war, drone warfare is on the cusp of a dramatic shift. Procurement of slow-moving aerial platforms like the Reaper that launched the Hellfire that killed Ahmadi has largely halted, with the strategic priorities of the USA shifting from manhunting in the Greater Middle East and North Africa to great power conflict with the advanced militaries of China and Russia. But while the nature of drone systems is changing, the



necessity of witnessing their violence remains. I focus here on the US because it continues to be the principal practitioner of interstate drone warfare, although Israel's sustained use of drones in Gaza, Russia's deployment of unmanned systems in Ukraine, and the growing drone power of Turkey, Azerbaijan, China, India, and others remain important loci in the transformation of war in the age of increasingly intelligent machines.

For much of the West, participation in contemporary warfare is heavily mediated by technologies of vision and sensing, and by journalistic norms and practices. With the arrival of the war on terror, media coverage “made vertical space intelligible to global publics in new ways and powerfully revealed what is at stake in being able to control the vertical field” (Parks 2018: 9). Media coverage of the invasions of Afghanistan and then Iraq rendered the aerial view familiar, training publics to recognise and decode new ways of seeing. According to Roger Stahl, drone vision “invited publics to see the drone war through the very apparatus that prosecuted it”, and in doing so “framed out those populations who must live and die under this new regime of aerial occupation” (2018: 68), making them vulnerable, invisible and ungrievable (Butler 2004). When drone war does intrude on the mediascape of the US, UK, Australia, France, Denmark or elsewhere in the West, it does through the existing profusion of screens, stories, images, and media encounters of the “drone-o-rama” (Kaplan 2017). But witnessing drone warfare is not solely a matter for news media; it is also a cultural and political problem that intersects with artistic practices, activist politics, and the conflict monitoring and human rights work of non-government organisations. My contention in this article is that such practices need to be complemented not only with attention to aesthetic modes of testimony, but also the non-human entities, agencies, and processes that make drone strikes possible, or are simply caught up in them. At present, the prevailing humanitarian discourse shapes what counts as witnessing and who (not what) can stand witness, so in part my purpose here is to urge an approach to witnessing conflict that moves beyond humanitarianism to embrace non-human technics, ecologies, agencies, and processes. As such, this essay should not be read as a manual or primer but rather a mapping of the critical, analytical, and ethico-political trajectories demanded by the problem of how to witness a drone strike. The names I give to these trajectories are *lived experience*, *violent mediation*, *infrastructural scale*, and *aesthetics*.

Throughout this article, I repeatedly return to the Kabul strike of 29 August 2021 but what follows is not an analysis of that strike per se, or of the witnessing it engendered. Rather, I consider Kabul and other instances of media and aesthetic witnessing of drone strikes in the context of an assemblage approach to witnessing this crucial dimension of digital war (Hjorth and Cumiskey 2018; Papailias 2016;

Richardson and Schankweiler 2020). The article begins with an examination of witnessing in the face of the deliberate opacity of remote warfare, mapping some of the key concepts that will animate the remainder of the article. From there, I turn directly to this question of how to witness a drone strike, pursuing it through the four intersecting trajectories of lived experiences, violent mediations, infrastructural scales, and aesthetics. In closing, I consider what the future of autonomous war might mean for witnessing, and what lessons can be drawn from the successes and failures of this first era of the drone. Constraints of space mean I cannot also address the traumas of digital war directly (Hoskins and Illingworth 2020; Richardson 2022), but my aim has been to keep the enduring effects of remote violence never far from the frame.

Witnessing remote war

Witnessing war has a long and complex history, but remains critical to public understanding, engagement with, and response to martial violence. Testimony, which occurs after the act of witnessing and makes what was witnessed manifest and communicable, can make war known or at least knowable by producing knowledge, providing a moral and ethical response to violence, and addressing power with countering claims as to what took place (Givoni 2016). Witnessing that leads to testimony thus makes contestation in public fora possible: the court, the tribunal, the parliament. “Making distant wars visible typically depends on representational strategies that emphasize differences of place and time”, observes Wendy Kozol (2014: 6), which tend to reproduce pre-existing discourses, and affects that divide self from other and friend from foe. What, then, are we to make of the radical limitations that beset the witness to drone violence? Violence precedes and exceeds the event of the strike itself: the violence begins well before, in the processes of datafication and correlative analysis that produced potential targets for killing, and continues after, in the enduring trauma of direct survivors and in the major and minor disruptions to collective life that living within the ambit of remote war produces (Edney-Browne 2019). Even if such dispersed violence were made visible, large swathes of the apparatus itself would remain only narrowly explainable due to their algorithmic nature (Amoore 2020).

While witnessing was once performed through speech and song, media technologies from the printing press to the television to the smartphone have transformed how war is witnessed. Witnessing increasingly centres on the visual. “Eyewitnesses and survivors today retain powerful cultural authority as embodied witnesses”, but most people engage with distant military conflicts through visual imagery (Kozol 2014: 6). While law, religion and human rights give witnessing moral force, John Ellis argues that “television sealed



the twentieth century's fate as the century of witness" and made it a "domestic act" (Ellis 2000 in Peters 2001, 708). Witnessing became a "generalized mode of relating to the world", as Paul Frosh and Amit Pinchveski put it (2009: 9), even as the lines between spectatorship and witnessing blurred or collapsed altogether (Boltanski 1999; Chouliaraki 2006). Responding to this problematic, Kozol proposes "ethical spectatorship" to "trouble the self/other construct by foregrounding the inseparability of spectatorship and the ethical imperative to 'see' in order to know about acts of violence and injustice" (2014: 16). Witnessing contemporary war demands attending to the ambivalence of witnessing, to the ways in which it reinforces and re-inscribes the desires of states or offers frictional or opposing claims. Witnessing thus finds its worth and purpose in the fractious politics through which publics participate in war and is a crucial means by which what is happening 'over there' might become 'ours'. Of course, the abundance of humanitarian and media witnessing in our time demonstrates the harsh limits on its capacity to limit conflict, which begs the question of whether loosening the stranglehold of humanitarianism might not enable new possibilities for ethico-political engagement with distant war.

Remote warfare is not just distant in space and time but removed from view by technocratic discourse and its distributed architectures of violence. For Jens Ohlin, remote warfare encompasses drones, autonomous weapons and cyber, and is characterised by "allowing operators to use ever more discriminating force while also receding further in time and space from the target of the military operation" (2017: 2). Remote warfare is profoundly asymmetric, exemplifying what Achille Mbembe calls necropolitics, in which "weapons are deployed in the interest of maximum destruction of persons and the creation of death-worlds, new and unique forms of social existence in which vast populations are subjected to conditions of life conferring upon them the status of living dead" (Mbembe 2003: 40). For the US, remote warfare is appealing because it enables military action at almost any point on the planet without the exposure of its own soldiers to immediate harm. By removing soldiers from the field of battle, it also removes publics and even policymakers from intimate relations to martial violence. Without body counts and flag-draped coffins to focus attention, remote warfare can operate under far less scrutiny than America's wars in Vietnam or Iraq. This remoteness is possible because drone warfare is also highly technical. The drone strike in Kabul occurred because of the algorithmic analysis of data, data collected through automated snooping systems and analysed using random forest algorithms to determine probable outcomes (Amoore 2020). But that data was also matched to pre-existing intelligence (accurate or not) about the location of ISIS-K safehouses. In the aftermath, the footage from the drone itself has not been made public.

All this points to the limits of what media witnessing and the situated testimony of survivors can do in the face of networked, distributed, and often-invisible structures and processes of war. Witnessing needs to be understood as fleshy and affective, as well as imagistic and discursive (Chouliaraki and al-Ghazzy 2021; Papailias 2016; Richardson and Schankweiler 2020), but also as material. Material witnesses are "nonhuman entities and machinic ecologies that archive their complex interactions with the world, producing ontological transformations and informatic dispositions that can be forensically decoded and reassembled back into a history" (Schuppli 2020: 19). Taken together, witnessing drone strikes—and, indeed, witnessing remote warfare more generally—requires attending more closely to these non-human traces, agencies, and entities, while not neglecting the experiences of survivors.

How to witness a drone strike (II)

While the elements of a drone strike might be registered by a vast array of materials, systems, persons, and ecologies, the bearing of witness—the communicative act of giving testimony—will necessarily be circumscribed. This might be through a lack of living eyewitness from the site of the strike, or through the blackboxing of technical elements within the drone apparatus. But bearing witness to a drone strike will also always call upon entities and agencies that can only ever offer a partial account. As such, providing a set of instructions—a primer for witnessing a drone strike—is not the task at hand. The short answer to the question of how to witness a drone strike is by widening the ambit of what counts as witnessing, witness, and testimony—but in practice it also means attending in more fine-grained, relational, and situated ways to the witnesses and evidence we already recognise. And it means pursuing the transversal relations that bind the system together, even when those relations are disjunctive or tenuous. The four brief forays into sites of inquiry for witnessing—the trajectories I am calling lived experience, violent mediations, infrastructural scales, and aesthetics—are thus intended as openings onto an approach to witnessing remote warfare that extends the limits of knowing that too often circumscribe attempts to witness its violence.

Lived experience

Drone strikes are swift, kinetic violence but their aftermaths endure, rending and reshaping the lived experience of those who lived under them. Witnessing drones strikes requires attending both to the immediate consequences of lost lives, injured people, and damaged cars, homes, and lands, but also to ongoing damage to the fabric of social, cultural, and



political life. Drone war's aftermaths are intimate, contested, and unruly; etched in stones, buildings, gardens, and bodies; seared into the fabric of communities and cultures. Witnessing a drone strike thus entails both the elevation of voices from the ground, but also close attention to the material, ecological, and cultural harms perpetuated by the ever-present potential of violence from above.

The testimony of survivors carries with it an urgent, even moral, force that provides media reportage and investigation with a certain standing. Yet this moral standing is not enough alone: such situated testimonies are readily available from Afghanistan, Pakistan, Yemen, Libya, Gaza, and other sites in the reports of human rights organisations and conflict monitors. Accounts by American drone pilots and sensor are not hard to find, whether in media (Linebaugh 2013) or testifying at the UN (Scahill and Greenwald 2014). Yet merely speaking does not mean that such witnesses will be heard or believed. In drone warfare, the politics of listening hinges on which voices count as worth hearing (Dreher 2009). In Kabul, Ahmadi's family and the reporters who rushed to the scene were able to lay claim to the meaning of the event with a temporal and spatial immediacy that lent them authority. But most drone strikes occur far away from the notebooks and lens of Western media, recorded instead by survivors or the local community and filtered to the wider world via social media.

Bearing witness to the experience of life under drones makes clear the deep social and cultural wounding they produce. Ahmad, a 21-year-old Afghani from Wardak, says that "life is like being in a prison. But the prison is big. You cannot meet at night, go for dinners, you cannot move easily and without fear—you cannot continue to perform your culture and your celebrations" (Edney-Browne 2019: 1351). Wahab, also 21, describes the shame of being watched from above: "We would have the curtains and the doors of our house closed to try to prevent their recording ... but this is useless because still we had to walk outside our houses—and when we did, we didn't feel relaxed. Every individual action of ours they were recording" (Edney-Browne 2019: 1351). Such testimonies expose the slow violence of drone warfare, its dissolution of tradition, its fracturing of community, its gradual alienation of people from lives lived prior to its arrival. This collective experience also points to the importance of contextualising drone violence within the specifics of history. In Afghanistan and Pakistan, that means making evident the enduring impacts of British colonialism on law, politics, and even the borders of states (Ashraf and Shamas 2020), as well as the neo-colonial geopolitics practiced by the US state.

Constant awareness of the lethal surveillance (Kinderwater 2015) of drone warfare limits or denies access to public space, which in turn depoliticises through social isolation. Combined with trauma, declining mental health, and the

erosion of traditional community activity and governance, this leads to what Edney-Browne calls "self-objectification", in which Afghan people begin to conceive of themselves as objects of surveillance (2019: 1353). Surviving entails reworking relations of community and the movements of daily life in counter-rhythm to the algorithmic operations of intelligence gathering and analysis. Disruptions to daily life and its communal governance are matters of space and movement, as well as custom, ritual, and routine. No longer socialising after dark, no longer holding community gatherings, no longer undertaking funeral rites: these are restrictions on mobility dictated by the uncertainty of violence from the air.

In the testimonies cited here and in others collected in the human rights reports, the buzz of the drones recurs repeatedly. In a very real sense, the *earwitness* to drone warfare takes precedence over that of the eye. The insistent, unceasing noise eats into the body, working at the affective level of embodiment "to the extent that the sound of loitering drones triggers mental and bodily responses—indicative of post-traumatic stress disorder—in advance of a drone strike having actually taken place" (Schuppli 2014: 390). Those on the ground cannot avoid the destabilising and disjunctive noise, grating as it moves from waves in the air to vibrations in the body. Of course, in the lived experience of surviving drone warfare, leaving such noise behind is not so easy as leaving the gallery space. *Earwitnessing* necessarily exceeds the human, the body feeling the disturbance of the air itself.

But the material traces of drone warfare can exceed both sound and voice. Lethal strike survivor Idris Farid describes "pieces—body pieces—lying around" and the effort to "identify the pieces and the body parts" to determine "the right parts of the body and the right person" (Stanford Law School and NYU School of Law 2012: 74). In an attack on a village in Yemen, that distinguishing between animal, child and adult was often impossible (Pugliese 2020). While the targeting systems and discourse logic of drone warfare dehumanises through gendering and racialising techniques, such as the presumption that Afghan military-aged males constitute valid threats (Wilcox 2017), its violence strips its victims of any corporeal distinction from other animals. Even the land is scarred. As one survivor put it, "the entire place looked as if it was burned completely", so much so that "all the stones in the vicinity had become black" (Stanford Law School and NYU School of Law 2012: 108).

This enfolding of more-than-human environments in this admixture of flesh necessitates radical forensics that sees testimony as "a relational assemblage of heterogeneous materials that, collectively, is mobilised to speak an evidentiary truth" (Pugliese 2020: 22). While mobilisation within a framework of laws typically depends upon a speaking subject, the registration of violence enacted on the sites of drone strikes constitute a form of witnessing that both precedes and



exceeds the human. It precedes the human because ruined flesh, scarred rock and shattered plant life are already witnessing in the instant of explosion, itself preceded by the air's mediation of light in the collection of sensing data and of force in the on-rush of Hellfire missiles. It exceeds the human because this witnessing occurs below the threshold of detectability—in the faint striations of dirt subject to passing shrapnel, in the misting of viscera, in the ephemerality of heat—and far outside it too, in the elusive scale of the drone apparatus itself. The lived experience of drone strikes is not reducible to the voices of the people who live under them, but rather calls for more expansive engagement with more-than-human ecologies.

Violent mediations

Drone strikes do not begin with the explosion of a Hellfire AR-114, or even with its launch from a loitering Reaper. Witnessing drone strikes necessitates tracing the emergence of the act of violence in and through the media-technological apparatus of the drone. What makes drones efficacious is their sensing capacity, their ability to mediate the stuff of the world into information and facilitate its analysis and exploitation. Mediation is more than simply representation in media, but “a performative enactment in time” that “involves demonstrating, putting forward, or bringing to life as much as it involves representing or depicting something that has happened” (Parks 2018: 2). While the drone's motility means that it is constantly mediating the atmosphere around it, connecting to GPS infrastructure, and managing control signals, the mediations that most urgently demand witnessing are those violent mediations that make drone violence possible (McCosker and Wilken 2020). Violent mediation names those material connective processes that are constitutively harmful, whether because they cut, target, exclude, define, categorise, or classify in ways that are injurious to human or non-human entities and environments. The killing of Zamairi Ahmadi depends on precisely these kinds of violent mediations: correlating movement without context; targeting systems that transform complex lives into pre-emptive targets; random forest algorithms that autonomously analyse data; remote sensor systems that provide narrow viewpoints re-imagined as god-like. In much media witnessing, including the coverage of the strike in Kabul, most of these technics remain obscured. To an extent, this is understandable as so much of remote warfare is blackboxed, either by military secrecy or its technological form. But as I will suggest below, even the tightly enclosed processes of threat identification algorithms can be approached in ways that open lines of witnessing potential.

Martial operations are intensely mediated, bound together through recursive informational flows structured and organised by media technics. “Military knowledge”,

write Packer and Reeves, is primarily “a media problem, as warfare is organized, studied, prepared for, and conducted according to communicative capacities” (2020: 9). Military strategy, logistics, and operations are all determined by media technological capacity, but also shape those technologies in turn. This co-constitution of war and media means that the humans whose lives are the fodder of martial violence are increasingly ancillary to the workings of the systems themselves, a transformation with significant ramifications for social and cultural life within Western polities (Asaro 2013). As I theorise it, violent mediation is embedded in a material-ecological understanding of war and the role of technologies of perception within it, a crucial processual dimension of what Antoine Bousquet terms the “martial gaze”, which aligns “perception and destruction” through “sensing, imaging and mapping” (Bousquet 2018: 8).

We might think of violent mediation as the connective tissue of such systems, constituting sensing at the material level of technical operation but also stitching sensing into larger apparatuses: the thermal camera of the drone sensing its environment entails violence within its mediating processes, but also in the translation from sensing (thermographic camera) to imaging (decoding for optical display) to targeting (fixing of the reticule on an agglomeration of pixels). Processes of mediation occur within each stage, but also across them and throughout the kill chain. Attending to violent mediation thus means focusing on the movement, use and structuring of information within the military apparatus, as well as within the elements that compose it. In the *Times* investigation of the Kabul strike, these violent mediations percolate below the surface but don't come to fully to the fore. The investigation is explicit about the tenuous nature of intelligence gathering and the dangers of correlating data points like driving a white Toyota Corolla and making multiple stops, but the architectures that make that possible don't materialise. Even the raw drone video footage obtained by the *Times* (Fig. 3) offers limited insight: parts of the screen are blurred to redact navigation and sensing information and it's unclear from the footage whether the quality has been degraded to protect drone vision capabilities. In media accounts of the assassination by the Trump Administration of Qasem Soleimani, head of the powerful Quds Force of the Islamic Revolutionary Guard Corps, these technics remain almost invisible. Coverage by the *LA Times* of the 2011 airstrike that killed as many as 23 civilians, including two infant boys, in a convoy in Uruzgan province, Afghanistan, delves more into the operational dimension, drawing on transcripts published as part of a military investigation into the incident (Cloud 2011). But witnessing the violent mediations of drone strikes is perhaps most possible via documentaries such as *Drone* (2014) and *National Bird* (2016), or the movies *Eye in the Sky* (2015) and *A Good*





Fig. 3 Screenshot of raw drone video obtained by the *New York Times* © New York Times (2021)

Kill (2014), which spend more time elaborating the media-technological processes through which killing takes place.

As such films make clear, witnessing a drone strike must precede the launch of any missile. Over Afghanistan and the FATA region of Pakistan, drone strikes fit into two broad categories. While ‘personality strikes’ target specific individuals identified by the US state as threats (alleged terrorist or insurgent leaders, for example), ‘signature strikes’ are activated when emergent patterns in accumulated data about movement and communication cross a certain threshold on a predefined decision matrix. Collected by drones carrying the GILGAMESH system, metadata from cell phone tower check-ins, calls, and texts is analysed by SKYNET software to identify “patterns of life” that could be mapped to potential threats or targets of interest (Pugliese 2020). This is the logic of pre-emption, in which the “deferred future is collapsed into the present so it can be acted upon now” (Andrejevic 2019: 86). Pre-emptive martial technics elide the specificities of the texture of life in favour of what can become operationally subject to tools that identify risk and act to eliminate it (Amoore 2013). Within SKYNET, a narrow set of data points—most of them drawn from cell phone signal interceptions—provides the basis for algorithmic analysis using a machine learning technique called a random forest, which uses probability trees for various data relations and outcomes to produce predictions. As Amoore writes, “when a random forest algorithm sentences someone to death by drone strike, the infinite (gestures,

connections, potentials) makes itself finite (optimal output, selector, score), and the horizon of potentials is reduced to one condensed output signal” (Amoore 2020: 128). Such an algorithm doesn’t witness in the sense of ‘knowing’ or ‘experiencing’ that we might grant the humans operating the drone apparatus or subject to its violence, but “mobilizes proxies, attaches clusters of attributes, and infers behaviors to target and to act regardless” (127). Yet this mobilisation of relations must be witnessed as a critical animating element within the violent mediations of drone war. Creating the conceptual space for algorithmic intensities, relations, and systems to understood as enacting non-human witnessing is crucial, but so too is tracing their affects and effects. Here, then, the reworking of social and cultural relations in response to drone operations takes on a further significance, since it becomes a kind of collective witnessing of what the algorithms do.

Drone violence has thus already commenced well before the strike, and the strike itself is—in a certain sense—a playing out of an already-occurrent action. In the Kabul investigation, violent mediation is manifested most explicitly in the counter-mapping of Ahmadi’s car travels through the city, in the presentation of time-stamped CCTV footage, in the testimonies offered by co-workers about his movements, and, belatedly, in the raw footage obtained under the Freedom of Information Act. At stake in more explicitly accounting for the media-technics of drone systems and the violent mediations that contribute to the infliction of lethal violence is



bringing the infrastructural dimensions of drone warfare to the fore, and with them reckoning with the scale of both individual strikes and with the aggregated and distributed violence of remote warfare.

Infrastructural scales

If the processes of violent mediation through which drone strikes are enacted need to become part of our witnessing assemblage, then so too the socio-technical infrastructures that enable the drone apparatus. These drone infrastructures encompass material objects and technologies, but also organisations, procedures, standards, practices, and individuals “in existing and emergent roles associated with information infrastructure” (Bowker and Star 1999: 98). Drone violence takes place remotely, but this physical distance between soldier-operators and their targets is bridged by a planetary infrastructure of atmospheric satellites, under-sea optical fibre, military bases, institutional procedures, technical protocols, and legal frameworks, to name just a few of the elements that connect the aerial platform to its ground control station and govern the flow of information and action within the system. While the basic architecture of such systems is by now broadly known, these infrastructures entangle additional actors into the fray—Germany, for example, which hosts the pivotal Rammstein airbase signals station—but at a more systemic level point to the infrastructural scale of drone violence. Infrastructures of remote warfare are not simply activated in the event of the strike, but are the precondition for its occurrence and for the topological transformation of war itself (Sear 2020). While the scale of such infrastructures is implicit in the *Times* investigation and other coverage of Kabul, media witnessing tends to position these infrastructures as background conditions in favour of the essential task of foregrounding the lived experience of survivors. However, witnessing drone strikes calls for a more engaged accounting with the global scale of its infrastructures. Sustained attention within media reportage of the network of American bases and allied facilities required to conduct drone operations would be one starting point. But there is also the necessity of bringing the social, political, legal, and other infrastructures into view and to understand these as constitutive of drone violence.

In the mediatised spectacle of Soleimani’s assassination, the (geo)political and legal infrastructures that enable drone warfare became visible because targeting a senior military leader of another state made the strike exceptional. In the American broadcast media coverage and in the commentary that carried over into blogs, opinion pieces and academic articles, questions of legality (Ferro 2020) and political implications were repeatedly raised (Binkaya 2020; Jahanbani 2020). Here, it seemed, the geopolitics of drone warfare came into view because the victim of a strike was *already*

political rather than rendered outside politics by the necropolitical nature of the apparatus itself, which predetermines those subject to its gaze as able to be killed. Claims of Soleimani presenting an “imminent threat” were retracted by the US, in favour of an argument regarding the ongoing threat posed by the Iranian Republican Guard (US House Foreign Affairs Committee 2020). Bringing these legal-political infrastructures into the frame of media witnessing represented a rare instance in which their dynamic agencies were recognised as necessary to a full accounting of the strike against Soleimani. For publics to witness such a strike entailing state responsibility, the enabling agency of legal infrastructures needed to be grasped. By contrast, the *Times* investigation of the Kabul strike left the *politics* of remote warfare aside for the most part, and in doing so radically delimited the potential to witness the material-technological *and* the socio-political infrastructures of drone warfare. The assassination of Soleimani also exposed the complexity of the information environment, as video that purported to be the feed from the Reaper’s thermographic camera was exposed as video game footage (Lajka 2020) and imagery from smartphones and CCTV cameras provided piecemeal visual evidence of the event (Guardian News 2020).

But witnessing remote warfare can also develop its own infrastructures, which hold untapped potential for distant and targeted publics alike to participate as co-witnesses to both individual strikes and the scale of aerial violence, countering the asymmetries of information and the discontinuous nature of media coverage of and public engagement with remote warfare. The UK-based conflict monitor Airwars maintains a database of over 60,000 civilian harm incidents from aerial warfare across the greater Middle East and North Africa (Airwars n.d.). Its information is sourced from social media and local reporting, with expert researchers and assessors responsible for collating, analysing, and presenting evidence within the incident template of the database housed at www.airwars.org. While Airwars partners with journalists and media organisations for investigations, its core work as a conflict monitor involves identifying, collating, aggregating, assessing, and publishing civilian harm events as database entries. Airwars relies on an established methodology to produce a kind of witnessing infrastructure of technologies, expertise, standards, and institutional networks that foregrounds voices and images from the site of drone and other air strikes (Airwars n.d.). By producing documented accounts of aerial harm to civilians, Airwars creates both a mechanism for individual demands for accountability and the means to relate voice and embodied experience to the geographical distribution and scale of remote warfare.

While not itself an agency for seeking restitution, Airwars’ database—and its influence on US civilian harm disclosure policy—can be as materially efficacious as any investigation by the *New York Times*. While both the Kabul



investigation and the Airwars database make clear the necessity of attending more to voices and bodies on the ground, they also signal the necessity of a more expansive, relational approach that seeks to knit individual strikes into the broader fabric of remote warfare. Airwars catalyses the witnessing of warfare on the ground—captured in images, videos and testimonies uploaded to social media or reported on by local journalists—into a larger information architecture, making it accessible to distant publics, policymakers, and militaries. While critiques can be made of extractive aspects of this kind of conflict monitoring (Ristovska 2021), they nonetheless open spaces for a participatory co-witnessing in which the immediate, lived experience of eyewitnesses and survivors can cohere with the mediated witnessing of people situated far from the violence itself. The unvarnished and often brutal nature of the images and accounts combines with the verification methodologies and presentation standards enacted by the database to situate individual events within the larger terrain of aerial and drone warfare. Here, then, the infrastructural scale is harnessed to counter the distributed and networked nature of such violence, making a distributed and infrastructural witnessing possible.

Aesthetics

Common conceptions of aesthetics limit its meaning to the apprehension of beauty, particularly in art, but aesthetics can be understood in more fundamental terms as a dual process of sensing and sense-making. That is, aesthetics describes how experiences of the world are sensed and how knowledge is produced from that sensing (Fuller and Weizman 2021: 35). In Rancière's terms, the politics of aesthetics concerns the 'distribution of the sensible,' which is to say how sensing and sense-making are arranged within political cultures and what forms of authority, hierarchy, and knowledge operate within and through that arrangement (Rancière 2019). But aesthetics in this processual sense do not presuppose norms or morals: sensing and sense-making animate the violent mediations of drone warfare as much as they do resistant art. There is an aesthetics to the witnessing of drone warfare within the military apparatus: the array of screens, the latency of imagery, the multispectral capacities, and the narrow fields of view afforded by the 'soda straw' camera of the drone, all layered over by the algorithmic apparatus of target identification via pattern analysis. Such an aesthetics presents itself as precise and hyper-technical but is remarkably prone to errors. Like the processes of violent mediation to which it is yoked, the sensing and sensing-making mechanics of the drone apparatus shape the knowledge claims that authorise drone violence.

To witness a drone strike from a ground control station outside Las Vegas is to do so within the aesthetic capacities and constraints of the system: to testify to threat, to watch

the strike unfold. Visible in YouTube videos of Reaper strikes and part of the visual rhetoric of films such as *Eye in the Sky* (2015), the event of a missile strike overwhelms the sensory capacity of the drone: a burst of white, an intensity of light that overwhelms the optical camera and of heat that undoes the thermographic sensor. Focussing infrared radiation through lens and onto the microbolometers assembled one-per-pixel into the sensor itself, thermographic cameras must manage wider wavelengths than their optical counterparts. As the raw footage from 29 August reveals (Fig. 4), when a missile strikes the combination of limited resolution and intense heat prevents infrared sensors from doing anything but assigning maximal intensities—computer vision cannot resolve what it cannot sense. Whether in optical or infrared, this incapacity to capture the event of the strike means that drone sensors necessarily repeat the erasure of life at the level of sensor process. Not only are these sensors overwhelmed, but latency within the network also means that the drone apparatus can only ever witness on a 2–6-s delay. Whatever appears on screen does so with the event already in the past, not real-time but still live in the sense that the drone system always experiences liveness on delay. Distance vanishes, but time dilates. Drone systems intensify this tension between occurrence and technical mediation: an elastic temporality brimming with violence.

There is a second sense in which aesthetics enables the witnessing of drone violence. For the research agency Forensic Architecture, aesthetics opens up an investigative mode that can address what founder Eyal Weizman calls "violence at the threshold of detectability" (Weizman 2017). For Forensic Architecture, "making sense involves constructing means of sensing", typically computational techniques of modelling, mapping, analysing, and geolocating (Fuller and Weizman 2021: 36). In one of their earliest investigations, "Drone Strike in Miranshah", mapping is used to make visible the split-second violence of a drone strike on a home in Northern Waziristan. Beginning with fragments of mobile phone footage aired on MSNBC, the investigation used this footage with satellite imagery to locate the specific structure, undertook pattern analysis of footage that showed the room struck but the Hellfire missile, and then used 3D modelling to build a replica of the space (Fig. 5). By triangulating the likely trajectory of the metal fragments from the missile, Forensic Architecture revealed the mid-air position of explosion and demarcated 'shadows' that likely signalled the position of bodies that absorbed the shrapnel before it could strike the walls (Fig. 6).

In "Drone Strike in Miranshah", the aesthetic capacities of walls, smartphones, and computer models each work in different ways to produce a witnessing assemblage. The shaky camera, capturing the fear of the observer; the scarred walls; the satellite imagery; computational models; all the countless mediation that swirl





Fig. 4 Screenshot of raw drone video obtained by the *New York Times* © New York Times (2021)



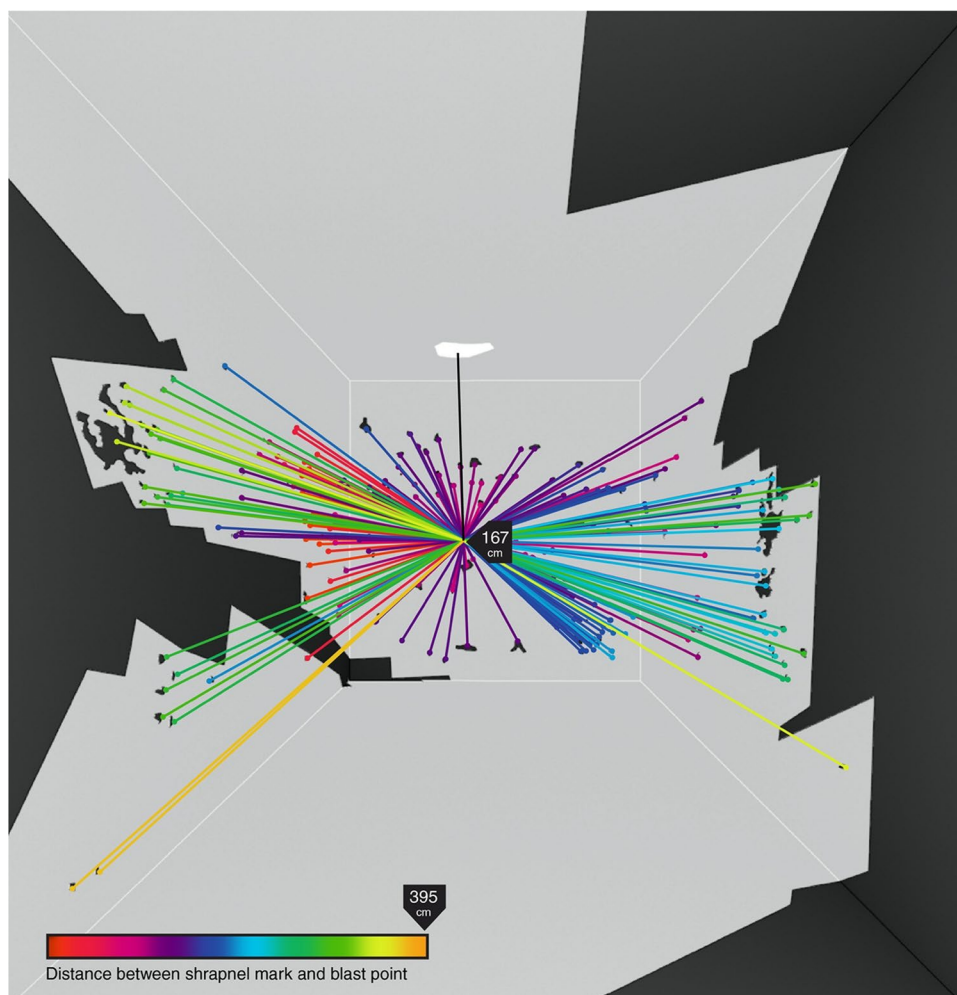
Fig. 5 Composite image of interior, from stills from MSNBC footage. (Forensic Architecture; MSNBC) © Forensic Architecture, 2021

through the making-possible of this forensic testimony. An assemblage of non-human agents freezes this moment in time, the impossible split second within which the delay-fuse Hellfire II AGM-114R knocks on the roof and explodes into fragments. In this sense, “aesthetics does not exclusively refer to a property or capacity of humans” because “sensing is also found in material surfaces and

substances, on which traces of impact or slower processes of change are registered, including in digital and computational sensors, which themselves detect, register and predict in multiple novel ways” (Fuller and Weizman 2021: 35). To be witness to what takes place at the threshold of detectability means bracketing the human sensorium in favour of an emergent, more-than-human



Fig. 6 The trajectories of shrapnel pieces are plotted on a colour scale by their distance from the point of explosion. (Forensic Architecture) © Forensic Architecture, 2021



aesthetics. The non-human lethality of the drone calls for non-human witnessing—even as they refuse to allow the human to escape responsibility.

Forensic Architecture's work operates in both the overtly investigative domain of human rights research and in the activist-art domain of galleries and public engagement, where it creates points of civic participation in the witnessing of war. But its approach has also been deeply influential on visual and open-source investigation as the *Times* visual presentation on the strike in Kabul attests. Aesthetics, then, must be understood as constitutive of drone strikes and something that must in that context be accounted for in their witnessing. But it is also a critical modality for the witnessing of drone strikes, as attention to sensing and sense-making operates both to make legible the undetectable and as a technique of address to publics that might otherwise resist the making-political of the supposedly technocratic violence of drone strikes.

Conclusion

In this article, I have argued that the deliberate opacity of drone warfare demands an approaching to witnessing that radically expands both the sites and events that must be witnessed *and* the entities and agencies that need to be understood as engaged in witnessing. Rather than offer a manual for improved journalistic practice or media coverage, I have sought to broaden the scope of the modalities through which drone war is witnessed. My central contention is that reckoning with the mutable and elusive nature of drone warfare requires greater attention to the lived experiences of the dead and the living, to the violent mediations that translate the complex textures of lives into computational systems for classifying and targeting, to the infrastructural scales at which drone warfare takes place and through which it can be witnessed, and understanding



aesthetics as constitutive of drone warfare itself, as well as a critical means of witnessing its violence. Doing so exposes the limitations of an exclusively humanitarian framing for the witnessing of war. Expanding the ambit of witnessing technoscientific war is vital if such violence is to make an ethico-political claim upon publics and heighten the sense that such wars are ‘ours’ and not purely technocratic matters, divorced from the polity at large.

At the outset, I framed this moment at the beginning of the third decade of the new century as one of flux in the form and purpose of remote warfare, and of drone technologies. By way of closing, then, I want to consider briefly how this framework for how to witness a drone strike might apply to the emerging battlefield of autonomous, self-directed swarms and other Lethal Autonomous Weapons Systems (LAWS), where the witnessing challenges of contemporary drones are only amplified, and the potential exists for further divorcing of publics and their wars. Autonomous weapons, whether in the form of self-organising swarms of robotic drones or automated targeting systems that can identify threats and making firing decisions, are a key area of military development, both in technical and strategic terms. Within critical discussions of autonomous weapon systems focus often centres on the role of human actors within the system. As with so much debate about AI more generally, problems are framed around the accountability of systems to human oversight. But military precision, logistics, organisation, and speed all depend on what Packer and Reeves call “a preventive humanectomy” that promises to reduce friction and boost efficacy by eliminating the weak point in data processing regimes. Within such systems, the capacity for the human to witness war narrows to the sharp, brutal end of violence, almost certainly launched from a significant geographical distance. Witnessing this becoming-target becomes impossible from within the humanist frame, both because the human is excised and because techno-scientific military systems, particularly those underpinned by complex algorithms or artificial neural networks, are themselves inscrutable to humans. Non-human witnessing as a mode of critical perception and analysis refigures relations between elements within systems of autonomous violence, and in doing so insists that we resist an uncritical return to the figure of the autonomous liberal subject as the antidote.

Understood within the four trajectories of analysis proposed in this essay, the lived experience of those subject to such systems of violence arguably take on an even greater significance. The violence and trauma produced by LAWS will no doubt share much with the long history of air power, but illuminating those realities, as well as the ways it differs, will be an essential—and likely increasingly difficult task. Attention, then, to the violent mediations, infrastructural scales, and aesthetics of emergent weapons systems will be increasingly crucial. Rejecting blackbox mystifications and

state claims of precision, witnessing increasingly autonomous warfare will demand more attention to the technics of systems themselves, both within computation and communication apparatuses and in their interfaces with legal, political, and military institutions. If required to predict the future (an always fraught task), I suspect that aesthetic activism and investigation will grow increasingly crucial to the task of witnessing drone strikes as they mute and metastasise. But if the strike in Kabul provided a murderous coda to the inauguration of drone warfare over two decades in the Afghan skies, it also reminded us of the necessity of scepticism towards military claims, and the necessity of continuing to evolve the techniques, practices, and concepts that enable the witnessing of such violence. It may well be that doing so is one of the only paths left to renewing and intensifying the injunction that witnessing places upon distant publics to not simply note the existence of such war but reckon with their own participation in its brutalities.

Note

1. It should be noted that quite a different argument might be made about the public participation in the drones used by Ukraine, Israel, Azerbaijan and others. As Russia’s invasion of Ukraine has profoundly demonstrated, drone strike footage can be leveraged to powerfully participatory effect. But closer analysis of this phenomenon will have to wait for a future article.

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Michael Richardson is an Associate Professor in the School of the Arts and Media at UNSW Sydney, and co-director of the Media Futures Hub. He studies witnessing, testimony and trauma at the intersection of political violence, technology, and culture.

