The control room : material and immaterial architectures of drone warfare

The Control Room: Material and Immaterial Architectures of Drone Warfare

Eva Schreiner

Two hundred ten people are needed to carry out a standard U.S. Air Force Predator or Reaper drone operation. [1] These 210 people form a network of actors across the globally dispersed spaces of violence that constitute the present-day infrastructure of war and empire. First, there is the drone vehicle itself, which must take off from a U.S. base near its place of operation—for instance, Chabelley Airfield in Djibouti. To locate potential targets, a vast intelligence network must be in place from Yemen's Old City of Sana'a to Pakistan's mountain regions. U.S. Air Force drones are further controlled via satellites that send information to a ground station at Ramstein Air Base in Germany. From Al Udeid Air Base in Qatar, as well as from Washington, D.C., senior U.S. officers, military lawyers, and a staff judge, monitor, and potentially intervene in operations. [2] While these spaces of violence form the background to this essay, I focus on a small trailer located in the desert just outside Las Vegas, Nevada. The walls of this windowless room are plastered with screens that look several generations old. Two heavy, beige leather armchairs occupy most of the space, while plastic keyboards, joysticks, telephones, and clipboards are scattered around them. It might not look like it, but this room is a central node in the U.S. military's high-tech drone warfare. In this so-called "tin box" [3] at Creech Air Force Base, a drone pilot and a sensor operator remotely control the drone, which is located 8,000 miles away. fig. 1

In many ways, the drone control room is an office space. Women and men, commuting to their jobs from towns nearby, spend up to twelve-hour shifts sitting in comfortable chairs in an enclosed, air-conditioned room looking at screens, talking to their colleagues, and clicking buttons. Instead of business suits, however, their workwear consists of camouflage flight suits, and the pulling motion of their forefinger launches a deadly missile. How are we to comprehend this room, with its mundane atmosphere and its grim mission? This seemingly paradoxical space sheds light on a warfare that is both endless and boundless. The logic of drone warfare is inherent to the architecture of the drone control room. Specifically, the ways of seeing established in this room and materialized in its interior space and its modular container form are linked to the present-day form of war that is globally dispersed, utterly asymmetrical, and potentially endless in its geographic and temporal scope. Nevertheless, these underlying mechanisms are not entirely new. Analyzing the architecture of the drone control room also shows that, despite the present

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1 See Michael P. Kreuzer, "Remotely Piloted Aircraft: Evolution, Diffusion, and the Future of Air Warfare" (PhD diss., Princeton University, 2014), 169.

2 See, e.g., Derek Gregory, "Drone Geographies," *Radical Philosophy* 183 (2014): 7–19; Lisa Parks, "Vertical Mediation and the U.S. Drone War in the Horn of Africa," in *Life in the Age of Drone Warfare*, eds. Lisa Parks and Caren Kaplan (Durham, NC: Duke University Press, 2017), 134–57. Operated from Langley, Virginia, the Central Intelligence Agency runs its own covert drone program, which is deeply interwoven with the U.S. military drone program I focus on.

3 Ed Pilkington, "Life as a Drone Operator: 'Ever Step on Ants and Never Give It Another Thought?'" *The Guardian*, November 19, 2015, https://www.theguardian.com/world/2015/nov/18/life-as-a-drone-pilot-creech-air-force-base-nevada (accessed May 12, 2017).

urgency and futuristic appearance of drone warfare, its fundamental logics were established more than five decades ago. Crucially, architecture is here understood not only physically but also as a spatial ordering of perception. The container functions as a material frame for a specific way of seeing, one on which the action of killing is based. Both perception and reaction happen in and through the container frame: material and immaterial architectures are fundamentally intertwined.

fig. 1 A U.S. Air Force pilot controls an MQ-9 Reaper drone from Creech Air Force Base, Nevada.

My aim in focusing on the underlying logics of the room instead of its concrete design is to intervene in two aspects of the current academic debate on drone warfare. Drones, officially termed unmanned aerial vehicles (UAVs) or remotely piloted aircraft (RPA), [4] are predominately talked about in terms of cyberwarfare and robotics. The technology emerges from a history of U.S. imperialism and global violence: from air raids in the Second World War to Cold War disputes and proxy wars; from Hiroshima to Baghdad. [5] Most historical accounts of drone warfare focus on this technological aspect and its roots in the "military-industrial complex," and even critical accounts display a certain technological awe. [6] Underneath the occluding high-tech surface, however, the drone is part of an intricate system of techno-social entanglements.

Second, although scholarship has tended to focus on it, the specific form of killing at a distance is not the main innovation constituting the drone system. Rather, the underlying mechanism of information processing inherent to this weapons system is what is crucial to understanding its workings. Drones are concerned with intelligence as much as with killing. The management of information occupies such a central place in drone warfare that the traditional division between the preparatory stages of reconnaissance and the active procedure of killing has become malleable: "Today, intelligence *is* operations," announced General Michael Flynn, then director of intelligence at the U.S. Central Command, in 2008. [7] As U.S. military documents leaked by Edward Snowden and published by *The Intercept* in 2015 show, the doctrine of intelligence, surveillance, and reconnaissance (ISR) has become a key component of drone operations in an integrated cycle to "find, fix, and finish" a target. [8] Drone control rooms such as the one in Nevada house and enable this consolidation of intelligence and operations. Information is

4 On this distinction, see Peter M. Asaro, "The Labor of Surveillance and Bureaucratized Killing: New Subjectivities of Military Drone Operators," *Social Semiotics* 23, no. 2 (2013): 196–224, here 216.

5 Cf. Derek Gregory, "Lines of Descent," *Open Democracy*, November 8, 2011, https://www.opendemocracy.net/derek-gregory/lines-of-descent (accessed May 10, 2017); Priya Satia, "Drones: A History from the British Middle East," *Humanity: An International Journal of Human Rights, Humanitarianism, and Development* 5, no. 1 (2014): 1–31. For the development of the fantasy of fighting at a distance, see Sven Lindqvist, *A History of Bombing* (New York: The New Press, 2001).

6 Cf. Grégoire Chamayou, *A Theory of the Drone*, trans. Janet Lloyd (New York: New Press, 2015), 26–29; Peter W. Singer, *Wired for War: The Robotics Revolution and Conflict in the 21st Century* (New York: Penguin Press, 2009).

7 Michael T. Flynn, Rich Juergens, and Thomas L. Cantrell, "Employing ISR: SOF Best Practices," *IFQ* 50 (2008): 56–61, here 56. Emphasis in original.

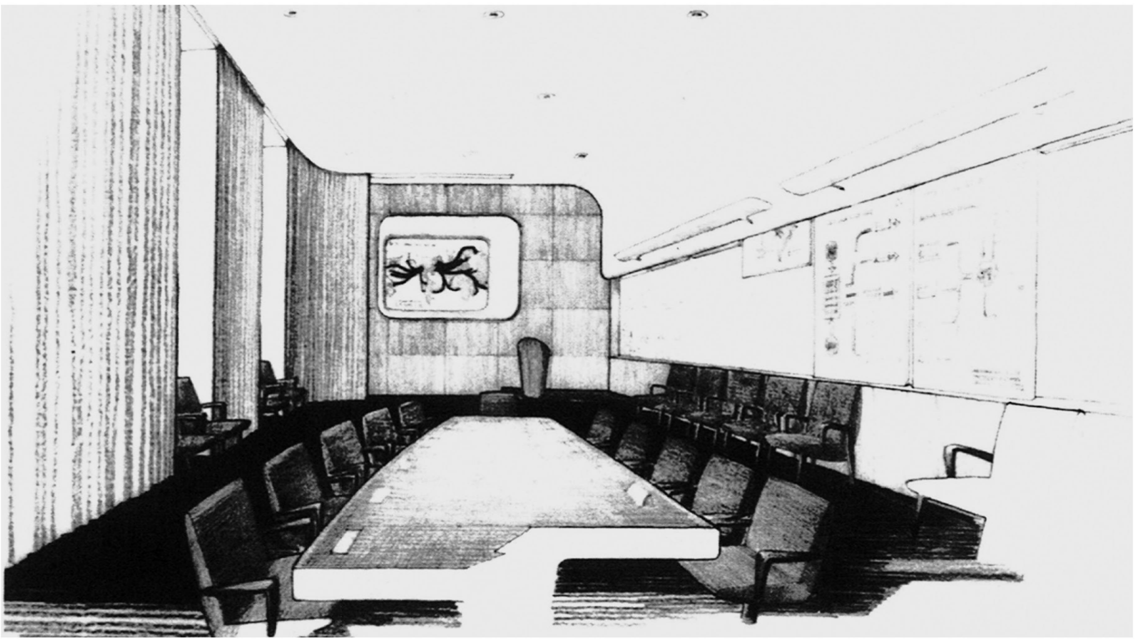
8 Betsy Reed et al., eds., "The Drone Papers: Documents: Small Footprint Operations 2/13," *The Intercept*, October 15, 2015, https://theintercept.com/document/2015/10/15/small-footprint-operations-2-13 (accessed June 21, 2018).

gathered, perceived, managed, and acted upon in and through the architecture of the control room, which therefore functions as a data-processing machine. Its architecture operates at levels that are not necessarily visible and that exceed standard understandings of spatial form.

From the Situation Room to SAGE Centers: Control Rooms in History

The idea of a professionally designed central control room for gathering military information emerged in the United States during the Second World War. Established architects, among them Buckminster Fuller, Louis Kahn, and Eero Saarinen, were recruited into the ranks of the Office of Strategic Services (OSS), America's Second World War intelligence bureau and precursor of the Central Intelligence Agency (CIA). With their help, the notion of a "war room," conceived as a top-secret, windowless building underneath the White House, took shape in the early 1940s. In 1943, Saarinen presented a model version of a "situation room" to the OSS; it was, however, never built. **9/fig. 2** Another well-known instance in the history of military control rooms can be found in Cold War weapons systems. In the 1950s, the Semi-Automatic Ground Environment (SAGE) was envisioned as the first computerized air defense system of command, control, and communications, but it proved obsolete before its completion. Several of its control centers, massive windowless four-story blockhouses, had already been built. **10/fig. 3**

When comparing the formal qualities of this architectural "type," a linear trajectory of technological development seems to emerge. The screens and charts dominating the walls of the windowless control room become increasingly sophisticated, the



9 Barry Katz, "The Arts of War: 'Visual Presentation' and National Intelligence," *Design Issues* 12, no. 2 (1996): 3–21, here 3–6.

10 Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: MIT Press, 1996), ch. 3.

fig. 2 Eero Saarinen, drawing for "Situation Room," 1943.

interaction with their handlers progressively more direct. However, attending to the ways information is managed in these spaces allows for a more complex picture to emerge. In the 1940s, the OSS's goal was to gather intelligence, evaluate it, and swiftly present it to decision makers. In the rooms designed for this purpose, multiple layers of images, maps, and diagrams could be superimposed on screens and spatially organized around central decision makers, providing President Franklin D. Roosevelt with "a panorama of concentrated information" and hence enabling him to absorb masses of data in short briefing sessions. [11] The underlying assumption of this emergent "philosophy of presentation" [12] was that the world could be known, facts about it accurately represented, and, based on that comprehensive knowledge, decisions taken.

These basic principles of information processing, evident in the Second World War-era situation room, are key to understanding the significant changes that would arise in information management, and thus in approaches to military control rooms, in postwar America. Developed in a collaboration of the U.S. Air Force with IBM, the Massachusetts Institute of Technology (MIT), and several technology corporations, SAGE stemmed from the Radiotype system IBM had exhibited at the 1939 World's Fair but was more than a technological advancement. On the one hand, it was tied to a sociopolitical context that made it necessary for the military to find ways to conduct warfare that avoided the loss of U.S. soldiers' lives. [13] On the other hand, it arose from a new way of systemic thinking that dominated the then-nascent fields of operations research, game theory, and cybernetics. At its center was a discourse surrounding the systemic interaction of "man" and "machine." [14] Instead of the situation room's panorama of information processed by a decision maker and subsequently acted upon elsewhere, SAGE aimed at the integration of information and action in its very design.

As architecture historian John Harwood notes, although the SAGE control rooms were distributed across U.S. territory, the individual locations were integrated into "a seamless network, both at the technological level of information flow and at the level of telescopic architectural modularity." [15] Similar to the Second World War-era situation room, within each control center the world was represented abstractly on screens, rendering it "manageable, coherent, and rational through digital calculation and control." [16] What differed, however, was the volume of constantly updated information being channeled into these rooms from radar stations and other sources. The amount of data was too large to be comprehended piece by piece. The IBM computer at the heart

11 Katz, "Arts of War" (see note 9), 5. Cf. Jean-Louis Cohen, *Architecture in Uniform: Designing and Building for the Second World War* (Montreal: Canadian Centre for Architecture, 2011), 322.

12 Katz, "Arts of War" (see note 9), 5.

13 Cf. Edwards, *Closed World* (see note 10).

14 John Harwood, *The Interface: IBM and the Transformation of Corporate Design, 1945–1976* (Minneapolis: University of Minnesota Press, 2011), 125.

15 Ibid.

16 Edwards, *Closed World* (see note 10), 104.

of SAGE, as architecture historian Reinhold Martin points out, was therefore designed to collect and combine incoming data and map it onto the cathode-ray displays, a process “intended to distribute an excess of information into an organized array of organized patterns.” 17 Further, this spatialized information was then “processed through the eyes and brains of ‘operators’ entrusted with recognizing aberrant patterns” and reacted upon “in real time” via light guns. 18 Harwood’s and Martin’s choices of words—“a seamless network,” “architectural modularity,” “organized patterns”—hint at the fundamental shifts underlying SAGE. The singular and centralized decision-making room of the Second World War had been expanded into a networked system of modular control centers in which decisions were not only made but executed.

fig. 3 SAGE operators, c.1959.

SAGE should also be understood within a wider architectural discourse concerning the interaction of man and machine/screen in the 1950s and 1960s. Prominent designers György Kepes and Ray Eames and Charles Eames, important actors within the “military-industrial-academic complex,” led the way. Kepes’s wartime experiences in an airplane cockpit led him to develop a new concept of visual perception, designed for “information flows emanating from communicating machines.” 19 The image was conceived not as a fixed representation but as a “landscape,” a constantly evolving process. Historian of science Orit Halpern argues that with this epistemic shift (from static representation to dynamic flow) vision itself came to be understood as “an algorithmic method or a logical pattern.” 20 In both Kepes’s and the Eameses’ teachings, the individual objects on the screen were neglectable, and their connection or “common structure” was the focus. Students were trained both as consumers of data, unearthing the logic within a large data field, and as the designers of vision itself, the managers of this pattern. 21

17 Reinhold Martin, *The Organizational Complex: Architecture, Media, and Corporate Space* (Cambridge, MA: MIT Press, 2005), 190.

18 Ibid. For the idea of “real time,” see also John Harwood, “The White Room: Eliot Noyes and the Logic of the Information Age Interior,” *Grey Room* 12 (2003): 5–31, esp. n. 40.

19 Orit Halpern, “Perceptual Machines: Communication, Archiving, and Vision in Post-war American Design,” *Journal of Visual Culture* 11, no. 3 (2012): 328–51, here 329.

20 Ibid., 335, 344.

21 Ibid., 341.

The Eameses took a similar approach in their design of the so-called "Information Machine" for IBM's 1964 World's Fair pavilion. Visitors to the Saarinen-designed building that housed the Information Machine found themselves in a closed oval, the walls plastered with screens. As Halpern notes, "the spectator was exposed not to any singular piece of content but to a perceptual field." [22] While the exhibit was an important moment in IBM's larger mission of "naturalizing the computer," [23] it also exemplifies the changing concept of vision in an information economy and the fundamental shift in information management that occurred after the Second World War. Precisely this new "landscape" of vision underlay the patterns mapped and managed in the interaction of operator and machine in the SAGE control room.

22 Ibid., 343.

23 Harwood, *Interface* (see note 14), ch. 4.

Perceptual Architecture: Cold War Logics in Present-Day Drone Warfare

This transformation in the conceptualization of vision and information processing in the 1950s and 1960s would form the basis of the drone control room's perceptual architecture five decades later. The first strike by an American armed drone is recorded in October 2001 in the immediate aftermath of the September 11 attacks, and the use of drones has since seen a steep increase. The militarized drone is hence inextricably linked to the so-called "War on Terror." Yet this new, ongoing war has deep historical roots, and anthropologist Joseph Masco convincingly traces the counterterror state of post-9/11 back to the governing of nuclear fears in the Cold War. Despite the lack of easy historical symmetries and linear technological developments, the underlying processes through which fear is mobilized and security normalized repeat themselves. [24] Similarly, the epistemic shift in vision coming out of the Cold War context led to configurations that allow for the present-day U.S. drone warfare to proceed. The logics developed in the SAGE control room more than fifty years ago are the same logics underlying the drone control room—of course, with distinct consequences in their present setting. These immaterial mechanisms are architectural insofar as they spatially order perception.

24 Joseph Masco, *The Theater of Operations: National Security Affect from the Cold War to the War on Terror* (Durham, NC: Duke University Press, 2014).

The 1940s situation room was based on the idea that all necessary information can be collected and presented in an alignment that allows each data point to be known. In the 1950s, as the volume of incoming information became too large for each data point to be processed individually, the focus was shifted to understanding general concepts—a landscape to be mapped and managed. In drone warfare, this process is at work from the outset. Before a single shot is fired, the drone crew—namely the pilot and sensor operator in the control room, as well as the team of military intelligence analysts behind them—needs to identify and locate a potential target. General Flynn describes "multiple sources of intelligence" being "massed" in order to detect an "insurgent" hiding "in plain sight." [25] In traditional air operations, the gathering of intelligence was separated from the use of lethal force: a pilot's job was the identification and destruction of the target, not its selection. In drone warfare, however, pilot, sensor operator, and mission intelligence coordinator are part of the decision-making process in what media scholar Peter Asaro terms a "tighter coupling of surveillance and the decisions to kill." [26]

What the drone crew sees on its screens is a compiled list of aggregated information from military and CIA sources, as well as the National Security Agency's (NSA) global metadata surveillance program, which together identify and geolocate potential targets. [27] This process is based on so-called "pattern-of-life analysis," which is part of the "activity based intelligence" (ABI) doctrine. Put simply, the doctrine assumes terrorists leave behind traceable "signatures," such as buying fertilizers used to build homemade bombs, visiting sensitive locations, or chatting with other "suspicious" people (all of these factors are of course highly racialized). [28] Taken together, such individual data points produce a behavioral pattern (hence the name "*activity based* intelligence"), which can be identified and subsequently surveilled. The choice of whom to track is therefore already based on a pattern analysis in which individual data points matter only when they occur together in a certain constellation.

Because the amount of available data is assumed to be infinite, these signatures are largely analyzed by nonhuman automation software, upon which the military and the CIA have come increasingly to rely. Several private companies (most notably IBM, a recurring actor in this essay) play a vital role in the development of what the industry calls "large-scale anomaly detection" programs. [29] For technological, as well as political and legal reasons, the process is not completely automated. However, the pilot and sensor operator follow the same pattern-seeking logic as the algorithm. Analyzing military reports, Asaro stresses the information-processing demands on the drone crew, which is required to "interpret a variety of pieces of information from various sources that are in turn mediated by various technologies and interfaces." [30] The crew treats incoming data points not individually but as part of a pattern within the "complex and dynamic information environment" [31] of the drone control room.

What matters is the relationship between individual items flaring up on the screen. The potential target is not analyzed in

25 Flynn, Juergens, and Cantrell, "Employing ISR" (see note 7), 57–58.

26 Asaro, "Labor of Surveillance and Bureaucratized Killing" (see note 4), 207.

27 See, e.g., Lisa Hajjar, "Drone Warfare and the Superpower's Dilemma (Part 1)," *Jadaliyya*, September 21, 2015, http://www.middleeastdigest.com/pages/index/22734/drone-warfare-and-the-superpower's-dilemma-(part-1 (accessed June 18, 2018).

28 Grégoire Chamayou, "Oceanic Enemy: A Brief Philosophical History of the NSA," *Radical Philosophy* 191 (2015): 2–12.

29 The leaked IBM documents can be accessed under: Reed et al., "Drone Papers" (see note 8). Cf. Jon Schwarz, "Drones, IBM, and the Big Data of Death," *The Intercept*, October 23, 2015, https://theintercept.com/2015/10/23/drones-ibm-and-the-big-data-of-death/ (accessed September 29, 2017). While IBM might be most famous for their computer hardware, it has always defined itself to be in the "business of controlling, organizing, and redistributing *information*." Harwood here quotes Eliot Noyes, the central figure in the redesign and management of IBM from the 1950s onwards. Harwood, "White Room" (see note 18), 13. Emphasis in original.

30 Asaro, "Labor of Surveillance and Bureaucratized Killing" (see note 4), 209.

31 Ibid.

terms of individual data points but according to its relationships to things (fertilizer), places (a mosque), and people (other potential targets). The NSA calls this process "contact chaining": the target is produced based on a network of relationships and understood, in the words of philosopher Grégoire Chamayou, as a "reticular individuality." 32 Therefore, not only does the drone control room operate as a node in the dispersed network of drone warfare, but the perceptual architecture of the room itself functions upon a mechanism of networked space. Vision is no longer understood as a static process but has become networked, a process of seeking patterns among dynamic data points.

32 Chamayou, "Oceanic Enemy" (see note 28), 6.

A related key mechanism of the drone control room's perceptual architecture concerns the production of a new relationship between past, present, and future. The 1950s and 1960s work of designers such as Kepes and the Eameses was tightly connected to that of communications theorists who put forward the idea that information is not an index of past or present events but is instead the potential for future action. 33 The data transmitted to SAGE and now the drone control room is hence analyzed in terms of the potential it holds for future events to take place. IBM puts it more confidently: "Analytics is the study of data to discover patterns, opportunities and linkages that enable prediction and inform decisions." 34 However, given that seeing, understood as pattern making, is based on the continuous recombination of information previously stored in an infinite dataset, the potential futures that are developed are always already part of the process. A world of feedback loops is created. Most directly, this process is visible in the ABI targeting model of "find, fix, finish, exploit, and analyze (F3EA)," in which killing an "objective" simply serves as the basis for finding "new lines of operations"—a never-ending, self-referential cycle. 35/fig. 4

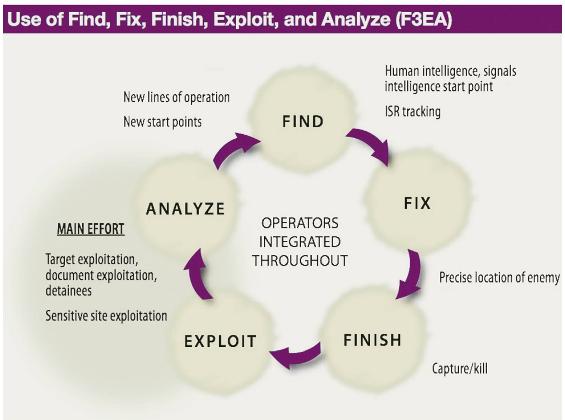


fig. 4 The targeting model of "find, fix, finish, exploit, and analyze (F3EA)," 2008.

33 Halpern, "Perceptual Machines" (see note 19), 339.

34 IBM Center for the Business of Government, *From Data to Decisions III: Lessons from Early Analytics Programs* (Washington, D.C.: Partnership for Public Service, 2013), 1.

35 Flynn, Juergens, and Cantrell, "Employing ISR" (see note 7), 57.

This new temporal relationship should be situated within a larger context of counterinsurgency that the U.S. military, according to anthropologist Masco, presents as "endless, boundless, and defensive." The resulting security state apparatus "constitutes a dangerous future as its object of concern." 36 That is, what is projected as the basis for action in the present is an imagined but potentially catastrophic future. No matter how unlikely, uncertain futures are mapped out and, significantly, acted upon in the form of "preemptive strikes." 37 What is promised and expected

36 Masco, *Theater of Operations* (see note 24), 1.

37 Cf. Louise Amoore, *The Politics of Possibility: Risk and Security beyond Probability* (Durham, NC: Duke University Press, 2013).

is an anticipatory control of time to come: the transformation of an unknowable future into a knowable and calculable system. As then-Secretary of Defense Donald Rumsfeld stated in 2002, the central concern in the War on Terror is the not-yet-visible dangers, the "unknown unknowns." [38] Looking for "unknown unknowns" results in a search for "terrorist behavior" that does not subscribe to a fixed definition of what "terrorist behavior" is. This process can be understood based on the 1960s shifts in perception. Since the focus in a pattern-seeking algorithm is not on the individual data points but on their relationships, and since lines drawn between data are mobile, the resulting form of "terrorist behavior" is able to take new shapes and define new forms of future threats continually. [39]

Crucially, however, to spot what is unknown, one needs to possess an inventory of known forms. Drone operators are supposed to develop a "target intimacy to the degree that they could easily recognize *something unusual*." [40] This idea of the unknown or unusual is strictly empirical, Chamayou argues: "it is *learned* ... on the basis of an analysis of frequencies and repetitions in given sets of activities." [41] Not only is the computer algorithm programmed to spot the anomaly (a discrepancy within the patterns of regularities); human operators in the drone control room are required to do the same. These processes at work in the immaterial, perceptual architecture of the drone control room are designed. The notion of seeing as seeking patterns in order to identify potential future actions is actively produced. This notion is also becoming part of the material realm.

Container Interiors

The perceptual logics underlying the drone control room are materialized in its physical architecture in multiple ways. The room's interior space has a certain haphazard quality to it, with its cheap-looking plastic appliances and paper checklists. On one level, this speaks to the rapidly expanding nature of drone warfare over the last fifteen years, but it also continues established, pre-9/11 mechanisms, which do not actually require costly changes in its (visible) hardware. The mundane appearance of the room further raises questions of representation and image circulation. After all, the available photographs and information about the room (including the image reproduced here) stem almost exclusively from the U.S. military.

What warrants attention, therefore, is not so much the old-school design of the monitors as their quantity. The multitude of screens and monitors mirrors the complex network of data analysis proceeding not only in the algorithms running in

38 See Errol Morris, "The Certainty of Donald Rumsfeld (Part 1)," *New York Times*, March 25, 2014, https://opinionator.blogs.nytimes.com/2014/03/25/the-certainty-of-donald-rumsfeld-part-1/ (accessed September 29, 2017).

39 A report published by IBM quotes a RAND senior policy analyst saying, "The spirit of it [ABI] breaks the traditional intelligence paradigm. ... ABI says no, we don't know what we're looking for and by the way, we may find the answer before we know the question." IBM Center for the Business of Government, *From Data to Decisions III* (see note 34), 32.

40 Flynn, Juergens, and Cantrell, "Employing ISR" (see note 7), 59. My emphasis.

41 Grégoire Chamayou, "Patterns of Life: A Very Short History of Bodies," *The Funambulist*, 2014, https://thefunambulist.net/history/the-funambulist-papers-57-schematic-bodies-notes-on-a-patterns-genealogy-by-gregoire-chamayou (accessed May 10, 2017). Emphasis in original.

the background but in the room itself, through the pattern-seeking analysis performed by the drone crew. Yet these displays are only one source of data. One drone pilot, for instance, tells of a photograph of the second plane hitting the World Trade Center on September 11. Plastered to the wall in direct proximity to the screens, it functions, in his words, "just to try to make you pissed off about it all over again right before you go do your job." 42 This image, and its evocation of threat, is thus another data point to and from which relations are drawn, demonstrating once more how, in a pattern-seeking mode of vision, past events form the basis of calculation for future action. Even if only anecdotal, this image helps to explain the situatedness of the perceptual architecture. The camouflage flight suits worn in the control room can similarly be read as marking the space as military, functioning as an (unconscious) reminder of a duty to protect from "unknown unknowns." The enclosed space of the drone control room does not simply house the perceptual, immaterial architecture of drone operations; it also becomes part of it.

42 Tonje Schei, "Drone Wars: The Gamers Recruited to Kill; Extract from the Film 'Drone,'" *The Guardian*, February 2, 2015, https://www.theguardian.com/news/video/2015/feb/02/drone-wars-gamers-recruited-kill-pakistan-video (accessed February 28, 2018).

fig. 5 Drone control room container on a U.S. Air Force base, c.2012.

The drone control room's exterior of comparatively thin, exposed steel boxes at first glance presents a sharp contrast to the Cold War SAGE defense system, whose blockhouse control centers were actual bunkers protected by "thick and opaque concrete walls." 43/fig. 5 Shifting the focus to the underlying mechanisms, however, allows for the perception of certain continuances, for seeing the container form as a materialization of the perceptual architecture established during the Cold War. What was learned in designing the buildings for the "military-industrial-academic complex" was the "instrumental value of being able to respond flexibly to new scientific developments," Martin argues. With research agendas continually shifting, the spaces themselves had to be as flexible as possible "in anticipation, as it were, of that which cannot be anticipated." 44 While the "tin box" of the drone control room is visually starkly different from the SAGE control centers as well as the office buildings Martin discusses, the underlying mechanism of a modular, ordered space is in fact similar. Containers are comparatively cheap, flexible, mobile, and readily available. The container architecture enables the U.S. military to continually modify and expand, adapting

43 Harwood, *Interface* (see note 14), 126.

44 Martin, *Organizational Complex* (see note 17), 186.

to perpetually changing understandings of threat and solutions to fight them. The drone control room hence not only houses military operators but actively contributes to the perpetuation of boundless, endless warfare: “unknown unknowns” are literally built into the system.