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**Protocols of Portability**

Haidee Wasson

**ABSTRACT:** Arguing that technologies of cinema have long been iterative rather than singular, this essay positions portability at the center, rather than the margins, of our working definitions of cinema. By using the American military’s development of the JAN (a portable 16mm projector) during World War II as a case study, this essay shows that ideals of adaptability, ease of operation, and efficiency shaped widespread, postwar technological developments. The implications of this for new directions in film historiography

are discussed.

**KEYWORDS:** historiography, film projectors, 16mm, portability, American military, World War II, film technology, JAN (Joint Army Navy), design protocols

Let’s speculate. How might we begin to write a history of cinema that upheld portability as a foundational, enduring, and dominant characteristic of the apparatus? What would it mean to presume adaptability and versatility when investigating the display and performance of films? What if we assumed that the recorded and projected forms of moving images secured and shown on celluloid have long been predominantly elastic and rounded, rather than rigid and rectangular? Dim and scratchy, rather than bright and clear? Barely audible, rather than gut-bustingly loud? A highly variable, small-scale encounter, rather than a codified spectacular event? Beyond hidden and seamless, what if the machines of cinema have long been visible, dirty, noisy elements of watching films? What would it mean to write the history of cinema as primarily a history of little images and not big ones?

Let’s assess. Histories guided by one or perhaps all of these questions would, like all histories, be partial histories. Yet, I suspect that such histories would surely expand not just the questions we ask but the objects, aesthetics, geographies, and related phenomena we examine, as well as the methods we use to make sense of them. Such histories would pursue all the vectors of cinema as a projected form, including its large and small screens, its confined and limitless spaces, its experimental as well as highly institutionalized forms. Such histories would presuppose that cinema has long been an iterative, rather than a singular, form, with multiple viewing platforms and protocols. Speculating in this fashion can provide a perspective on genres of film and modes of use that we have only just begun to examine. Lastly, foregrounding portability leads quickly to assessing the ways in which cinema has long been intimately linked to creative and progressive activities, but also to powerful institutions and governmental agencies, nationally and internationally, which have long bypassed the theater proper in favor of nimble, adaptable, mobile machines.

Let’s consider an American case study: the JAN P-49. This portable 16mm projector was commonly referred to as the JAN. Its letters were an acronym for Joint Army Navy, and the *P* stood for protocol. The JAN was as much an abstraction as a thing, a list of ideal qualities or performance standards desired of a portable film projector by the American military during World War II. In other words, the JAN was a set of design protocols, a kind of callout to American industry to innovate a particular kind of film projector, one that met the military’s rapidly expanding needs for film projection. In practical terms, there was no single JAN. The protocol resulted in a family of projectors, manufactured by a number of large and small American corporations. Yet, the JAN answered a reasonably important question: what did the American military, a singularly powerful global institution, want from a film projector?[[1]](#footnote-1)

The urgent need for more motion picture equipment was clear. Several years into the growing European conflict, Congress passed the Selective Services Act of 1940 (the draft). The events of December 1941 at Pearl Harbor triggered America’s official entry into the war. New recruits needed efficient and effective training. Morale on the home front and warfront required bolstering. The military machine, with its massive information and communications needs, demanded the most modern tools of acquisition, display, analysis, and dissemination, and film was a crucial element in these efforts. In 1942, the Army Pictorial Service established the Photographic Equipment Branch to consolidate ongoing efforts to identify and meet military-wide audiovisual needs. Soon after, in 1943, the initial standards for the JAN were written by a committee comprised of representatives from each of the branches of the military under the aegis of the also recently established Standards Committee on Photography and Cinematography. There were minor variations in the protocol over the years, but the basic principles of the earliest JAN persisted throughout its subsequent iterations.

The JAN was a whole audiovisual system intended to firmly institutionalize moving pictures and—when relevant—their sounds into the structures and operations of the American military. It included a projector as well as an amplifier and speaker, and a screen. Thus, the JAN protocols entailed among other things identifying how clear and loud moving picture sound should be, and how bright and big the image. Brightness, for instance, ranged from 275 to 385 lumens, which is about the level of a standard miniature or pocket projector today. The screen size ranged from 67"x85" to 84"x114," depending on which of two types of screens were used, matte or beaded; the greater the reflectivity, the larger the screen. Equally important, the JAN was to be carried by a single person. As such, it featured a firmly mounted handle atop the case, integral to its design. The machine’s rugged case and housings were also meant to ensure proper function in light of a broad range of sometimes rustic transportation methods and performance scenarios. Though the ability to easily move the machine to many places was foundational to its intended operation, it should be pointed out that some units weighed as much as seventy pounds, drawing attention to the relative definitions of “portability” across contexts. Seventy pounds for a portable movie theater might not seem so bad, but compared to current ideas about portability—“Can you carry it in your pocket?”—the term strains under some prohibitive weight. Anecdotally, I have been told that soldiers frequently threaded a stick through the JAN’s handle so that two men, rather than one, could bear its load.

 In addition, the protocol called for simple operation in order to offset the considerable challenge of training the required number of new projectionists. Strong performance under heavy use was also crucial, which was defined by the JAN protocol as the ability to run a film one thousand times without visible deterioration of the print. The performance goal was steady, daily operation without repair for two years. The JAN was to be in near-constant running mode, easy to use, and consistent in performance—a reliable and everyday tool. The resulting metal castings protected the internal works and the amplifier, which functionally created the appearance of multiple metal boxes within boxes. The JAN looked like a laboratory hybrid, falling somewhere between a nineteenth-century optical toy and a tank. Many JANs procured by the army were issued in camouflage green, making the projector but one harmonious element of all standard-issue equipment.

 The JAN protocols for film speed leave behind the demand for variable controls readily evident in the preceding design and engineering discussions about portable projectors. These earlier discussions frequently wrestled with the demand for projectors that allowed films to be stopped and started, reversed, or run at variable speeds. An ongoing challenge, the JAN’s additional imperative for simple mechanisms that caused minimal damage to film prints led to eliminating such options from the projector entirely. No celluloid would linger inside of the JAN’s heavy metal box or in front of that hot lamp. Cooling systems were specified to operate well at full running speed only.

The persistent challenge of reducing projector heat runs through the history of many film display technologies. But it holds particular importance for efforts to miniaturize projection devices. There has long been a positive or parallel relationship between bulb brightness and image quality. We have tended to equate brightness with image quality. Yet, illumination has a long and similarly positive, parallel relationship to heat. That is, efforts to improve brightness have also been necessarily linked to the challenges of managing heat. One response to the demand for a smaller projector was to use less powerful bulbs. Another was to build miniaturized cooling systems (fans) into projectors. But, by far, the most significant challenge posed by heat was doubly challenging in light of the persistent user desire to pause or still the image. By and large, if a film was moving at eighteen or twenty-four frames per second, lamp heat was a manageable threat. But pausing the image in order to allow for live commentary and/or close extended examination risked exposing the film to a concentration of heat that frequently and irreparably damaged it. To be sure, cinema’s heat entailed a complex relationship between miniaturization of the apparatus and the size, speed, brightness, and lifespan of its images. This was a complexity that the American military was unwilling to entertain for its standard issue equipment.

In general, the JAN’s design protocols were clearly built on a long history of debate concerning the qualities and performance standards of small-gauge projectors, readily evident in the publications of professional organizations such as the Society for Motion Picture Engineers (SMPE). Established in 1918, one of the SMPE’s earliest goals was to standardize an industry-wide format for portable projection, a goal accomplished five years later with the 16mm gauge in 1923. Later wartime design efforts were geared toward building on and adapting these standards and protocols. An idea as seemingly simple as portability changed significantly in these formative years. For instance, before the war, small projectors exemplified a categorically different kind of portability than that demanded by battle. Prewar portability was a comparably genteel mobility. Can it be moved from closet to classroom? Attic to atelier? During the war, portability came to mean ruggedness; resistance to extreme weather; travel by air, land, or sea; and performance in highly impromptu venues indoors and out. According to the JAN protocol, the ideal portable projector could withstand being dropped eighteen inches onto a concrete floor, ten times, without any impact on performance.[[2]](#footnote-2)

In sum, the military wanted a projector that was portable, which, in this context, meant movable and adaptable as well as easy to use, maintain, and fix. It wanted a projector that was low in cost, mass produced, and notably tough. Why a projector? And why a projector like this? Published histories show us that the American military’s active involvement in making and showing films began during WWI, but did not become a deeply institutionalized aspect of military operations until American entry into WWII. With America at war, Hollywood filmmakers joined the service and made films in support of the cause. These efforts tend to be represented by *Why We Fight*, often associated with Frank Capra, a seven-part series of documentary films shown first to soldiers and eventually to the general public. These and many other films were used for a range of purposes, including soldier and civilian morale, as well as basic and specialized training. Thomas Schatz also reminds us of the many ways in which Hollywood films made for commercial distribution were shaped through cooperation with the governmental imperatives of the US military.[[3]](#footnote-3) But there is another story to be told about cinema as a wartime apparatus, one not well addressed by focusing on the familiar. First, it’s important to note the wide range of film types made by and for the military in the 1940s. This includes animated shorts; training films about jungle survival, foreign customs, battlefront surgery, and army codes of conduct; instructional films regarding equipment operation; films for religious observance; and therapeutic films addressing postwar trauma.[[4]](#footnote-4) Some of these were regularly shown to soldiers; others were widely available to be seen as part of the military’s global film distribution system. Some, such as recruitment films, circulated domestically.

For all that we know or don’t know about these kinds of films, one study indicates that we know even less about the whole range of military uses of moving pictures. A military report written in 1954 looking back on past film activities indicated that 75 percent of the military use of moving image technologies was not to entertain or educate soldier audiences, or to comfort worried citizens, but was put to “applied military purposes.” This other 75 percent entailed the use of film for mapping, aerial surveillance, ground and underwater surveys, battle study, reconnaissance, ordnance testing, top-secret communiqués, periscope films, and, among other functions, gunnery training.[[5]](#footnote-5) Also relevant here are films used for intraorganizational communication, which included content like field reports, troop movement, POW footage, and battle updates (movies as illustrated office memos). Many of these films were classified, and hence largely inaccessible even to many soldiers, despite the expansive system of film libraries standard at American military bases by the end of the war. All military films came affixed with a label indicating the clearance required for access: restricted, confidential, secret. Film viewing in the military was strictly hierarchical, with the most valuable films moving up a distribution chain that was minute in size, sometimes one-to-one, rather than the mass distribution model we generally associate with commercial cinema. In other words, the most important films would be seen by a general or by the president. The less sensitive films circulated from library to library, camp to camp. This system of viewing was instituted for tens of thousands of films, but also hundreds of thousands of feet of footage never bound for status as a completed “film” proper. An effective system of circulation entailed a standardized display platform, of which the JAN was but one crucial element. Collectively, this amounted to a global, integrated system for circulating and viewing a highly coordinated program of audiovisual content, and a kind of multifaceted film viewing, one that included conventional projection scenarios with large seated audiences but also small audiences of a few or one. It included packaged programs for entertaining and teaching soldiers but also memos for bureaucrats to be seen once, as well as aerial footage to assess bomb spray patterns to be watched over and over, frame by frame. This technological infrastructure supported what one report described as “practically every activity of the Armed Forces.”[[6]](#footnote-6)

There is a fascinating story here about how the American military became such an avid user of celluloid and viewer of films. Yet, basic questions remain unanswered. How did they *make* so many films? How did all of those film production facilities located on so many military bases operate? What was good film analysis, according to the US military? What myriad forms of knowledge, aesthetics, and experience can be gleaned from these diversified practices of film viewing? And, to return to the primary focus of this short article: how did all of these films get seen? To be sure, knowing about the JAN helps us make some sense of this global apparatus. In short, the JAN helped the American military to efficiently and effectively show—that is, to enlarge and illuminate, and in many but not all instances, make audible—a vast assortment of films across a diverse array of viewing contexts. The coordinated, global scope of this highly adaptable, portable cinema amounted to a paradigmatic shift in the history of moving images and their technologies.

Some background on military film exhibition is helpful. At the beginning of WWII, the film program that had been set in place to entertain and to train soldiers was still largely built on the immobile, stationary theatrical model using 35mm equipment. It is worth noting that even before American entry into the war, the US Army Motion Picture Service constituted what its representatives claimed was the largest single movie chain in the country (seven hundred theaters in 1942).[[7]](#footnote-7) As American involvement in the war increased, the need for a nimble kind of display system that could serve multiple, expanding, and even unforeseen needs became clear. Thus, due to its smaller size, adaptability to all manner of spaces, lower costs, and lighter weight, 16mm film became the standard equipment for all overseas operations. Meanwhile, a combination of 35mm and 16mm formats supported film use back home in the United States, where the military availed itself of commercial, theatrical, and so-called nontheatrical distribution circuits (both civilian and military proper). In order to facilitate circulation to all overseas operations, Hollywood began offering features on 16mm in February 1942.

With the standardization of a display system, individual films became part of a distribution and exhibition system that was dynamic, vast, and unparalleled in its scope.[[8]](#footnote-8) It reached perimeter radar and weather stations and remote outposts in cold, hot, wet, and dry theaters of operation (Fiji, India, Iceland). This network included temporary tent-theaters, underwater mobile theaters (submarines), deck-side theaters (transport carriers), and what was called by one publication at the time, the “foxhole circuit”—the impromptu theaters in makeshift facilities at or near battlefronts. These were in addition to the more than six hundred theater-like operations at army posts or naval stations, as well as at 1,150 smaller bases, called the Blue Circuit. Facilities also existed in military hospitals as films played a regular role in convalescence and its varied boredoms. These and other locations were serviced by plane, boat, or van (depending on urgency). More remote locations received deliveries by mule, parachute, or the back of a worthy soldier.[[9]](#footnote-9)

The military set up schools for projectionists in its film libraries and exchanges in the centrally located facilities both in the United States and in international theaters of operation.[[10]](#footnote-10) These locations also housed projector repair shops. Films were held at central and regional film libraries, sometimes positioned at transportation hubs to speed along delivery. Estimates vary, but one report indicates that, by 1945, there were 3500 showings of Hollywood films to troops per day and 8300 overall shows per day.[[11]](#footnote-11) This was likely only a fraction of film viewings, as these numbers would not include the many kinds of films made by the military and the fuller range of what a “show” could mean, such as the daily impromptu, informal, and small-scale projection scenarios made possible by portable projectors. By the end of the war, while conventional 35mm theatrical military venues held relatively steady, the number of portable and provisional theaters grew from an estimated 370 before entry into the war to well beyond 16,000.[[12]](#footnote-12) Using this number, the ratio of portable projection machines to purpose-built theaters used by the military at the end of the war was 22:1, representing a fifty-fold increase in mobile cinema devices and their provisional performance contexts.

The American military needed a projector that could be used on the deck or in the bowels of a ship and that could fit through the small entryways and round hatches of a submarine. It needed a projector that could play in tents and that could operate in spaces four or five feet high. It needed satisfactory performance in extreme subzero temperatures, as well as in tropical heat and humidity. It needed a machine that a projectionist-soldier could carry and repair easily in a field or near a battlefront. Moreover, the military needed a projector that could withstand heavy use and versatile demands. The result was the JAN protocol and a global network of unparalleled scope.

What else does the JAN tell us about American cinema? How does its kind of portability help us to expand our understanding of film’s place in media and cultural history? With respect to the smaller film gauge, Gregory Waller has shown that advertising and industry discourse shaped the 16mm projector domestically during wartime, articulating 16mm film projectors to a predictably patriotic, nationalist, and industrial ideal of military fortitude. He argues that the “promise” of 16mm—generally not available for civilian purchase during the war, but widely available after—created a clear picture of the small film projector as a mighty war machine, a weapon perfected on the worldwide battlefield, one that neatly aligned these portable viewing machines with a nation not just geared up for war, but ready for an enduring era of “unmatched American military and industrial prowess and of unmatched American might.”[[13]](#footnote-13) This might was also rapidly equated with the machine’s compactness, its portability, and its ability to be rapidly produced, distributed, and put to use—an example of the “military-industrial

complex” so widely attributed to this postwar era. World War II was, after all, widely considered to be the first mass-industrial war, fought and won with carpet and blockbuster bombs, as well as an armada of media technologies. The portable projector was but one of the technologies shaping this effort.

 Waller’s work provides a crucial complement to my own. As the military-industrial might of the projector was forged both on the battlefront and home front, a complex of discourses, filmmaking and filmshowing technologies, as well as lasting infrastructures, shaped a significant postwar development in film culture: the small audience, the widespread institutionalization of film viewing, and the everyday sense that cinema and its technologies (in this case, projectors) were integral to postwar life. This was not cinema as an event or a night out, but as part of a settling common sense about the place of media and machines in cultural life. After the JAN, small-gauge projectors were put to innumerable uses that demonstrated the feasibility of cinema as a regularized, familiar, and even pedestrian technology, one made possible by the imperatives of war and the industrial logics of mass-produced precision machines.

 The wartime protocols and manufacturing precedents laid out here became a powerful catalyst for the proliferation of projectors that followed. RCA (Radio Corporation of America), for example, a major force in the manufacture of media devices (phonographs, radios, televisions) filled sizable projector contracts during the war and continued to play a prominent role in this market thereafter. And, while engineers began designing and companies marketing a highly diversified range of projectors (silent and sound), there was also a clear trend toward what one commentator of the time called a “mass market projector,” a sturdy, simple, synch-sound instrument that could stand up to daily use and be operated by an untrained projectionist.[[14]](#footnote-14) To be sure, the mass-market projector echoed many of the qualities of cognate media (such as radio) that had already made the transition from technician’s delight to household convenience. But the mass-market projector also resonated with the projection principles articulated specifically in the JAN. The imperative toward reduced cost and simplicity—a push-button conduit to automatic, premade content—invisible as a machine per se, persisted as a common refrain in engineering and design discourse. For instance, the ideal of a multiply articulated projector that exercised considerable control over all vectors of cinema—brightness, speed, stillness—a type of projector commonly referred to in later years as “analytic,” ceded ground to the idea of a machine for the “casual” motion picture fan who was less invested in a display of machine savvy than in simply owning an efficient, if blunt, playback device.[[15]](#footnote-15)

 The drive toward the seamless insertion of film projectors into a booming audiovisual economy received another catalyst with the post-Sputnik National Defense Education Act of 1958, which provided yet another influx of military money and anxiety into expanding and transforming the technological apparatus of small cinema by supporting its widespread use in classrooms, a move that marks concretely the further industrialization of learning: mass-produced machines fortifying the Cold War American mind.[[16]](#footnote-16) The military might of the portable projector was not just an industrial might but also closely linked to what Lizabeth Cohen has called “a consumer’s republic,” making projectors a commonsense element of a postwar media environment supported by a citizenry partly conceived as a mass body of consumers.[[17]](#footnote-17) These connections among military, industrial, and consumer forces help to explain why small-gauge projectors were so numerous in postwar America. Already by 1959, these portable, small-scale, provisional cinema devices outnumbered movie theaters by a factor of 370:1, confirming a growth trend for portable cinema that continued until surpassed by video in the 1980s.[[18]](#footnote-18)

1. The document outlining the JAN protocol was not issued until May 31, 1944. The first projectors issuing from the protocol were not ready to use until the war ended. For a succinct overview of its development, see James A. Moses, “Trends of 16mm Projector Equipment in the Army,” *Journal of the SMPTE* 55, no. 5 (1950): 525–35. [↑](#footnote-ref-1)
2. Raymond Spottiswoode, *Film and Its Techniques* (Berkeley: University of California Press, 1951), 261; Robert A. Kissack Jr., Army Film Distribution and Exhibition,” *Journal of the SMPTE* 46, no. 1 (1946): 26–29; and Moses, “Trends of 16mm Projector Equipment in the Army,” 525–35. [↑](#footnote-ref-2)
3. Thomas Schatz, *Boom and Bust: The American Cinema in the 1940s* (New York: Scribner, 1997). [↑](#footnote-ref-3)
4. Editors of *Look*, *Movie Lot to Beachhead: The Motion Picture Goes to War and Prepares for the Future* (New York: Doubleday-Doran, 1945). [↑](#footnote-ref-4)
5. These numbers were presented in the Motion Picture Association of America’s “Report of the Film Survey Committee,” July 1954, 5, Binger Collection, American Museum of the Moving Image. In 1954, the three branches of the military budgeted a combined $100,000,000 annually for such activities. Patricia Zimmermann provides a general view of some of these activities in *Reel Families: A Social History of Amateur Film* (Bloomington: Indiana University Press, 1995). [↑](#footnote-ref-5)
6. “Report of the Film Survey Committee,” 17. [↑](#footnote-ref-6)
7. R. B. Murray, “Administration of U.S. Army Motion Picture Service,” *Journal of the SMPE* 40, no. 1 (1943): 53. Murray estimated half a million seats in 1942, with 4630 programs each week. [↑](#footnote-ref-7)
8. Schatz concurs, claiming that these small screening environments constituted “the largest distribution and exhibition circuit in the world—and one that entirely encompassed the entire globe.” *Boom and Bust*, 136. [↑](#footnote-ref-8)
9. “Report of the Film Survey Committee,” 39. [↑](#footnote-ref-9)
10. Moses, “Trends of 16mm Projector Equipment in the Army,” 527. [↑](#footnote-ref-10)
11. By October 1945, Hollywood had delivered 43,189 prints of 1,941 features to the War Department, plus 33,189 prints of 1,050 shorts. The estimated number of showings per day, worldwide, was 3,500, with daily attendance of about 1.5 million. This significantly outstripped the number of USO live entertainment shows by a factor of 127:1 (estimated). “Get ’Em into Action: Notes for a Conference on the Distribution of Films and Equipment,” Army Pictorial Service, Toledo, Ohio, May 29, 1943. [↑](#footnote-ref-11)
12. According to James A. Moses, “during the period 1942–1945, the Signal Corps procured more than 16,000 16mm projectors from several commercial manufacturers.” “Trends of 16mm Projector Equipment in the Army,” 527. [↑](#footnote-ref-12)
13. Gregory A. Waller, “Projecting the Promise of 16mm, 1935–45,” in *Useful Cinema*, eds. Charles R. Acland and Haidee Wasson (Durham, NC: Duke University Press, 2011), 144. [↑](#footnote-ref-13)
14. Percival H. Case, “Some Engineering Aspects of Amateur Projection Equipment for the Mass Market,” *Journal of the SMPE* 49, no. 2 (1947): 139–46. [↑](#footnote-ref-14)
15. As Percival Case of Excel Movie Products, Chicago, explained, “Such refinements as stop-on-film, reverse projection, and automatic rewind, though demanded by the advanced cinematographer, do not add to the fundamental subjective enjoyment of the casual motion picture fan, to a degree which justified their cost, so they are not included.” Ibid., 141. It’s also worth noting that this particular iteration of portability entailed an ideal image size of eighteen inches. [↑](#footnote-ref-15)
16. Charles R. Acland, “Curtains, Carts, and the Mobile Screen,” *Screen* 50, no. 1 (2009): 148–66. [↑](#footnote-ref-16)
17. Lizabeth Cohen, *A Consumer’s Republic* (New York: Random House, 2003). [↑](#footnote-ref-17)
18. See Haidee Wasson, “Suitcase Cinema,” *Cinema Journal* 51, no. 2 (2012): 148–52. [↑](#footnote-ref-18)