Headline: *What Many Are Getting So Wrong About Obsolescence*
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Selected Definition: *Survivability myth* — the belief that a battlefield system is obsolete when itself or its user is vulnerable.

Introduction

What makes a military technology obsolete? In late November 2024, the mercurial oligarch Elon Musk took to X (Twitter) to severely criticise the "idiots" building the F-35, a multirole fighter jet developed and manufactured by Lockheed Martin (Hambling, 2024). As the chair of the incoming Department of Government Efficiency tasked with slashing government spending, Musk did not just complain that the aircraft was overdesigned and overpriced. He also questioned the very necessity of fighter jets in the future. "Crewed fighter jets are an inefficient way to extend the range of missiles or drop bombs," Musk posted. "A reusable drone can do so without all the overhead of a human pilot [...] Manned fighter jets are obsolete in the age of drones." He added that fighter jets are "laughably easy to take down" because their "stealth means nothing if you use elementary AI with lowlight sensitivity cameras" and thus "will be shot down very quickly if the opposing force has sophisticated SAM or drones."

There is an increasingly common public perception, and even in some military commentary, that the inability of a weapons system itself or its user to survive on the battlefield is the critical cause of its obsolescence. This 'survivability' narrative has driven charges of obsolescence against the full spectrum of military technology available, challenging us to reflect on whether the tools we have to fight the next major war with are sufficient. One article in March 2022 questioned if tanks were still worthwhile investments as endless footage of their destruction by anti-tank missiles and drones was published (O'Brien, 2022). "Tanks, fighter jets, and warships are being pushed into obsolescence," argued an Atlantic article in May 2022 because drones and various missiles were causing significant losses among those systems (Cumming, 2022).

These arguments, based on published footage and other media describing the loss of large and expensive equipment, seem so intuitive that it might be puzzling why many major militaries have and continue to procure similar equipment. This is because much of the public commentary is getting a crucial fact about the battlefield incorrect. It is not survivability that drives

technological obsolescence. Instead, superior performance in the relevant battlefield role and sustained availability are the primary determinants of technological obsolescence.

Killing the Survivability Narrative

Understanding the intersectional complexities and nuances of modern warfare begins with tremendous effort and broad research, which is not always possible on all levels of debate. Making accurate statements about the battlefield requires in-depth technical knowledge of a dizzying range of technologies, but also how they interact with variables like tactics, environment, and quantity. Often, certain erroneous claims are driven by misconceptions about warfare, war economics, and even physics.

Many experts, for example, responded to Musk's criticisms by explaining the basic economic and physics constraints that make it impossible for smaller drones to detect, chase, or engage modern aircraft. Others pointed out that modern air defence, like those employed by the Islamic Republic of Iran, was helpless against airstrikes launched by stealthy Israeli F-35Is back in October (Epstein, 2024). Likewise, Ukrainian ground air defences have decimated the Russian Air Force, but have lacked the range to prevent the relentless bombardment of glide bombs by Russian jets operating dozens of kilometres behind the front. Above all, the surest indicator of the fighter jet's and any other weapons system's continued relevance is to follow the money. The dramatic reveal of two new Chinese next-generation aircraft (Jensen, 2025), four years after the first US Next-Generation Air Dominance prototype flight (Insinna, 2020), underscored how major militaries continue to believe that fighter jets and other large piloted aircraft will play a critical defence role in the next few decades at the very least.

Certainly, even military officials with experience and technical expertise have made similarly incorrect assessments. Consider, for example, some 20th-century claims that put into question the future survivability of the aircraft carrier. After US Navy testing of anti-ship bombers in 1925, for example, Lt. Commander G.B. Vroom claimed that the plane could only defeat the battleship through "too much publicity" and that "dropping bombs on ships undefended by planes merely proves that V^2 equals 2 Gs" (Vroom, 1925). In 1940, Nazi German naval leadership likewise believed that carrier-launched combustion engine planes would eventually "not be usable in this war" and thus never seriously invested in carriers (Polmar, 2008, p. 418). Lt. General James H. Doolittle, who relied extensively on carriers in the Pacific

campaign against Imperial Japan, argued before a US Senate Committee that “the carrier has two attributes: one attribute is that it can move about; the other is that it can be sunk” (Polmar, 2008, p. 2). And yet, in 1993, former US President Bill Clinton would remark that the first reaction in Washington to an international crisis breaking out would be to ask where the nearest carrier was (Cohen, 2010).

It is uncertain why this narrative of survivability persists, but it has proliferated during the Russian full-scale invasion of Ukraine, as drone cameras reveal more than ever the attrition of modern equipment in large-scale peer-to-peer combat. At first glance, the narrative provides a palatable argument: if the multirole fighter jet is easily shot down by existing or anti-air and the aircraft carrier is easily sunk by submarines or anti-ship cruise missiles, then these expensive systems provide minimal value since they cannot survive to deliver on their intended purpose. To continue using them would be to needlessly risk valuable human lives and capital. But war necessarily involves a varying risk of loss, after all, whether it be by enemy or friendly fire (Lagrone, 2024).

One might take the Kantian perspective, wherein the constituents of democratic societies are incentivised to prioritise survivability in the procurement of defence technologies in case they must consent to war. Maybe the argument is just logical enough in theory to be palatable to a wide audience. Whatever the reason, in practice the survivability narrative invariably fails to predict which kinds of military technologies persist or not.

Figure 1 – Despite the proliferation of drones, tanks like this Ukrainian T-64 have opted for improvised protective cages rather than disappear from frontline combat altogether. АрміяInform, CC 4.0

Consider how the lens of survivability views the relationship between infantry and armour as an unsolvable cycle. In the era of mechanised armour, infantry are too slow to deploy to battlefields without transportation, putting pressure on defence ministries to procure mechanised transport wherever possible. Yet the proliferation of automatic fire and artillery leaves infantry too vulnerable in unarmoured trucks and cars, so it follows that armoured personnel carriers are used instead. Still, the lack of significant armament on armoured personnel carriers could leave them dangerously defenceless, so perhaps an infantry fighting vehicle with an autocannon as its primary armament is better. Yet the thin armour still leaves infantry inside vulnerable to enemy mines and larger guns, so a tank's increased armour and firepower are imperative to maintain survivability. At each step, the additional weight from additional armour and ammunition decreases speed, affordability, and—most importantly—transport capacity. Such survivability-driven procurement leaves the infantry trailing the tank on foot, seemingly beginning the cycle anew.

In the reality of mechanised assault, however, neither of these systems is considered in isolation but as part of a larger tactical approach that ideally involves the full spectrum of

terrestrial and airborne systems. Instead, the task of the typical commander is to combine the capabilities of systems at their disposal—such as mobility, protection, firepower, and disruption—to hide their respective deficiencies and complete the mission. The machine-gun-laden and thinly armoured personal carrier is not made obsolete by the tank, for it contributes to a completely different tactical profile.

In fact, the infantryman, owing to their inherent lack of natural protection against blades, bullets, and other dangerous battlefield implements, has long been rendered obsolete if survivability was the crucial factor of obsolescence. In the past, the common soldier could rely upon worn or wielded armour, and some of the wealthier knights could equip themselves in full armour suits that were virtually impenetrable to the crossbows and the guns of the time. Later, the proliferation and evolution of gunpowder weapons left chainmail and metal armour—for those that could afford it—helpless against increasingly accurate and penetrative bullets. As armies nationalised and began fielding their infantry in regular uniforms absent any substantial protection, the essential vulnerability of the infantryman was acquiesced to by modernising militaries around the world.

With the development and spread of shell artillery, this vulnerability has become horrifically acute over time. Infantry increasingly avoid direct combat with each other because their primary threat is now the artillery. During the American Civil War, around 12% of casualties came from artillery (McIntire, 2022), and in the First World War, the war of the ‘big guns’ pounding troops trapped in trenches, that figure rose to over sixty percent (Jones, 2016). In the battlefields of Ukraine, however, every four out of five casualties (Watling, 2024) came from artillery fires. Casualties among infantry are not only expected but even incorporated into strategies of relative attrition (Gady & Kofman, 2024). Infantry are less survivable than ever, yet are no less relevant than they have ever been.

Good is Better than Bad, but Bad is Better than None

What makes these systems, like the infantryman or the armoured tank, persist in the modern army despite visually observed evidence of their vulnerabilities? There is indeed a much more accurate explanation: the lack of available superior alternatives. Superiority means that an alternative system either (1) fulfils the same battlefield role as the previous system but with better efficiency or performance, or (2) transforms or replaces the previous battlefield role by

creating a new capability. For example, weapons systems whose evolution is measured in "generations" of systems, such as fighter jets or tanks, become superior through superior speed, range of engagement, armament and numerous other capabilities. Generally speaking, the newer systems of newer generations dominate those of previous generations, such as when the US Air Force and allies decimated the hundreds of older aircraft of Saddam Hussein's Iraqi regime during the Gulf War. Likewise, the carrier demonstrated its superiority over the battleship by replacing its gun-based fire support with air-based fire support. As a sophisticated platform for naval aircraft, carriers exploited them to strike farther and with greater precision—even though they were no more survivable against the anti-ship weapons of the time than battleships.

Simultaneously, the superior alternative must also be available. A military must be able to procure and maintain a weapons system, which is not possible under budget constraints, under sanctions regimes, or in the absence of infrastructure for it, such as sufficient replacement parts or ammunition. Yet if a weapons system is expensive enough, it cannot replace other systems that are inferior since even the wealthiest of militaries are limited by economic constraints and budgetary pressures from other departments. For example, a regular unguided munition is inferior in most characteristics, such as range and accuracy, to most modern precision missile systems. Nonetheless, their cost makes them prohibitively expensive for strikes against less-valuable but still important targets like trench defences and heavy equipment. In other cases, a weapon system might, on paper, be superior to its peers but locally or fundamentally lack important supporting elements in sufficient quantity, like a consistent supply of ammunition, fuel, or proprietary replacement parts. In other circumstances, a military simply does not have sufficient quantities of the most modern systems but still requires specific battlefield roles to be fulfilled.

Nowhere is this more apparent today than in Ukraine. The Russian Armed Forces, for example, continue to require armour to protect assaults and transport infantry quickly, but stockpiles of T-80 and T-72 series tanks have been severely attrited or emptied, and production and modernisation of newer armour have not kept pace with loss rates. As a result, the Russian Ministry of Defence continues to draw down equipment reserves for older tanks and artillery, even pieces better suited for museum exhibitions than frontline combat. Ukrainians, for their part, have relied extensively on underarmoured donations, like the myriad Humvees and Mine-Resistant Ambush Protected vehicles (Axe, 2023), leftover from decades of

counterinsurgency warfare, for frontline assaults in the absence of sufficient donated or domestic armour.

Figure 3 – German forces pull 10.5cm howitzers on horseback in occupied Norway, 1940. Although trucks would have been a much more efficient transport for artillery, horses were often in more abundant supply than either trucks or their fuel. National Library of Norway, CC 4.0

Likewise, some of the qualitative advantages of Western-donated artillery systems like the German Panzerhaubitze 2000 or the French Caesar self-propelled guns over older Soviet systems, in light of the paucity of 155mm artillery shells, could not be exploited as intended. In other circumstances, Russian units have used golf carts (Axe, 2024) and motorcycles (Segura, 2024)—which are completely devoid of any direct protection—to at least maximise the mobility of infantry. That most of these systems lack survivability does not preclude their use, for even an older tank presents a threat. As commentators mock the "outdated" and "obsolete" systems in use by the Russians, they ignore that the same conditions of mass attrition cause similar equipment problems for Ukrainians. Without alternatives, the standards for obsolescence fall dramatically.

For a weapons system to be truly obsolete, there evidently must be alternative systems that fulfil the same or a better tactical purpose, and they must be available in sustainable quantities. Certainly, some historical military technologies appear to have fallen into irrelevance because of their survivability. Defensive technologies, like castles and the intricate star forts that later replaced them, or steel armour and shields, are no longer survivable against modern explosive artillery and high-calibre ammunition. Yet in so far as their role was their survivability—to be able to consistently repel the various contemporary projectile and melee threats of their time—and this was made generally impossible by the aforementioned weapons, their obsolescence was still distinctly caused by a change in their battlefield role, one that overlapped with survivability.

This is not to argue that the bicycle or the early Cold War tank is not obsolete, but it reaffirms how much more nuanced the contribution of technology is to strategic planning than is presented within the neat vacuums of academic debate. Although firearms immediately presented a kinetic advantage over bolts and arrows, it took centuries of improvements in fuse safety, barreling, and reload mechanism design for them to become the universal weapon of the infantryman. Still today, some militaries employ modernised crossbows for niche situations where noise discipline is crucial. Likewise, even the widespread proliferation of ranged weapons did not immediately spell the end of melee combat. Bayonets, knives, and clubs were common in the trenches of the First World War, and as late as 1945, Imperial Japanese defence procurement insisted on bayonet lugs for the Type 96 and Type 99 light machine guns and other main firearms.

Technology thus absolutely drives the development of new tactics, but tactical thought likewise influences the adoption of technology. Until advancements in artificial general intelligence facilitate human-machine teaming, or even machines by themselves capable of assaulting and occupying territory, militaries will continue to plan offensive action around infantry in mechanised armour supported by long-range fires and air support. This likely means the persistence of many contemporary systems, like tanks or aircraft. Drones provide a tantalising, cost-effective answer to fighter jets and their missiles in theory. But can you design a combat drone that can fly as far and as fast as a fighter jet, equip it with sufficiently strong sensors to detect the jet, and carry capable enough ordinance to engage it without simply making another expensive aircraft whose decision-making is slowed down by remote piloting or still

unreliable algorithms? The anecdote of the Russian S-70 Okhotnik-B unmanned combat drone, which was shot down by friendly aircraft over Ukrainian territory after a catastrophic control failure (Newdick, 2024), perhaps hints at why major militaries have not yet changed their tactical approach completely away from piloted combat aircraft.

Conclusion

Military procurement has long been seen as a distant realm of government policy, more the target of disdainful lip service for its wastefulness in light of pressing civil and environmental needs than any meaningful debate. Indeed, the procurement of technologies and the construction of supply chains, conducted on a national level far away from constituents, do not synergise well with a transparency that can create sensitive vulnerabilities for armies. But if we are to have meaningful public debate on specific military procurement and the social opportunity costs of sixth-generation fighter jets and other systems, we have to understand the need for nuance, avoid reductive conceptualisations with little external validity, and accept that the survivability lens oversimplifies the battlefield into a narrow, game-like mentality. Warfare is not a rock-paper-scissors match wherein the existence of gaps in specifications and capabilities of certain weapons systems leads to catastrophically one-sided engagements.

This may prove difficult in an era of pervasive social media that provides the user with an unprecedented access to both battlefield information and their political representatives. Some private citizens, influenced by public online debates, even directly affect the outcome of national budget proposals (Gold et al., 2024). Musk and his like-minded colleagues are certainly far from being authoritative experts on military affairs, but they might still have a wide public audience and access to key government actors. Some might even be investors in emerging miltech and Silicon Valley darling firms like Anduril, which sells drone prototypes to the US Department of Defence, and thus have clandestine motivations to influence the distribution of billions of dollars in military contracts.

Regardless, individuals with access to the internet are now privy to a wealth of readily available open-source information that intelligence agencies once expended a tremendous amount of resources and effort to obtain. Satellite imagery lets users speculate on the rate of equipment loss and specifications of nuclear submarines, driving security analysis without

relying on experts with insider information or direct military publications. Telegram and other platforms publish endless streams of media from current conflicts, whose biased selection makes the vulnerabilities of military technologies more visible than ever before. Occasionally, confidential specifications are leaked online for sometimes the most trivial of reasons.

Such a flood of information easily facilitates erroneous narratives and obscures the nuanced reality in military affairs as it does in other realms. Citizens certainly can and should expect their military officials to have more in-depth and accurate assessments necessary for strategic procurement. Yet the slow death of the Pax Americana and the return of conventional war require sustained increases in defence budget spending, which means sacrifices elsewhere. If citizens are to understand the necessity of procurement decisions in the coming future, they must understand that survivability does not necessarily drive obsolescence.

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