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EMERGING TECHNOLOGIES: INNOVATION, DEMASSIFICATION, EFFECTIVENESS, REVOLUTIONS IN MILITARY AFFAIRS

Mircea UDRESCU
Academy of Romanian Scientists, Bucharest, Romania
udrescumircea@yahoo.com

Eugen SITEANU
Academy of Romanian Scientists, Bucharest, Romania
esiteanu@yahoo.com

ABSTRACT

While emerging technologies are generally incipient technologies, still under development, whose competitive impact is expected to be quite high and may have long-term strategic significance, by replacing current technologies with the potential to become key technologies, "emerging destructive technologies"designates the set of emerging technologies that are meant to be destructive and be used as methods, systems and techniques specific to war. And, since the great powers do not seem too willing to bury the hatchett of war, but use it in all geopolitical discourses, the destructive component of emerging technologies has become a catalyst for the innovative efforts of companies and states, which leave open great prospects for success in the lucrative business. The practice of emerging technologies so far has led to a change in the paradigm of warfare for many countries, to the conduct of remote warfare, to simultaneous and rather complicated hybrid actions, to the transformation of radio and television into modern instruments of psychological warfare. Emerging technologies with a destructive role are in the process of triggering new revolutions in the field of military affairs, resulting in the privatization of quality ideas incorporated in the means of combat, but also to dominate the market competition. Emerging technologies with a destructive effect propose for political decision makers: the decrease of human density on the battlefield, a modular articulated army with the possibility of ad-hoc summoning, a modern vision of the super-soldier, robotization and miniaturization of combat technique.

KEYWORDS: emerging technology, fighting technique, destructive technologies, army, military affairs

1. Emerging Technologies – a Catalyst for Innovative Efforts

Well acknowledged voices in the field state that *"...as the enthusiasm for interventions abroad faded, the conflict between the great powers returned. Russia has asserted its specific interests, while China's rapid economic growth has begun to put it in a position that could pose a challenge to American superiority in the Asia-Pacific region. Technological advances in robotics and artificial intelligence have given credibility to the visions of a future battle waged with automatic equipment and*

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opened the perspective of almost dehumanizing versions of the ideal type of classical warfare" (Freedman, 2019, p. 24), which confirms the fact that, more accentuated than during the Cold War, the arms race entered a period of great qualitative accumulations, the competitive peak being the destructive emerging technologies.

In general, emerging technologies – are incipient technologies, still under development, which have a competitive impact that is expected to be quite high. They can have a long-term strategic significance, by replacing current technologies with the potential to become key technologies. Examples: ceramics for car engine components, nanotechnologies, biotechnologies, etc.

Emerging technologies are technologies whose development, practical applications or both are still largely unrealized, so that they become figuratively prominent from a background of non-existence or obscurity. These technologies are generally new, but also include older technologies that are still controversial and potentially underdeveloped. Emerging technologies are often perceived as being capable of changing the *status quo*. They are characterized by radical novelty (in application, even if not in the origins), relatively rapid growth, coherence, prominent impact, as well as some level of uncertainty and ambiguity. In other words, an emerging technology can be defined as a "radical and relatively rapid technology, characterized by a certain degree of persistent coherence over time and with the potential to have a considerable impact on the socio-economic field (s) that is observed regarding the composition of the actors, institutions and models of interaction among them, together with the processes of production of the entailed knowledge, but its most important impact is in the future and thus the emergence phase is still somewhat uncertain and ambiguous. of technologies such as educational technology, nanotechnology, biotechnology, cognitive science, psychotechnology, robotics, information technology and artificial intelligence (Little, 1981).

The phrase "emerging destructive technologies" suggests the set of emerging technologies that have as their purpose their destructive use, just as methods, systems and techniques specific to war. And, since the great powers do not hide the ax of war, but use it in all geopolitical discourses, the destructive component of emerging technologies has become a catalyst for the innovative efforts of companies and states, which leave open and great prospects for success in the lucrative business.

2. From the Practice of Emerging Technologies

Regardless of the field of activity and the degree of training, everyone claims that whoever has the information also has the power – economic, political, military, etc. Everyone who now has access to the INTERNET already has access to power. This is more than enough reason to see that emerging technologies are driving radical change. For the military, the following aspects are worthy of consideration:

2.1. Changing the Paradigm of Warfare

Overall, society has experienced mutations difficult to imagine due to emerging technologies. Millions of computers dominate communications in finance, transportation, navigation, public administration, etc. The world is experiencing a real communication boom. Everyday principles and techniques provide data on anything and everyone; one can appreciate the progress and regression of any organization, manage statehood and national developments, influence economic, social and cultural courses. Giant companies have appeared on the horizon and they maintain thousands of outsourced systems of competitive contributions, through which

they cultivate effectiveness and efficiency, for profit or overall success. Today's society is marked by communication technology. But the innovative device that made it possible for millions of computers to connect in order to integrate humanity into a concert of mass production is beginning to realize that the whole system may know actions similar to Pearl Harbor, but this time in the media. If an opposing computer program enters the million computers of a computerized superstructure, it can cause significant damage in a short time similar to that of a classic war in a long time. This is a threat that defies all the traditional notions of pursuing armed conflicts, of war. Warfare has changed and is in the process of changing radically, thanks to the great conquests in emerging technologies. In 1991, the world admired the accurate and rapid technology used by the United States during the Gulf War, and the unfolding of hostilities showed that the United States was ready to wage such a war against Saddam Hussein, with skills derived from the backstage of the Cold War. The most important technology that the Americans had in the Gulf War consisted of: high-precision projectiles, remote-controlled missiles, laser-guided bombs, aircraft capable of penetrating the best guarded military areas, in zonal high-protection marine convoys, etc. This is evidence of a change in the basic military methods used during a war.The Gulf War was an important moment in the history of wars, because it gathered on the battlefield the past, with the working present, but also with an unpredictable future. The past is represented by the Iraqi strategy, which has aligned its troops to the borders. For the US military, information was the essence of the action plan, and the destruction of the enemy's intelligence system made the opponent's troops no longer respond to commands. The most important command points on the ground were destroyed, and the Iraqi leadership moved confused to and from destroyed, dysfunctional leadership points. The strategy of obtaining relevant information and destroying adverse information systems was tested in the Gulf War, and its effectiveness and efficiency were proven. The Americans' results have been spectacular, but they are already thinking about how to act when the opponent has equivalent technologies.

2.2. The Remote Unmediated Conduct of War

Throughout history, battles have taken place where soldiers were concentrated, accompanied by proper fighting techniques. Those who conceived the battles aligned the forces, concentrated devices, started the battles, but waited for them to take place without being able to intervene decisively, immediately, in certain hot places on the battlefield. Nowadays, a new form of combat appears, which has its own characteristics, in the sense that the actual battle does not necessarily take place where the soldiers are concentrated, but thousands of kilometers away, from where they identify and superior enemy decision centers become vulnerable. American theorists have estimated that in the Gulf War the military participated in a completely different war. Within hours, despite all the belligerent statements of the Iraqis, the entire defense system was effectively shut down, this time attacking from the inside out, not as in the traditional styles of outside attacks. After a day of in-depth fighting, Iraq could do nothing militarily, with each isolated military unit waiting in confusion to be taken out of the battle. Industrialization led to mass production, a strategy that also included the military component. In the military field, for a long time the quantitative battle ratio, according to mass production, which compared tanks with tanks, aircraft with planes, cannons with cannons, nuclear weapons with nuclear weapons, dominated the strategic

conceptions. The new strategic concept "star war" made the qualitative elements, with origins in eruptive technologies, to include the military fields, the technological competition ending the Cold War. The basic requirement has become effectiveness.

2.3. Simultaneity and Hybrid Actions

The assembly line specific to industrialization led to a division of labor that turned the worker into a limited specialist, similar to automation, in certain operations that had to be performed quickly and accurately as required by the assembly line of mass production. The assembly line is also a metaphor for the military. The fighters were mobilized in units, being trained to make the best use of a certain fighting technique. At the strategic level, there were for a long time prospects of using mass destruction, total annihilation, or ideas of destroying society in general. Battle reports targeted people to people, units to military units, localities to localities, districts to districts, until nuclear night covered the world. Both the First and Second World Wars, as well as conflicts specific to the Cold War were characterized by the influences of the industrial revolution. Lots of ammunition, lots of soldiers, lots of tanks, lots of bombs, maneuvers and strategies that had to ensure a quantitative advantage, no matter how small. Using the tools provided by the mass industry, opponents could destroy each other and kill each other, with victory leaning toward the one who was left with something from what the fight had begunwith. Even a unipolar victory by irrational mutual destruction was expected.

But, as emerging information technologies became consumer goods, even in the military it was found that *"At the beginning of the 21st century, it was obvious that the scenarios inherited for the future war were inadequate. The US military clung to an ideal type derived from the classical model and then faced a more disorderly form of warfare for which it was unprepared and struggling to emerge. Her British allies believed that they understood the situation in Iraq based on their experience in the peacekeeping operation in Bosnia and the support of civilian power in Northern Ireland, but their scenarios were also inadequate; they found themselves fighting harder than the Americans"* (Elliot, 2015). In 1977, the commander of the US Marines, General Charles C. Krulak, advocated the phrase "three block warfare" to express the reqiurements of the modern battlefield: *"At some point, our troops will distribute food and clothing to refugees, providing humanitarian assistance. In the next moment, they will keep two conflicting tribes at bay – carrying out peacekeeping operations – and, in the end, they will fight a medium-intensity battle, but with a large number of victims, all on the same day ... three blocks from the city"* (Krulak, 1997, pp. 139-141). At the beginning of 2013, the Chief of Staff of the Russian Army pointed out that: there were progressive erosion of the differences between war and peace, as well as between uniformed personnel and undercover operations; wars are no longer declared, but simply begin; in this way, a prosperous and stable country can become an arena for the most intense armed conflict, in a few months or days; under these circumstances, military means become more effective when combined with other non-military means, including political, economic, information, humanitarian, etc; as a result, frontal clashes between military formations gradually remain a thing of the past; current conflicts involve the widespread use of political, economic, information, humanitarian and other non-military measures; all this could be supplemented by inciting the local population to become a true fifth pillar, but also the involvement of masked military forces. Through the Ukrainian campaign, launched in 2014, Russia applied these principles, patenting

the basic features of hybrid warfare (Freedman, 2019, pp. 306-307).

Industry and marketing theories already insist on changing the paradigm of industrial production, in the sense that economic performance is changed from mass production, which can satisfy any individual consumer, to the development of individual,niche production, which can be more and more diversified, thus eliminating the intrinsic losses of mass production, offered on hold, with the satisfaction of orders on demand. Today's industry is able to move from mass production to offering products with individual characteristics. This is already true for the military, as simultaneity has already been experienced by modern armies which, in a very short time, attack the enemy with paratroopers, with special ground operations forces, and with naval and air forcesremotely. All these actions are already coordinated with microprocessors. Emerging technologies in the field of microprocessors have already changed the traditional concept of time, space, distances and execution speed. Weapons become effective everywhere, on land, in water, in the air or in the depths of the sea. The fulfillment of the missions is already related to digital processes. The power of microprocessors is used to store information transmitted from the battlefield to the computer, after which it can be transmitted immediately to various decision centers. Soldiers equipped with video cameras and built-in computers are able to communicate with each other, transmit contact information and identify targets to be neutralized by involving all categories of combat technique.

2.4. Television and Radio Have Already Become Modern Instruments of Psychological Warfare

Media corporations are already equipped with specific means, aircraft, helicopters, off-road vehicles, information processing computers, etc., to ensure the smooth running of the journalistic profession. Processes in these technologies mean a rapid reduction in the ability of governments to control access to information. As a result, the media has become an important factor in the development of events around the world. The world power of television and radio has even changed the concept of war. Nowadays, when television and radio broadcasts are made from all over the world, the possibility of another type of war has arisen. It is about the use of television and radio for hostile purposes to influence the will of others, changing their opinion on reality. In the Gulf War, all Allied forces had megaphones installed above their vehicles. They could be used as a microphone or for transmitting recorded messages. In this context, the victories obtained without bloodshed became vital for the American army, but also for the public opinion. The American military man is trained to be credible to public opinion and to act quickly and efficiently, with a psychological effect on both his comrades and his opponents.

3. Revolutions in Military Affairs: Trends of Transformations Amplified by Emerging Technologies

3.1. Military Affairs: Meanings and Significance

Military affairs are increasingly understood as a complex phenomenon, the dimensions and characteristics of which fundamentally change the matrix of military power and all its approaches in geopolitical and geostrategic terms, both in peace and in crisis situations, as well as in the conditions of a modern warfare. The content and significance of the phrase "military affairs" have their origin in the premise that, for more than half a century, the United States has been *"the epicenter of a general disturbance, comparable in magnitude to that generated by the industrial revolution"*, supported by emerging technologies.

In other words, the business world is aware of a *"metamorphosis, simultaneously organizational, commercial and technological"*, which is accompanied by a *"profound redefinition of relations between the state, civil society, the economy and the military, whose characteristics are relative disorganization and state weakening"*. This great paradigm shift is driven by a triple revolution – electronics, computing and telecommunications, based on emerging technologies – and whose principle is to create a widespread network of new social and economic structures for all areas of society, including the military. The revolution in military affairs, what was initially understood as an "emerging revolution" has now, based on emerging technologies, come to represent "a revolution in full maturity", especially for countries that have the capacity to support organizational and market competitiveness. Throughout history, mankind has experienced several military revolutions, generated exclusively by the revolutionization of combat technology and warfare strategies. Military revolutions can be minor or major. It is considered a minor military revolution, the mutations resulting from a single important innovation, especially those that make possible the transition from combat technique to a new combat technique, which also has implications on operational doctrine, troop training and logistics. The major military revolutions aim at the transformations dictated by a series of innovations, which amplify each other and determine qualitative leaps in the field of endowment, organization, operational doctrine and the general conception of waging war. The new phrase of the military business revolution, in the conditions of emerging technologies, suggests the radical change of the framework of research, innovation, production and contracting of military equipment, in a competitive public-private system open to innovation (Murawiec, 1998). The military affairs revolution involves, among many other things, a whole series of issues aimed at improving weapons systems, reorganizing the industrial-military complex, reforming procurement procedures, all suggesting a real trade revolution. The American military business revolution has two major objectives: new high-performance weapons systems, but also the domination of the world market for combat equipment.

3.2. Trends in the Transformations Incurred By the New Emerging Technologies

Decreasing human density on the battlefield. Emerging destructive technologies are called upon to contribute to lowering human density on the battlefield. It is estimated that one of the trends that continues to manifest itself strongly in the configuration of the conflict is represented by the continuous decrease of the human density on the battlefield. If in antiquity it was estimated at about 10,000 fighters / km. square, in the Napoleonic era at 4,800, in the first world war at 404, in the second world conflagration of 36, so that in the Gulf War there were no more than 2-4 fighters. The nuclear danger during the Cold War accelerated the dispersal and the appearance of intelligent ammunition will further amplify this process. That is why, in American doctrinal documents, a decade ago, major attention was paid to the dispersion of forces, considering that the future will depend more on the electronic connection than on the physical or geographical one (Department of the Army, United States of America, 1994). On a largely depopulated battlefield, tanks are easy to spot, as is the large-scale fighting technique and the power to strike and destroy rests on advanced weapons that do not require a human presence. The principle of smaller and more precise actions allows the reduction of logistics assemblies, favoring easier control of ammunition stocks.

Across the battlefield, the collection, transmission, processing and dissemination of information is part of the operations, the destructive strike becoming almost certain. Electron and information flows do not suppress energy and material flows, but only orient them and make them infinitely more efficient. Intelligence is no longer a pile of information, gathered before the fight and introduced into battle plans, but, mastered, processed, structured and distributed in real time, as it is integrated directly into current operations. For the Gulf War, an ultra-precise blow led to the replacement of thirty classic bombs. Laser-controlled bombs offer the possibility of increasing the destructive power a thousand times compared to the undirected ones. As a result, forces equipped with such weapons will be able to purchase small ammunition and keep smaller stocks. The US military revolution focuses on respecting and incorporating the emerging technological triad: electronics, information and telecommunications.

Towards a modular army. According to one of the most important principles of the revolution in military affairs, the performance of systems is much more important than the performance of platforms with combat technique, in the sense that one conditions the other. Therefore, no element, system or subsystem can be conceived outside the system of systems that organizes the whole. The center of gravity shifted from the internal combustion engine, which allowed the movement of forces and means to be where it was needed at the right time, to the processing of remote-hitting information of the opponent. Basically, the destruction per unit of mass, through emerging technologies, is considered to increase continuously. It is estimated that emerging technologies will fundamentally transform military logisticsin the sense of ensuring a modular army, into dispersed action, according to the Japanese kanban principle, in a continuous flow. Uncomfortable with the heavy logistic convoy, the fast forces acting on the battlefield will have more mobility, increased maneuverability, being supported in deep support, but very effective. Emerging technologies are putting pressure on military bodies to move doctrinally from the concentration of technique and forces to the focus on effects. That is why American doctrinal documents stipulate: *"In order to exploit the huge potential offered by technology (emerging technology) we will have to systematically develop our ability to produce the effects of quantity – the necessary concentration of fighting power at the decisive moment and place –, resorting less than in the past to the physical concentration of forces ..... Instead of allied forces and sequential operations, we will produce mass effects in a different way and simultaneously"* (Joint Chief of Staff, 2010). The temporary gathering of several units in a configuration especially established to have certain effects is one of the most important organizational tasks and synergy is one of the most used doctrinal words.

The vision of the supersoldier. As in the American economy, the nature of military activity changes fundamentally, becoming skill-intensive – with an emphasis on skill, after long labor-intensive – with a focus on resources. Education, technological competence, high professional qualification become absolutely necessary, being inconceivable that an army can operate effectively, without the fighters that compose it having a level of training that will allow them to wage war by designing force. Illustratively, the fact remains that during the Gulf War, 88 % of soldiers had high school diplomas, reaching virtually the highest percentage in the entire history of the military. The American soldier has nothing in common with the one imagined for carrying ammunition. He must understand the tactics of mechanized and infantry forces, the

operational capability of helicopters and airplanes, for which he becomes a ground operator almost all the time. He is proficient in geometry and navigation, in order to direct artillery fire. His knowledge includes armor, mining and countermeasures, destruction, computers, vehicles, laser pointers, thermal visors, satellite communications equipment and logistics organization. The key to all this knowledge and skills is the effort to bring on the individual endowed with an entrepreneurial spirit at the level of the potential content of the technology (Joint Chief of Staff, 2010). On the other hand, the effectiveness of advanced technology ensures that people are less exposed, leading more and more to the concept of "zero deaths", as proof that the soldier's life is of great value. The postmodern military unit is thus composed of fighters capable of bringing increasing added value to their own professional capacity. This is how the "soldier as a system" was designed, a fighter equipped with formidable technologies, which considerably increase its effectiveness and range. This is how you will reach the army that strikes beyond the field of view, the active army that investigates the enemy beyond the horizon, which makes the range of the fighter to increase by about thirty kilometers, and the group by about eighty two kilometers. Based on emerging technologies, with supersoldiers, the United States, in the revolution in military affairs, aims to achieve the following objectives: to be able to discover at any time all the high-value targets that are on the battlefield; be able to hit directly any detected target; be able to destroy any target they may hit in order to become unstoppable in the face of any modern military force on the battlefield. Everything becomes possible in the design of systems based on three emerging technologies: digitization, computer processing and global geolocation, systems to which employment weapons are subordinated.

Military business revolutions: robots and drones. Beyond any considerations, emerging technologies require unsustainable costs, but they offer fighting techniques that put any imagination to the test. The battlefield is able to integrate invisible aircraft, robots and drones. In 1984, a graph was drawn showing the exponential increase in the cost of a fighter jet, starting in 1910, to reach a shocking conclusion: *"In 2054, with the entire defense budget, only one fighter jet will be bought. This plane will have to be used jontly bythe air force and the navy ..."* (Augustine, 1987, p. 143). But today, it is known that the $ 1.5 trillion F-35 program leads to unit costs of $ 100 billion per aircraft, which ultimately means that the technological advantage that could be offered might be offset by the quantitative loss. The exorbitant costs of applying emerging technologies in military technology have the effect, among other things, of increasing military budgets followed by a dramatic decrease in the quantity purchased. Thus, while the budgets of the US Navy and aviation increased in real terms by 22 and 27 percent, respectively, from 2001 to 2008, the number of warships decreased by 10 percent, and that of combat aircraft – by 20 percent (Freedman, 2019, p. 328).

Digitization, the information revolution, the computer, nanotechnology, etc. they all joined in to propose human-free systems to the military. The first unmanned systems, which are already operational, are drones carrying lethal missiles. They can fly over targets, transmit information to a remote operator, and he commands the execution of destructive fire. The modern concept of drones was developed in Israeli laboratories as a solution to the needs of research, surveillance and espionage of hostile Palestinian areas. Now, drones are a military component for a lot of countries capable of accessing emerging technologies, they have been forced to use them as a result of their involvement in local conflicts. Drones have become the

destructive tools responsible for target killings, the perfect weapon for custom killing. Systems without human crew were also created for land troops, starting with robots especially designed to defuse explosive devices, but also for reconnaissance missions. For such roles, robots were preferred to human fighters, because robots *"are not hungry. They are not afraid. Don't forget the orders. They don't care if the soldier next to him was shot. They do a better job than people, especially for boring, dirty and dangerous missions"* (Singer, 2009, p. 63).

In the context of the military revolution, during the Obama Administration, the "Third Compensation" strategy was adopted to emphasize the idea that the US must use its technological power to offset the advantages of opponents, based on combat networks in human-machine cooperation, carrying out simultaneous operations on land, in space, air, sea, submarine and cyber. At the forefront there was artificial intelligence designed to delegate decision-making power by machines, arguing that defensive systems could operate at the speed of light to respond to an attack, while offensive systems would be more effective, directing missiles to the best targets (McGrath, 2016).

Public opinion is beginning to worry about the uncertainties that exist within robotics miniaturizations. Nanotechnology, atomic manipulation, bioenergy, etc made it possible to imagine drones as insects that take pictures and can inject individuals with poisons. Levels change from human-operated systems, where people lead and supervise, to completely independent ones. Emerging technologies offer solutions, solutions that now appear mainly in private companies with global interests. This is a competitive situation that allows individuals and small groups to have access to lethal technologies that are easy to access and use. Smartphones incorporating the ability to use satellite imagery, navigation, research and espionage systems, etc. are now available to anyone; they are no longer special-purpose qualities for the most advanced military organizations. As a result, the vulnerability of some systems to blows in places once considered safe has increased. Attacks can come for no reason and without warning from anywhere, with extraordinary speed (Witters & Blum, 2015).

Emerging destructive technologies have made drones and a robotic industry available to humans, and miniaturization is about to sustain the science-fantasy imagination. Man is increasingly replaced by automated systems, considered intelligent, and robotics is able to design swarms of tiny robotic creatures to bring death to opponents, even the size of a population, a nation or a state. The destructive purpose, maintained by emerging technologies, has glorified the Machiavellian principle, the goal excuses the means, since no one respects the sacred laws of robotics: 1. A robot is not allowed to cause any harm to a human being or, by non-intervention, to allow a human being to be harmed. 2. A robot must obey orders given by a human being, as long as they do not contradict Law 1. 3. A robot must protect its own existence, as long as it does not contradict Law 1 or Law 2 (Asimov, 1942). Robots have been appreciated as they have ensured the automation of production lines, bringing increased efficiency and profit, but are also beginning to be improved in quality and to contribute to destructive actions on a nominated opponent, with efficiency and effectiveness.

4. Conclusions

The business world started and developed in the general market context. The nature of market business adjusted the degree of enrichment of many business people. Thus, businesses developed with food, animals, gold, oil, etc., so that much

later we can talk about business specific to the military field. Emerging technologies have made the business world fully committed to the urgent application in the practice of production and services of the latest scientific discoveries in the field. Digitization, miniaturization, artificial intelligence, robotization, etc have turned automated systems into consumer goods. Emerging technologies have directed the business world to specific processes of concentration and centralization of capital, consolidating corporations of global interest. And if until a certain point, the military field was considered a closed field, of state competence, the application of emerging technologies to military systems has increased the supply of products from private corporations to public administration. The achievements and projections of emerging technologies in the destructive plan have made possible the emergence of real revolutions in the world of military affairs, in which the private corporation plays a decisive role. The private corporation offers quality fighting systems and techniques, simultaneously cultivating market competitiveness, but also the desire for power. Wisdom lessons can be learned from history, and the lesson of destructive emerging technologies makes it clear: states that lose technological competition lose not only the ability to win war, but also the ability to be part of the political shaping of the world.

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