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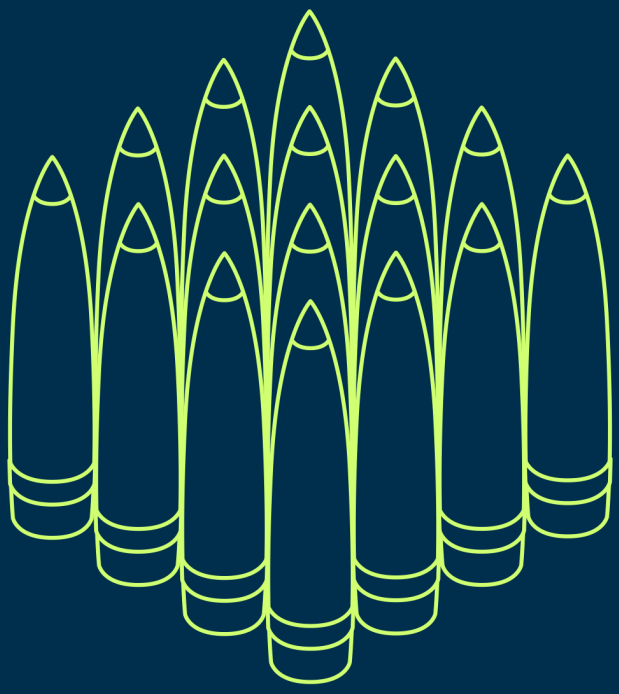

Defence Industrial Autonomy

Without Stabilisers, Europe's Ammunition Stockpiles Are Just Years Away From Failure

By Annika Gerbig

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Executive Summary

The EU and its Member States have scaled up their defence industrial manufacturing, including ammunition production, at a pace not seen since the Cold War. Such upscaling efforts, however, rely on a particular chemical input, creating a dependency that falls through the cracks. Propellant stabilisers are compounds that stop artillery propellants from decaying into dangerous storage hazards. They are made from aniline, whose production is concentrated in China at levels higher than those of almost any other major defence-relevant chemical. Despite its importance to the stability of artillery, the dependency on Chinese aniline goes unregistered by EU monitoring tools due to its overall limited use in the chemical make-up of said propellants. That smallness is deceptive: aniline stabilisers are disproportionately important relative to their volume. Were Beijing to restrict the necessary upstream chemistry, Europe would only realise its dependency once existing stockpiles are depleted, by which point the window to respond would already be closed.

Without aniline-based propellant stabilisers, newly produced ammunition shells would begin to degrade within one to two years. At a moment where EU defence policies aim to produce two million 155mm rounds a year, the need to secure a supply of stabilisers cannot be understated.

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Key Recommendations

Three steps that can circumvent stabilisers to be at the heart of unsafe stockpiles:

Map the Dependency

DG DEFIS, together with the EDA and national material agencies, should commission audits of stabiliser and aniline-precursor sourcing across European producers, covering suppliers, inventory and the origin of upstream feedstocks, within twelve months. Nothing should be able to stockpile or reshore that has not first been measured.

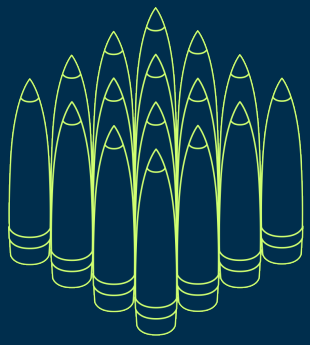
Close the Monitoring Gap

Defence-critical intermediate chemicals should be tracked as a category in their own right, to complete the raw elements covered by the Critical Materials Act and the finished outputs that are covered by ASAP and EDIP. The next scheduled review of the CRMA strategic-material lists would be a natural choice to do so, together with the Joint Research Centre adapting its supply-risk methodology to flag inputs which are below volume threshold but are non-substitutable.

Bridge the Portfolios

Establishing a permanent channel between ECHA and DG Environment on one side and DG DEFIS on the other, so that REACH decisions on dual-use stabiliser chemistry are taken with their defence-supply consequences in plain view. This does not need to be a new institution; a joint working group with a standing mandate would be sufficient; however, it should be created in the near future before potential future REACH decisions on stabilisers force this issue.

Those actions are not focused on new chemistry, but rather on redirecting the EU's focal points toward watching an input that it currently cannot see.



Dependency Hiding in Plain Sight

Every nitrocellulose-based propellant carries a stabiliser, often diphenylamine (DPA), centralites, akardite II, and the wider family of aromatic-amine compounds such as aniline. Those additives, which account for under 5% of the full propellant load, keep ammunition safe in storage by capturing and neutralizing the reactive nitrogen oxide gases that are released as propellants age, thereby preventing an explosive chain reaction. By keeping the propellant chemically stable, stored ammunition is safe, meaning that a shell stockpiled today will still be safe to store and fire two decades from now.

That same component of propellants, however, is defined by underlying upstream chokepoints. The majority of plants that produce stabilisers, in addition to substitutes that REACH, the EU's chemical safety regulation, administered by the European Chemicals Agency (ECHA), is trying to implement due to fewer health and environmental concerns, rely on aniline-derived feedstocks. China holds the largest single share of global aniline capacity at roughly 44% as of 2020. This share, however, is climbing, with the Chinese company Wanhua Chemical alone on course to become the world's largest aniline producer, already producing two million tonnes of aniline yearly, accounting for roughly a quarter of global capacity. This chokepoint is therefore not defined by one compound, but a whole branch of chemistry that shares a single upstream bottleneck.

Timing is what makes this urgent. Europe is scaling up ammunition production through the Act in Support of Ammunition Production (ASAP) and theEuropean Defence Industry Programme (EDIP), pushing towards two million 155mm rounds a year while supplying Ukraine and refilling national stockpile depots. Yet all of that production and its safe storage depend on steady, reliable access to propellant stabilisers. Without them, stockpiles begin to degrade within one to two years. Without a secure supply of stabilisers, Europe could scale up production and still end up with stockpiles it cannot safely keep or use.

Why Is a Quick Fix Not Possible?

Nitrocellulose propellant is not stable; it slowly breaks down over its lifespan, which results in it releasing gases such as nitrogen oxides that then speed up the breakdown process even further. This autocatalytic reaction is what accelerates the decomposition process towards instability if left unchecked. Stabilisers are therefore added to the propellant as they absorb the released nitrogen oxides before the chain reaction can take place. This mechanism is what turns propellant shelf life from one or two years into twenty years plus.

Two important variables make existing stabilisers hard to replace, complicating the move away from dependency. One is the lack of interchangeability of propellants, stabilisers, and related ammunition components. Each propellant is mixed with a specific stabiliser at specific dosages and tested for compatibility with the nitrocellulose and shell components such as coatings and plasticisers. If a stabiliser recipe

were to change, a reformulation of the whole charge would be needed, followed by re-qualifying the new formulations ballistically, re-clearing their use on every weapons system in use, and re-testing them according to NATO stability standards. This process alone would take years per propellant per weapons platform.

The Chokepoint

When following the production of a European 155mm shell backwards, the chain and the emerging choke point become evident. The shell holds a propellant charge; the charge holds a stabiliser; the stabiliser is made from an aniline compound; aniline comes from benzene and ammonia; and aniline capacity sits disproportionately in Chinese industrial clusters. Just five steps from a finished artillery shell, a dependence on a Chinese chemical plant is laid open. A handful of Chinese producers, Wanhua Chemical among them, dominate the top of this chain, while Europe's own propellant base is comparatively thin. Firms such as Eurenco in France, Nitro-Chem in Poland, Rheinmetall Nitrochemie in Germany, and MAXAM in Spain make the propellants; their stabiliser inputs however trace back to the same Chinese aniline.

> *"Just five steps from a finished artillery shell, a dependence on a Chinese chemical plant is laid open."*

REACH offers no way out from this dependency either. Stabilizers such as DPA are being pushed out under REACH due to its decomposition products being carcinogenic. The safer alternatives offered as replacements, such as arkardite II or other nitroaniline and urea-derived stabilisers, are themselves also made from aniline. Substituting away from DPA, therefore, shifts the dependency from one compound to another within the same chemistry family without reducing it. Therefore, the exposure is structural to aniline-based chemistry, rather than tied to any one compound.

This concentration would matter less if it weren't paired with China's demonstrated willingness to exploit such dependencies. China has used export licensing as a coercive tool several times in the past, namely in July 2023 with gallium and germanium, in October 2023 with graphite, in 2024 with antimony and tungsten, and in February 2025. Each of these Chinese export restrictions has been conducted through the Chinese Ministry of Commerce dual-use licensing regime, which also governs the chemistry sitting upstream of stabilisers. The legal machinery for a propellant stabiliser restriction therefore already exists, and is just one political decision away from execution.

Brussels' Blind Spot

The dependency is invisible by design, not by neglect, as it slips through three institutional and regulatory gaps at the same time. Propellant stabilisers are too small by mass, making up only a small percentage of a propellant charge, and thus fall below the volume thresholds that supply-chain dashboards are built to flag. Stabilisers fall into a blind spot between the different EU monitoring tools. Each tool watches a different layer of the supply chain: the Critical Raw Materials Act tracks raw ele-

ments, while ASAP and EDIP track finished outputs. Stabilisers are neither a raw element nor a finished product; it is an intermediate chemical sitting in between, letting it slip through the gap, resulting in it going unmonitored.

This is further exacerbated across the EU's division of portfolios. REACH and chemicals policy sit within the Directorate-General Environment (DG ENV) and the European Chemical Agency ECHA, while ammunition policy sits within the Directorate-General for Defence Industry and Space (DG DEFIS). However, the two do not coordinate on dual-use chemistry, resulting in the same compound facing phase-out pressures on environmental grounds, while simultaneously remaining defence-critical and unwatched on the other side. Both the Niinströ preparedness report and the Draghi competitiveness report recognised the problems with this kind of cross-portfolio blind spot, while ironically overlooking propellant stabilisers.

What Disruption Would Look Like

Disruption would not announce itself, and the following is a plausible scenario rather than a forecast, but it illustrates why this dependency is so dangerous. For the first six months, no visible problem would arise as production runs on stabiliser already in inventory. Between six and twenty-four months, the inventory is drained, new propellant outputs slow down, and ageing stockpiles begin failing periodic stability tests based on batches and storage. After two years, Europe is left scrapping entire batches of ammunition that failed safety testing, paying to reprocess the propellant in order to salvage them, or leaving unstable, potentially dangerous stock in storage.

Simultaneously, the substitution path would still be years away from delivering alternatives. Unlike the visible supply shocks caused by export restrictions of antimony and tungsten, that resulted in immediate price surges, a stabiliser disruption quietly degrades existing stockpiles. If there were to be a stabiliser shock now, in the middle of sustained resupply of artillery shells to Ukraine, NATO stockpile replenishment commitments, and the largest European defence build-up in decades, the shockwaves could be immense. By the time this disruption became obvious, months down the line, the time to act would have already passed. This is why action needs to be taken in anticipation rather than in response.

About the Author

Annika Gerbig is a German national currently based in the Netherlands. She holds a degree in European Languages and Cultures and is completing her MSc in Crisis and Security Management at Leiden University, specialising in War and Peace Studies. Her professional interests centre on evolving geopolitical dynamics and security policy, with particular attention to strategic competition and great power rivalry. She is especially interested in how contemporary geopolitical developments are shaping the future of defence, international security, and global stability.

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