

The Western Munitions Bottleneck

How Single-Source Feedstock and Five-Prime Concentration Cap the Magazine at 30 to 60 Days

30-60d

WESTERN MAGAZINE
INFLECTION WINDOW IN
PEER COMBAT

40K/mo

US 155MM PRODUCTION RATE
BY 2025 (100K GOAL
SLIPPED TO MID-2026)

\$934B

OPEN FMS CASE VALUE
COMPETING WITH US-
SERVICE REPLENISHMENT

EXECUTIVE DASHBOARD

The Western precision-munitions industrial base is structurally undersized for sustained peer conflict, and the binding constraint shifts inside weeks from finished-round assembly to feedstock and qualified-supplier microelectronics. Today's appropriations do not fix today's magazine.

THEESIS

The Western precision-munitions industrial base can sustain peer combat for roughly **thirty to sixty days** before the binding constraint shifts from finished-round assembly to single-source feedstock and qualified-supplier microelectronics, and to a five-prime concentration that cannot be expanded inside a budget cycle. The exposure is class-stratified: long-range PGMs deplete first on a sub-week clock in a Taiwan Strait scenario, 155mm depth runs against a Ukrainian consumption denominator the surge ramp does not cover, and interceptor inventories sit on a multi-year, not multi-quarter, replenishment curve. The thesis is falsifiable on two conditions: a formal DoD declaration that 100,000 155mm shells per month has been achieved, and a published Tomahawk lead time below 24 months. Until both, the multi-year math stands.

KEY STATISTICS

<1 weekPGM exhaustion in CSIS Taiwan-Strait wargame¹**40K/mo**US 155mm production rate by 2025; 100K/mo goal slipped to mid-2026^{2, 3, 4}**150-200K**Ukrainian monthly 155mm consumption across roughly 300 systems⁵**24/30 mo**PAC-3 MSE lead time: 24 months missile, 30 months SRM^{6, 7}**34 months**FY27 Tomahawk lead time, first delivery March 2030⁸**90%**USAF PGMs that rely on TSMC chips⁷**50 → 5**US prime defense-contractor consolidation, 1990s to today¹³**\$934B**DSCA open FMS case value (16,098 cases)^{11, 12}

Scope & method. Open-source intelligence only, verified against allowlisted Tier 1, 2, 3, and 4 sources per AEIG Module 2 source policy. Company-stated capacity claims (Rheinmetall, Hanwha, Lockheed, Raytheon) are flagged as forward targets and not treated as verified throughput. No classified production figures and no current stockpile-depth numbers are used. Window: 2022 to mid-2026. Timeliness: DURABLE, with a 6 to 18 month shelf life. Material updates follow major budget-cycle publication, a prime-contractor capacity announcement above one billion dollars, or a new CSIS, RAND, or IISS magazine-depth study.

KEY JUDGMENTS

Seven judgments anchor this assessment. Each is tied to the cited evidence in the sections that follow and carries an explicit confidence level.

- 1** High The Western precision-munitions industrial base is structurally undersized for any sustained near-peer conflict beyond the first 30 to 60 days, with the binding constraint shifting from finished-round assembly to sub-tier feedstock and qualified-supplier microelectronics within weeks.^{1, 13, 8}
- 2** High The single most acute single-source bottleneck in the US system is nitrocellulose at Radford Army Ammunition Plant, with the SRM duopoly a close second. Each carries a multi-year qualified-supplier path no supplemental appropriation can shortcut inside 24 months.^{9, 7, 10}
- 3** High The honest replenishment math for the most-stressed systems is multi-year, not multi-quarter. Even with FY2027-funded large-lot orders, Tomahawk first deliveries do not arrive until March 2030 and SM-6 inventories do not return to pre-Iran-war levels until early 2029.^{8, 6}
- 4** High The TSMC microelectronics layer renders the magazine vulnerable to a Taiwan contingency in a self-referential way: the conflict that would most stress the magazine is also the conflict that could break its critical-chip pipeline.^{7, 1}

5

Moderate

European allied capacity is adding meaningfully through 2027 (Rheinmetall Unterlüß 350,000 per year, Diehl-Nammo 350,000 to 2029, EU ASAP target 2 million shells per year by end-2025), but upstream feedstock remains the binding constraint and Rheinmetall has had to vertically integrate around nitrocellulose.^{9, 16}

6

Moderate

South Korea is the swing producer of Western 155mm and self-propelled-howitzer capacity and is being used by Poland as a hedge against unreliable US and EU throughput. Hanwha unit-economics on three K9 lines exceed any European peer.¹⁵

7

High

Multi-year and large-lot procurement are the right policy mechanisms but carry a built-in lag. Authorizations from 2024 to 2025 convert to throughput in 2026 to 2028, not in the budget year. Today's appropriations do not fix today's magazine.^{6, 14, 8}

SECTION 01 • STRUCTURE

The Thirty-to-Sixty-Day Magazine

Magazine depth has a precise operational meaning: inventory plus replenishment rate measured against consumption. When inventory empties faster than the line refills it, operational tempo is set by the slowest link in the production chain.

The Empty Bins finding from CSIS, repeated and refined in subsequent CSIS work, states the case in plain English: in a Taiwan Strait scenario, the United States would likely run out of some long-range, precision-guided munitions in less than one week.¹ The finding is not a stockpile-depth claim. It is a consumption-rate-versus-replenishment-rate claim, and the rate side is the load-bearing element. Long-range PGMs (Tomahawk, JASSM, LRASM, PrSM) are the highest-consumption-per-shot class in a maritime-strike scenario, the most chip-dependent class, and the class with the longest production lead time. The convergence of those three properties is what produces the sub-week finding.

The thirty-to-sixty-day frame is not a single mass-emptying event. Different munition classes hit empty at different times. Long-range PGMs hit first, under one week in the Taiwan case. The 155mm magazine runs against a consumption denominator set by operational scale: at the Ukraine-stated rate of 5,000 to 6,700 rounds per day across roughly 300 Western artillery systems, the US 40,000-per-month surge production is fully absorbed by a single Ukraine-scale theater, with nothing left for stockpile rebuild or

for parallel demand.⁵ Interceptor inventories (PAC-3 MSE, SM-3, SM-6, THAAD) sit on a parallel exhaustion curve tied to threat density: at the FY27 Navy ask of 540 SM-6s with 36 to 39 months to first delivery, inventory does not return to pre-Iran-war levels until early 2029.⁸

The thirty-to-sixty-day inflection is therefore a windowed event, not a cliff. Inside it, the binding constraint shifts. In the opening days, the constraint is finished-round throughput and the assembly-line tempo at the prime. By week three or four, the constraint shifts to the qualified-supplier layer beneath the prime: solid rocket motors at the L3Harris and Northrop duopoly, nitrocellulose at Radford, energetics at Holston, microelectronics at the TSMC interface. By week six or eight, the constraint shifts again to feedstock and qualification, and qualification is the binding step that cannot be shortcut on the appropriations clock.

The GAO finding that underpins the structural read is unsentimental. The DoD relies on more than 200,000 suppliers across all tiers; its efforts to gain visibility into the sub-tier layer have been characterized as "uncoordinated" and producing "little insight into the vast majority of suppliers."¹³ The Pentagon does not know with operational precision where its own bottlenecks are.

ASSESSMENT · HIGH CONFIDENCE

The thirty-to-sixty-day inflection is real, class-stratified, and not addressable inside an FY budget cycle. Long-range PGMs deplete first, 155mm runs at the consumption denominator, and interceptors sit on a parallel multi-year replenishment curve. The binding constraint shifts from assembly to sub-tier feedstock and qualified-supplier microelectronics within weeks, and qualification timelines cannot be shortcut by appropriations action.

Rationale: Convergent T2 wargame findings (CSIS Empty Bins, Six Critical Systems, Rebuilding Missile Inventory) with T1 GAO supplier-visibility evidence; the production-lead-time facts (PAC-3 24/30 months, Tomahawk 34 months, SM-6 36 to 39 months) all sit beyond a single budget cycle by construction.

SECTION 02 · STAKEHOLDER

Five Primes, Two Engine-Makers, One NC Plant

The magazine problem is downstream of a consolidation problem that pre-dates the current strategic environment. The qualified-supplier pool has been compressed at every layer.

In the early 1990s the United States had approximately 50 prime defense contractors. Today it has roughly five.¹³ Beneath the primes, consolidation continues at every layer. The solid-rocket-motor base

shrank from six firms in 1995 to two by 2017: Northrop Grumman following its 2018 Orbital ATK acquisition, and L3Harris following its 2023 Aerojet Rocketdyne acquisition.¹⁰ At the feedstock layer, North American nitrocellulose production sits at a single facility (Radford Army Ammunition Plant), and the principal US production of RDX and HMX military explosives sits at a single plant (Holston AAP, operated by BAE Systems Ordnance Systems under a 25-year facilities-use contract).⁹

The consolidation has three operational consequences upstream of the magazine question. First, the qualified-supplier pool at every layer has been compressed, removing the option to surge through bid competition during a crisis. Second, the long-cycle capital intensity of qualifying a new supplier extends well beyond the budget cycle on which DoD operates, which means appropriations action does not produce capacity action on the same horizon. Third, the supplier-tier visibility problem compounds with consolidation.

The Pentagon has documented the problem at the policy layer. The National Defense Industrial Strategy of January 2024 was the first such DoD strategy and identifies four priorities: resilient supply chains, workforce readiness, flexible acquisition, and economic deterrence.¹³ The most concrete direct industrial-base intervention is the completed one-billion-dollar investment in L3Harris Missile Solutions to expand SRM capacity for PAC-3, THAAD, Tomahawk, and Standard Missile.¹⁰ The intervention is the right shape (capital at the binding constraint, at the prime that needs the capacity, with system-level demand signaled). It will not, however, change the duopoly arithmetic.

ASSESSMENT • MODERATE CONFIDENCE

The consolidation of the US prime base from approximately 50 firms to 5, and the parallel consolidation at the SRM and feedstock layers, is structurally upstream of the magazine problem. The NDIS names the problem; the Pentagon's one-billion-dollar L3Harris investment addresses it at the margin without changing the underlying duopoly.

Rationale: Documented prime-count consolidation, SRM duopoly history, single-site NC and energetics footprint, GAO sub-tier opacity finding; NDIS as the policy-recognition document; L3Harris investment as the largest current industrial-base intervention.

SECTION 03 • WALK-THROUGH

The 155mm Case

The 155mm artillery shell is the most documentable bottleneck in the Western magazine: publicly described facility by facility, contract by contract, ramp target by ramp target.

The 2023 stated trajectory was straightforward. DoD said it could lift US 155mm production from a 2022 baseline of approximately 14,000 per month to 20,000 per month by spring 2023 and to 40,000 per month (480,000 per year) by 2025.¹ The 2025 throughput was largely met: by September 2024 monthly production at Scranton AAP reached approximately 36,000 shells, and all-US-facility production reached approximately 40,000 per month by 2025.² The capital investment underpinning the ramp was a 217-million-dollar task order modernizing 155mm projectile metal-parts capacity at Scranton AAP and at General Dynamics' Wilkes-Barre facility.²

The 2025 number is real, and the ramp from 14,000 to 40,000 per month inside roughly three years is a genuine industrial-base achievement. The 2025 goal posts have, however, moved. The US Army's stated goal of 100,000 155mm shells per month, originally targeted for October 2025, slipped first into mid-2026 and remains on that revised timeline as of mid-2025 reporting.^{3, 4} The slippage is itself the load-bearing finding. The DoD met its 2023-stated 2025 target. The goal-post was already revised upward, and the new goal-post is slipping.

The Ukraine consumption denominator gives the slippage its operational meaning. Ukrainian forces are reported to consume 150,000 to 200,000 155mm shells per month, peaking at 5,000 to 6,700 rounds per day, against a Ukrainian-stated need of 200,000 per month and an earlier publicly stated requirement of 20,000 shells per day for approximately 300 Western artillery systems.⁵ Even at the lower bound, the 40,000-per-month US production rate supplies roughly one quarter of a single Ukraine-scale theater's monthly consumption. At the 100,000-per-month goal, when it is reached, US production supplies roughly half. Neither number leaves headroom for stockpile rebuild or for parallel demand.

ASSESSMENT · HIGH CONFIDENCE

The US 155mm production ramp is real but trailing its own targets. The 100,000-per-month goal slipped from October 2025 to mid-2026 and even at the surge rate the system supplies only a fraction of Ukraine-scale consumption. The 100,000 target will be reached on the mid-2026 revised timeline barring a feedstock disruption; any further slippage will be the most visible public signal of the underlying NC and energetics pathology.

Rationale: Convergent DoD, Defense News, Defense One, and NDIA reporting on the Scranton and Wilkes-Barre capital line and the all-facility throughput observation; Ukrainian-stated consumption rates with analytic discount applied to the upper bound.

SECTION 04 • POLICY

The Single-Source Pathology

Beneath the 155mm ramp sit four single-source dependencies whose binding character only becomes apparent when the assembly-line layer reaches its surge rate.

Radford Army Ammunition Plant is the only North American manufacturer of nitrocellulose, the essential precursor for every propellant and explosive used across the US Army's ammunition industrial base.⁹ Nitrocellulose is the load-bearing chemistry beneath both small-caliber and large-caliber propellant systems. The European exposure is parallel and worse: the United Kingdom currently lacks domestic nitrocellulose production capacity and relies on imports, and BAE Systems is piloting a novel manufacturing process that would eliminate nitrocellulose and nitroglycerine from selected propellant chemistries, potentially industrial by late 2026.⁹

Holston AAP, operated by BAE Systems Ordnance Systems under a 25-year facilities-use contract, is the principal US producer of RDX and HMX military explosives.⁹ The energetics layer is the chemistry that fills the projectile after the propellant fires it. The qualification cycle for a second-site or alternate-chemistry energetic runs in years, not quarters.

The SRM supplier base shrank from six firms in 1995 to two by 2017. SRM lead times on critical components run 7 to 10 months as of early 2026, and the Pentagon's one-billion-dollar investment in L3Harris Missile Solutions is the largest current direct industrial-base intervention in the SRM lane.¹⁰ The duopoly persists. The FPRI lead-time decomposition for PAC-3 MSE makes the consequence explicit: 24 months for the missile and 30 months for the solid rocket motor.⁷

The US Air Force estimates 90 percent of its precision-guided munitions rely on Taiwan Semiconductor Manufacturing Company chips.⁷ The Taiwan-Strait scenario that would most stress the Western magazine is also the scenario that could break its critical-chip pipeline. The microelectronics layer is the only one of the four single-source dependencies not addressable by US industrial-base investment alone.

ASSESSMENT · HIGH CONFIDENCE

The four single-source dependencies (Radford NC, Holston energetics, the SRM duopoly, and TSMC microelectronics) are not symmetrically remediable. Radford and Holston are addressable by capital and qualification cycles measured in years. The SRM duopoly is addressable at the margin by direct investment but the duopoly structure persists. The TSMC dependency has the longest remediation timeline and the highest self-referential risk.

Rationale: Documented Radford NC monopoly, Holston single-site footprint, SRM duopoly history with capacity intervention scale, USAF-published TSMC dependency, FPRI PAC-3 lead-time decomposition.

SECTION 05 · CAPITAL

What 2030 Actually Looks Like

The CSIS Six Critical Systems framework, refined in the 2026 Rebuilding Missile Inventory analysis, applies the lead-time arithmetic without rhetorical compression.

The Tomahawk number is the cleanest illustration. The US Navy requested 785 Tomahawks in the FY2027 budget. First deliveries are projected for March 2030. The implied production lead time is 34 months after appropriation.⁸ CSIS's own characterization is that rebuilding Tomahawk, THAAD, and Patriot inventories to pre-Iran-war levels will take three or more years.⁸

The SM-6 number is parallel. The US Navy requested 540 SM-6s in the FY2027 budget with 36 to 39 months to first delivery and inventories not returning to prewar levels until early 2029.⁸ Both Tomahawk and SM-6 define the cruise-missile and air-defense floor of the current magazine.

The PAC-3 MSE number is the most quoted. PAC-3 MSE annual production rose from a pre-2022 baseline of 300 per year to 500 per year by early 2024, with a 650-per-year target set in CRS material from 2024.⁵ Lockheed delivered approximately 620 in 2025.⁷ In January 2026, DoD and Lockheed Martin signed a seven-year framework agreement targeting PAC-3 MSE production of 2,000 missiles per year by 2030.^{6, 7} The lead-time arithmetic remains 24 months for the missile and 30 months for the solid rocket motor.⁷

Multi-year procurement and large-lot procurement are the mechanisms that make multi-year promises bind. The US Air Force awarded a 4.3-billion-dollar Large Lot Procurement covering JASSM lots 22 to 26 and LRASM lots 9 to 12 in August 2025, with a parallel 3.5-billion-dollar AMRAAM award.⁸

ASSESSMENT · HIGH CONFIDENCE

The honest replenishment math for the most-stressed systems is multi-year, not multi-quarter, and today's appropriations do not fix today's magazine. Tomahawk first deliveries arrive March 2030; SM-6 inventories do not return to pre-Iran-war levels until early 2029; PAC-3 MSE requires 7 years to triple to the 2,000-per-year target. The thesis is falsifiable on a published Tomahawk lead time below 24 months and a verified 100,000-per-month 155mm rate.

Rationale: FY2027 Navy budget submission, CSIS Rebuilding Missile Inventory analytic series, January 2026 PAC-3 framework agreement, CRS 2024 PAC-3 and GMLRS production data.

SECTION 06 · TRANSMISSION

The Allied Pivot and the FMS Backlog

Allied capacity determines whether the Western magazine reads as a US-only or a coalition system, and the FMS backlog has become an unintended capacity signal.

The largest single European addition is Rheinmetall's Werk Niedersachsen in Unterlüß, Germany. The facility opened on 27 August 2025 with planned 155mm output of 25,000 shells in 2025, 140,000 in 2026, and up to 350,000 per year from 2027. Build cost was 500 million euros over 15 months from groundbreaking.⁹ The Diehl-Nammo joint venture (ARGE DiNa 155) holds a German Armed Forces framework agreement covering up to 350,000 155mm shells running to 2029.⁹

The European Commission's Act in Support of Ammunition Production (ASAP) is the pan-European programme behind the national-level ramps. ASAP allocated 500 million euros to 31 projects across explosives, powder, shells, missiles, and testing/reconnaissance, targeting 2 million 155mm shells per year of European production by end-2025. Chemring Nobel received 66.7 million euros to more than double its explosives capacity.¹⁶

South Korea is the second leg of the allied pivot. Hanwha Aerospace expanded K9 self-propelled-howitzer annual production capacity from 80 to 160 (second line) to 240 (third line, opened April 2024). Poland completed delivery of 212 K9s under its first executive contract; a second contract worth approximately 2.6 billion dollars will deliver 152 additional units through 2027.¹⁵

FY2025 total US arms transfers (FMS plus DCS combined) reached 331.18 billion dollars; DSCA tracks 16,098 open FMS cases with an open case value above 934 billion dollars per the State Department FY2025 release.^{11, 12} Open FMS cases compete with US-service replenishment for the same constrained primes, the same SRM duopoly, the same Radford NC throughput, and the same TSMC-dependent chip pipeline. There are not parallel production lines for FMS-delivered PAC-3 MSE and US-service PAC-3 MSE; there is one PAC-3 MSE line.

ASSESSMENT · MODERATE CONFIDENCE

The Foreign Military Sales backlog has become an unintended capacity signal: the 934-billion-dollar open FMS case value competes directly with US-service replenishment for the same constrained primes, energetics, and SRM lines, and therefore extends the effective replenishment timeline for US forces. The reader should treat FMS-backlog inflection as a structural variable in the magazine question, not as an independent demand-side metric.

Rationale: DSCA open-case figure read against CSIS replenishment math and FPRI PAC-3 lead-time decomposition; no contradicting reporting identified.

SECTION 07 · OUTLOOK

Three Scenarios, 30 to 90 Days and 6 to 12 Months

Construction confidence reflects analytical quality, not probability. Each scenario carries a velocity and a triggering signal.

Baseline · Muddle Through

CONSTRUCTION CONFIDENCE: HIGH · VELOCITY: GRADUAL

Status-quo Ukraine-scale consumption continues at the lower bound. The 155mm and GMLRS lines remain bottlenecked but manageable at the 40,000-to-100,000-per-month surge envelope. Interceptor and cruise-missile lines remain stressed but not exhausted. The FY2027 budget cycle proceeds without congressional disruption and the multi-year procurement and large-lot mechanisms continue to convert authorizations into throughput on the 2026 to 2028 schedule. PAC-3 MSE production tracks toward the 2030 framework target. Allied capacity adds meaningfully on the Rheinmetall, Diehl-Nammo, and Hanwha schedules. Prime-contractor margins improve on the volume side and EPC tailwinds at the facility-construction layer persist through the 2027 to 2028 throughput-conversion window.

SIGNAL TO WATCH: CONFIRMED 100,000-PER-MONTH 155MM RATE AT THE ALL-US-FACILITY LEVEL

Deterioration • Pacific Contingency or Sustained Multi-Theater Demand

CONSTRUCTION CONFIDENCE: MODERATE • VELOCITY: RAPID

A Pacific contingency activates the Empty Bins scenario at scale: long-range PGMs deplete on a sub-week clock, the TSMC microelectronics pipeline is at simultaneous risk, and interceptor and cruise-missile inventories are drawn down faster than the FY2027-onward delivery schedule can replace them. The 155mm magazine becomes a secondary problem because the long-range PGM and interceptor magazine becomes the binding constraint. The Defense Production Act tool usage expands and direct industrial-base intervention scales beyond the one-billion-dollar L3Harris example. Equity exposure shifts decisively toward integrated primes with energetics and SRM positions over pure-play finished-round assemblers.

SIGNAL TO WATCH: A TAIWAN-STRAIT KINETIC EVENT, SUSTAINED SIMULTANEOUS UKRAINIAN AND PACIFIC DEMAND, OR A TSMC FAB DISRUPTION REGARDLESS OF CAUSE

Stabilization • Multi-Year Procurement Converts and Allied Capacity Lands

CONSTRUCTION CONFIDENCE: LOW-MODERATE • VELOCITY: STRUCTURAL

Multi-year and large-lot procurement contracts authorized in 2024 and 2025 convert to throughput on schedule through 2027 and 2028. Rheinmetall Unterlüß reaches 350,000 per year by 2027; Hanwha's three K9 lines run at 240 units per year and the Polish second-contract delivery is completed through 2027; EU ASAP delivers within 30 percent of its 2 million-shell pan-European target. The 100,000-per-month US 155mm rate is achieved and held. The PAC-3 MSE 2,000-per-year target is met on schedule. The magazine question moves from binding to manageable on a six-to-twelve-quarter horizon.

SIGNAL TO WATCH: A BUDGET-STABLE TWO-YEAR WINDOW WITH NO CR DRAG, RADFORD NC MODERNIZATION COMMISSIONING ON SCHEDULE, AND NO PACIFIC KINETIC EVENT

ASSESSMENT • MODERATE CONFIDENCE

Across all three scenarios the magazine's structural cost base does not return to its 2022 baseline on any horizon shorter than two full budget cycles, and even under Stabilization the four single-source dependencies remain the binding constraint on the system's surge optionality. The planning question for an operator is not which scenario obtains; it is which component of the magazine is most exposed to which scenario, and at what threshold each operator's positioning decision flips.

Rationale: Institutional persistence of feedstock-layer constraints across all three pathways; the documented PAC-3, Tomahawk, and SM-6 lead-time architectures; the limited substitution capacity at NC, energetics, SRM, and TSMC; the FMS-backlog overhang as a constant load.

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AEGEAN INTELLIGENCE GROUP

Publishable Market Research

Timeliness: DURABLE. This brief is anchored to lead-time arithmetic and consolidation-driven feedstock pathology that does not move on a quarterly cycle. Carries a 6 to 18 month shelf life. Updates follow a formal DoD declaration of 100,000-per-month 155mm achievement, a published Tomahawk lead time below 24 months, a prime-contractor capacity announcement above one billion dollars, or a new CSIS, RAND, or IISS magazine-depth study.

Classification: CLIENT CONFIDENTIAL. Prepared on open-source intelligence verified against allowlisted Tier 1 to Tier 4 sources. No classified production figures, no current stockpile-depth numbers, and no Russian or Chinese consumption baselines are used.

Analytic judgments are Aegean's.

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