

Defense Production for Ukraine: Background and Issues for Congress

September 16, 2024

Congressional Research Service

<https://crsreports.congress.gov>

R48182



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Since the commencement of Russia's full-scale invasion of Ukraine in February 2022, the U.S. government has engaged in efforts to organize and expand the production of defense equipment for Ukraine-related purposes. To date, such purposes have included the direct provision of security assistance to Ukraine, the replacement of U.S. equipment already provided to Ukraine from existing stocks, and the expansion of U.S. and global defense industrial capacity.

Congress has played a role in these efforts, including by enacting annual and supplemental defense appropriations to fund Ukraine-related acquisition and industrial base investment programs; establishing or modifying authorities and policies relating to security assistance, defense procurement, and related activities; and overseeing the executive branch's use of these funds and authorities.

The Biden Administration contends that these attempts to mobilize the defense industrial base are critical to the effective battlefield performance of the Ukrainian military, as well as the realization of broader U.S. strategic interests. Partly as a result of these actions, since 2022, U.S. suppliers—which include both privately-owned defense contractors as well as government facilities and organizations—have increased the production of certain defense articles relevant to the conflict in Ukraine (e.g., artillery shells, precision-guided munitions, and air defense systems). Some policymakers and analysts argue that production challenges remain.

Potential questions facing Congress include:

- Do U.S. and global suppliers possess adequate industrial capacity to achieve congressional objectives regarding Ukraine?
- Is the executive branch's use of Ukraine-related production authorities and appropriations meeting congressional intent?
- What has been the impact of U.S.-produced defense equipment on the conflict? Are U.S. suppliers providing the right kinds of capabilities to achieve congressional objectives regarding Ukraine?

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September 16, 2024

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Contents

Introduction	1
Background	2
Funding, Authorities, and Programs for Ukraine-Related Production	2
Overview	2
Producing Items for the Ukraine Security Assistance Initiative	4
Replacing Items Transferred Under Presidential Drawdown Authority	5
Foreign Military Financing and Foreign Military Sales	6
Investing in the U.S. Industrial Base.....	7
Producing Key Weapon Systems and Munitions	8
155 mm Artillery Round	9
Javelin	11
Stinger.....	12
M142 High Mobility Artillery Rocket System (HIMARS)	13
Phased Array Tracking Radar to Intercept of Target (Patriot)	14
Uncrewed Aircraft Systems (Drones)	15
F-16 Fighting Falcon	16
Production Diplomacy	18
Coordinating National Production with Foreign Governments	18
International Co-Production.....	20
Issues Facing Congress	23
Industrial Capacity	23
Assessing Capacity Needs	23
Legislative Options	24
Exercising Oversight.....	25
Existing Oversight Efforts	25
Possible Oversight Questions for Congress	27
Impact on the Conflict.....	28
Relationship to Battlefield Performance	28

Figures

Figure 1. Ukraine-related Funding and Authorities.....	4
--	---

Tables

Table 1. Production Output for Selected Weapons and Munitions, 2022-2024.....	8
Table A2. Defense Articles and Services Provided to Ukraine, 2022-2024	32

Appendixes

Appendix. U.S. Security Assistance to Ukraine	32
---	----

Contacts

Author Information.....	35
-------------------------	----

Introduction

On February 24, 2022, Russia launched a full-scale invasion of Ukraine. Since then, the government of Ukraine has fought to defend and retake Ukrainian territory, assisted in various ways by the governments of the United States and other countries.

At the outset of Russia's full-scale invasion, the Ukrainian Armed Forces (UAF) was equipped mainly with upgraded Soviet or early post-Soviet era systems, and Ukraine's domestic defense industry—which was largely inherited from the Soviet Union—possessed only a limited ability to produce advanced equipment at scale.¹ As a result, the UAF faced a persistent shortage of materiel, a problem exacerbated by equipment losses sustained in previous fighting as well as by Russian strikes on Ukrainian production facilities.² This made Ukraine dependent on outside security assistance, the largest amount of which has come from the United States (other countries in Europe and elsewhere have also provided significant security assistance, but not on the scale of U.S. commitments).³ The U.S. government refers to the coordination of security assistance to Ukraine as *Operation Atlantic Resolve* (OAR).

To provide this assistance, the United States has sought to leverage its *defense industrial base* (DIB)—the network of organizations, facilities, and resources that supply the U.S. government with defense articles and services.⁴ Broadly speaking, the U.S. DIB supports Ukraine's war effort in two major ways: 1) by producing weapons, munitions, and other military hardware to provide directly to the UAF, and 2) by manufacturing items to replace those that the United States has already provided to the UAF from its existing stocks.

In addition to using its own DIB, the U.S. government has also sought to encourage and coordinate the global production of materiel for Ukraine (efforts sometimes referred to as *production diplomacy*).⁵ As part of these efforts, U.S. officials have negotiated and coordinated production investments and procurement actions with other governments, as well as assisted in the creation or expansion of international co-production arrangements and related industrial partnerships.

The mobilization of the U.S. DIB to produce weapons for Ukraine has been the subject of considerable debate, both within Congress and more broadly. The Biden Administration has

¹ Following the dissolution of the Soviet Union in 1991, Ukraine inherited roughly 30% of Soviet defense industrial capacity. Despite efforts to bring Ukrainian defense production in line with NATO standards prior to 2022, years of underinvestment, corruption, and mismanagement have impacted the country's defense industry. See Kateryna Bondar, "Arsenal of Democracy: Integrating Ukraine into the West's Defense Industrial Base," *Carnegie Endowment*, December 4, 2023; and Tor Bukkvoll, "Failures in Ukrainian Arms Procurement 2014-2023: The Negative Effects of Limited Access Orders on National Security," *Problems of Post Communism* (2024), pp. 1-23.

² For more information on Ukraine's military performance in the conflict, see CRS In Focus IF12150, *Ukrainian Military Performance and Outlook*, by Andrew S. Bowen.

³ This preeminent role has been recognized by other governments—for example, German Chancellor Olaf Scholz stated in February 2024 that "support from the United States is indispensable for the question of whether Ukraine will be able to defend its own country." A. Hernandez-Morales, "U.S. Aid 'Indispensable', Scholz Says," *Politico*, February 10, 2024. For a breakdown of security assistance by country, see the Kiel Institute for the World Economy, "Ukraine Support Tracker," <https://www.ifw-kiel.de/topics/war-against-ukraine/ukraine-support-tracker/>.

⁴ For an overview of the U.S. defense industrial base, see CRS Report R47751, *The U.S. Defense Industrial Base: Background and Issues for Congress*, by Luke A. Nicastro.

⁵ In the contemporary context, the term *production diplomacy* appears to have been coined by Under Secretary of Defense for Acquisition and Sustainment Dr. William LaPlante, and has since been used by other government officials and some think tanks. See remarks in "Strengthening the U.S. Industrial Base (Transcript)," Center for Strategic and International Studies, September 26, 2023, <https://www.csis.org/analysis/strengthening-us-industrial-base-hon-dr-william-laplante>.

maintained that 1) Ukrainian victory is in the United States' national interest; 2) U.S. suppliers are capable of meeting the requirements of arming Ukraine's military (given the proper government support); and 3) the resultant capacity expansion also improves U.S. military readiness and the health of the domestic economy.⁶ Some officials also have claimed that the size of the U.S. DIB means that its production efforts are uniquely important to Ukrainian success, and that no other country or group of countries could replace its contributions.⁷ Other stakeholders have argued that Ukraine-related production consumes limited resources that would better be applied to other national security problems, such as strategic competition with China.⁸ Still others have posited that, even with Western assistance, Ukrainian victory is impossible, or that U.S. support for Ukraine is itself unwise (making Ukraine-related production wasteful at best and dangerous at worst).⁹

Background

Funding, Authorities, and Programs for Ukraine-Related Production

Overview

Since 2022, Congress has appropriated \$174.2 billion in emergency supplemental funding for Ukraine-related purposes, with the majority of funds going to Department of Defense (DOD) and defense-related accounts—which received \$110.7 billion, or 64% of the total—and Department of State, Foreign Operations, and Related Programs (SFOPS) accounts—which received \$58.4 billion, or 34% of the total.¹⁰

Ukraine-related appropriations to DOD and defense-related accounts have been used for a variety of purposes, including the provision of defense articles and services (i.e., *security assistance*) to

⁶ For example, in his address of October 19, 2023, President Joe Biden stated: “On Ukraine, I’m asking Congress to make sure we can continue to send Ukraine the weapons they need to defend themselves and their country without interruption, so Ukraine can stop Putin’s brutality in Ukraine... We send Ukraine equipment sitting in our stockpiles. And when we use the money allocated by Congress, we use it to replenish our own stores, our own stockpiles, with new equipment. Equipment that defends America and is made in America. Patriot missiles for air defense batteries, made in Arizona. Artillery shells manufactured in 12 states across the country, in Pennsylvania, Ohio, Texas... Just as in World War II, today patriotic American workers are building the arsenal of democracy and serving the cause of freedom.” See also similar remarks in the State of the Union address of March 7, 2024, and the address of July 9, 2024.

⁷ As an example of this view, U.S. National Security Advisor Jake Sullivan has claimed that “at the end of the day, there is no alternative to the United States stepping up to the plate and providing a level of resources that allow Ukraine to have the artillery, the air defense systems and the other capabilities they need.” NATO, “Joint Press Conference,” February 7, 2024, https://www.nato.int/cps/en/natohq/opinions_222506.htm. See also comments by German Prime Minister Olaf Scholz in Footnote 3.

⁸ See, for example, Senator J.D. Vance, “J.D. Vance: The Math on Ukraine Doesn’t Add Up,” *The New York Times*, April 12, 2024.

⁹ See, for example, Anatol Lieven, “Ukraine Can’t Win the War,” *Time*, February 24, 2024.

¹⁰ Congress has provided emergency funding for Ukraine in five supplemental appropriations acts: Ukraine Supplemental Appropriations Act, 2022 (P.L. 117-103, Division N); Additional Ukraine Supplemental Appropriations Act, 2022 (P.L. 117-128); Ukraine Supplemental Appropriations Act, 2023 (P.L. 117-180, Division B); Additional Ukraine Supplemental Appropriations Act, 2023 (P.L. 117-328, Division M); and Ukraine Security Supplemental Appropriations Act, 2024 (P.L. 118-50, Division B). Although defense and SFOPS accounts together received 98% of this emergency funding, Ukraine-related appropriations were also made to Agriculture; Commerce, Justice, Science; Energy and Water; and Financial Services, General Government; and Labor, Health and Human Services, Education accounts. Congress has also provided certain funding for Ukraine-related activities in regular appropriations acts.

Ukraine, the replacement of items already transferred to Ukraine from DOD stocks, the deployment of U.S. military personnel and assets to Europe, and related activities.¹¹ Funding with direct production requirements or implications has included:

- \$31.8 billion to procure newly manufactured weapons and equipment for provision to Ukraine under the *Ukraine Security Assistance Initiative*, or USAI;¹² and
- \$45.8 billion to replace defense articles and services already provided to Ukraine, as well as to reimburse the department for services, military education, and training provided to Ukraine or foreign countries that have supported Ukraine.¹³

Funding related to defense production for Ukraine but provided to non-defense accounts has included \$6.33 billion for the SFOPS *foreign military financing* (FMF) account, to be made available to Ukraine and countries impacted by the situation in Ukraine.¹⁴ This assistance may be used by its recipients to, *inter alia*, procure defense articles and services from U.S. suppliers via the foreign military sales (FMS) system.¹⁵

Outside of the appropriations described above, Congress has also increased the total dollar-amount limit for *Presidential Drawdown Authority* (PDA; a statutory authority by which the President may transfer materiel from existing stocks and provide services to foreign countries) to permit more transfers to Ukraine than statute would have otherwise allowed.¹⁶ Since 2022, Congress has raised this cap to a combined maximum of \$33.3 billion.¹⁷

Figure 1 below provides a notional illustration of how such funding and authorities have been used to supply Ukraine with weapons and equipment, as well as replenish U.S. defense stocks.

¹¹ For more information, see CRS Insight IN12107, *Department of Defense Supplemental Funding for Ukraine: A Summary*, by Brendan W. McGarry.

¹² In addition to the \$31.8 billion provided for USAI via supplemental appropriations acts, Congress has also provided \$900 million via regular appropriations acts during this period (P.L. 117-103, §8139; P.L. 117-328, §8110; and P.L. 118-47, §8148). See also DOD, “Ukraine Security Assistance,” infographic, August 8, 2024, https://www.acq.osd.mil/news/spotlight/ukraine-infographic_08aug2024.pdf.

¹³ This total includes both \$39.34 billion in operation and maintenance (O&M) funding for transfer between certain accounts and \$6.436 billion in multiple procurement accounts for replacement of DOD stocks. According to information provided to CRS by DOD, the procurement funds were appropriated by P.L. 118-50, Division B and include \$3.103 billion in Procurement of Ammunition, Army; \$1.897 billion in Missile Procurement, Army; \$549.0 million in Weapons Procurement, Navy; \$366.0 million in Missile Procurement, Air Force; \$309.0 million in Other Procurement, Army; and \$212.4 million in Procurement, Marine Corps. For more information, see CRS Insight IN12107, *Department of Defense Supplemental Funding for Ukraine: A Summary*, by Brendan W. McGarry.

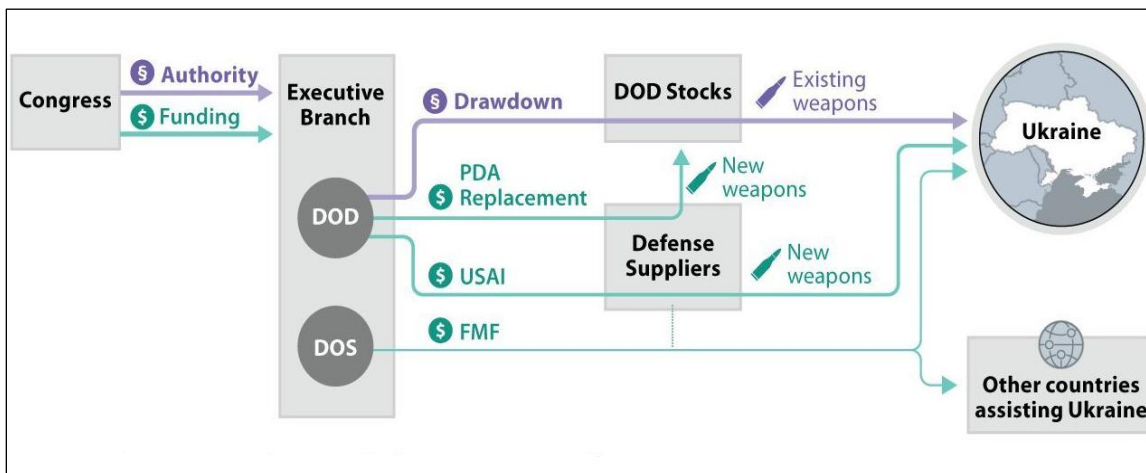
¹⁴ CRS Report R47275, *Department of State, Foreign Operations, and Related Programs (SFOPS) Supplemental Funding for Ukraine: In Brief*, by Emily M. McCabe, p. 10.

¹⁵ For more information on FMF, see Defense Security Cooperation Agency (DSCA), “Foreign Military Financing (FMF),” <https://www.dscamilitary-financing-fmf>.

¹⁶ 22 U.S.C. §2318. For more information, see CRS In Focus IF12040, *U.S. Security Assistance to Ukraine*, by Christina L. Arabia, Andrew S. Bowen, and Cory Welt.

¹⁷ Congress increased the annual PDA cap from \$100 million to \$11 billion for FY2022, \$14.5 billion for FY2023, and \$7.8 billion for FY2024; for more information, see CRS In Focus IF12040, *U.S. Security Assistance to Ukraine*, by Christina L. Arabia, Andrew S. Bowen, and Cory Welt.

Figure I. Ukraine-related Funding and Authorities
Selected Funding and Authorities Used to Aid Ukraine and Replenish U.S. Stocks



Source: CRS graphic.

Notes: FMF assistance may be used by Ukraine and other recipient countries to, inter alia, procure materiel from U.S. defense suppliers.

Using these funds, authorities, and programs, the executive branch has reported that it has *provided* more than \$55.7 billion in security assistance to Ukraine since February 2022, including \$26.2 billion committed for USAI contracting actions, \$25.6 billion in announced PDA transfers, and \$4 billion committed for FMF uses.¹⁸

In addition, the executive branch has used other funding sources to make investments that it has framed as supportive of security assistance to Ukraine, including Defense Production Act (DPA) Title III projects and other industrial base expansion programs and authorities.¹⁹

Producing Items for the Ukraine Security Assistance Initiative

USAI is an initiative to fund security assistance to Ukraine, which may include the provision of defense equipment, training, logistics support, intelligence support and other defense articles and services to the military and security forces of Ukraine. Although USAI was initially established by Section 1250 of the FY2016 National Defense Authorization Act (NDAA; P.L. 114-92), the majority of USAI assistance has been provided since February 2022.²⁰ The provision of USAI assistance typically has involved new contracting actions with U.S. defense suppliers. As of August 8, 2024, DOD has awarded \$15.8 billion of USAI funding to various contractors for 155 millimeter (mm) artillery rounds, air defense systems and munitions, mobile rocket artillery systems, and other defense equipment.²¹

¹⁸ The term *provide* in this context refers to 1) appropriated funds that have been obligated or committed (i.e., their use has been notified to Congress); and 2) PDA transfers that have been publicly announced. DOS, “U.S. Security Cooperation with Ukraine,” September 6, 2024, <https://www.state.gov/u-s-security-cooperation-with-ukraine/>; and DOD, “Ukraine Security Assistance,” August 8, 2024.

¹⁹ See discussion in “Investing in the U.S. Industrial Base” section below.

²⁰ CRS In Focus IF12040, *U.S. Security Assistance to Ukraine*, by Christina L. Arabia, Andrew S. Bowen, and Cory Welt.

²¹ DOD, “Ukraine Security Assistance,” infographic, August 8, 2024.

To address what it has described as urgent Ukrainian shortfalls, the executive branch has also taken actions to redirect the production and delivery of certain defense articles—initially intended to be sold to other countries—to Ukraine via USAI. On June 20, 2024, for instance, National Security Council spokesman John Kirby announced that “the United States government has made the difficult but necessary decision to reprioritize near term planned deliveries of foreign military sales to other countries, particularly of Patriot and [National Advanced Surface-to-Air Missile System] missiles to go to Ukraine instead.”²² One media report has suggested that the costs of this reprioritization could exceed \$1 billion and would be drawn from USAI funds.²³

Replacing Items Transferred Under Presidential Drawdown Authority

To replace the capabilities provided to Ukraine through PDA, DOD has contracted with suppliers to produce new items for U.S. use. As of this writing, President Biden has invoked PDA to transfer approximately \$25.6 billion in defense equipment to Ukraine since August 2021; as of August 8, 2024, DOD has obligated \$21.0 billion for contracting actions to replace the equipment so provided.²⁴

Although PDA replacement funding is intended primarily to backfill PDA-provided equipment, contracting actions are not necessarily being taken on a ‘one-to-one’ basis (that is, DOD may not be procuring a replacement for every single item sent to Ukraine). Rather, the Government Accountability Office (GAO) has reported that DOD may use PDA replacement funds for four distinct purposes:

- To “buy exact replacements of weapons delivered to Ukraine;”
- To “buy newer, modern variants of weapons delivered to Ukraine;”
- To “invest in the defense industrial base to accelerate the production of weapons;” and
- To “reimburse service costs, including logistics costs associated with PDA transfers to Ukraine (e.g., operation and maintenance fuel costs to ship equipment overseas).”²⁵

As of December 2023, the largest amount of PDA replacement funds had been obligated for actions related to ammunition production (\$6.0 billion), followed by actions related to missiles (\$5.4 billion) and combat vehicles (\$2.7 billion).²⁶

PDA Valuation Errors

On June 20, 2023, DOD reported overestimating the value of equipment transferred to Ukraine under PDA by \$6.2 billion, including \$2.6 billion in FY2022 and \$3.6 billion in FY2023. Deputy Press Secretary Sabrina Singh said department officials discovered inconsistencies in how financial managers in the military services calculated such estimates. In a “significant” number of cases, Singh said, the services used *replacement cost* (i.e., the cost to purchase a new item to replace a transferred item) rather than *net book value* (i.e., the depreciated value of a

²² The White House, “On-the-Record Press Gaggle by White House National Security Communications Advisor John Kirby,” June 20, 2024, <https://www.whitehouse.gov/briefing-room/press-briefings/2024/06/20/on-the-record-press-gaggle-by-white-house-national-security-communications-advisor-john-kirby-15/>.

²³ Tony Bertuca, “U.S. to Redirect Foreign Sales of Air Defense Missiles,” *Inside Defense*, June 20, 2024.

²⁴ CRS analysis of Ukraine appropriations acts; DOS, “U.S. Security Cooperation with Ukraine,” September 6, 2024; and DOD, “Ukraine Security Assistance,” August 8, 2024. See also CRS In Focus IF12040, *U.S. Security Assistance to Ukraine*, by Christina L. Arabia, Andrew S. Bowen, and Cory Welt.

²⁵ U.S. Government Accountability Office, *Ukraine: Status and Challenges of DOD Weapon Replacement Efforts*, GAO-24-106649, April 30, 2024, p. 2.

²⁶ *Ibid.*, p. 4.

transferred item). After correcting for the “valuation errors,” Singh said, DOD identified \$6.2 billion in previously announced PDA still available for use.²⁷

Some Members of Congress have expressed concern these errors may have affected the pace and mix of equipment transferred to Ukraine. In May 2023, for instance, House Foreign Affairs Committee Chairman Michael McCaul and House Armed Services Committee Chairman Mike Rogers issued a joint statement claiming that “these funds could have been used for extra supplies and weapons for the upcoming counteroffensive, instead of rationing funds to last for the remainder of the fiscal year.”²⁸

In July 2024, the U.S. Government Accountability Office (GAO) published a report examining the valuation of PDA transfers, and documented additional valuation errors totaling over \$2.1 billion. GAO found that some DOD components did not consistently follow department accounting policy when valuing defense articles for PDA, and recommended that Congress clarify the definition of PDA-related “value” in the Foreign Assistance Act, and that DOD update its *Financial Management Regulation* to include a PDA-specific valuation section, among other recommendations. Without these or similar changes, GAO states that “DOD cannot have assurance that the articles will be valued accurately, which may result in a miscalculation of the remaining presidential determination authorization amount.”²⁹ In addition, if Congress were to base the amounts appropriated for PDA replacement actions on misvalued PDA transfers, one result could be too much or too little funding to procure new weapons and munitions for U.S. stocks.

Foreign Military Financing and Foreign Military Sales

As noted above, both FMF and FMS have been used to provide security assistance to Ukraine.

According to the Department of State (DOS), as of September 6, 2024, \$4 billion of the \$6.33 billion in Ukraine-related FMF had been notified to Congress.³⁰ In addition, DOS has reported that the United States has \$595.9 million in active FMS cases with Ukraine (it is unclear how much of this total is financed by FMF).³¹ Recently approved FMS sales include “Blanket Order Sustainment of U.S. Army Supplied Systems” (May 2024; \$100 million estimated cost), HIMARS and “related elements of logistics and program support” (May 2024; \$30 million estimated cost), and “HAWK Phase III Missile System Sustainment and related elements of logistics and program support” (April 2024).³² In addition, at least \$2 billion of Ukraine-related FMF is intended to fund a “defense enterprise fund,” which U.S. Secretary of State Antony Blinken described as having three elements:

One is to provide weapons today, so this will assist Ukraine in acquiring those weapons. Two is to focus [on] investing in Ukraine’s defense industrial base, helping to strengthen even more its capacity to produce what it needs for itself but also to produce for others.

²⁷ DOD, “Deputy Pentagon Press Secretary Sabrina Singh Holds a Press Briefing,” transcript, June 20, 2023.

²⁸ House Foreign Affairs Committee, “Chairmen McCaul and Rogers on Pentagon Multi-Billion-Dollar ‘Accounting Error,’” press release, May 18, 2023.

²⁹ GAO, *Ukraine Assistance: Actions Needed to Properly Value Defense Articles Provided under Presidential Drawdown Authority*, GAO-24-10634, July 2024.

³⁰ DOS, “U.S. Security Cooperation with Ukraine,” September 6, 2024, <https://www.state.gov/u-s-security-cooperation-with-ukraine/>.

³¹ Ibid.

³² DSCA, “Ukraine – Blanket Order Sustainment of U.S. Army Supplied Systems,” May 16, 2024, <https://www.dsca.mil/press-media/major-arms-sales/ukraine-blanket-order-sustainment-us-army-supplied-systems>; DSCA, “Ukraine – HIMARS,” May 10, 2024, <https://www.dsca.mil/press-media/major-arms-sales/ukraine-high-mobility-artillery-rocket-systems>; and DSCA, “HAWK Phase III Missile System Sustainment,” April 9, 2024, <https://www.dsca.mil/press-media/major-arms-sales/ukraine-hawk-phase-iii-missile-system-sustainment>.

And finally, using this fund to help Ukraine purchase military equipment from other countries, not just the United States, for Ukraine's use.³³

More generally, the executive branch has reported an uptick in FMS since 2022, and some DOD officials have attributed much of this increase to European reactions to the war in Ukraine.³⁴ Depending on the particular systems and components involved in these sales, they could have an impact on the production of Ukraine-related defense equipment. For example, increased demand for systems relevant to the war in Ukraine (e.g., HIMARS or PATRIOT) could lead to production or sustainment delays for Ukraine or other FMS customers (or both).

Investing in the U.S. Industrial Base

The U.S. government has also made a number of Ukraine-related investments in the DIB. Since February 2022, Congress has appropriated at least \$600 million for Ukraine-related uses of Title III of the DPA, which allows the President to provide loan guarantees, loans, purchases and purchase commitments, grants, and other financial assistance directly to suppliers for the purpose of expanding production.³⁵ According to DOD, these appropriations—along with other DPA Title III funds—have been used to bolster and expand the production of numerous systems and components relevant to Ukraine assistance, including missiles, other munitions, and strategic and critical materials.³⁶ As an example, Aerojet Rocketdyne (a subsidiary of L3 Harris Technologies Inc.) is using Ukraine-related DPA Title III funds in Camden, AR, and Orange, VA to expand and modernize production facilities for solid rocket motors.³⁷

Beyond DPA appropriations, DOD has also reported using nearly \$5.6 billion for other industrial base expansion efforts related to Ukraine, including \$4.9 billion associated with the production of 155 mm artillery shells, Guided Multiple Launch Rocket System (GMLRS) munitions, Javelin anti-tank systems/munitions, Stinger anti-air systems/munitions, and other related equipment.³⁸ Ukraine-related industrial base investments may utilize funds from a number of different appropriations accounts. These may include the Industrial Facilities line item within the Procurement of Ammunition, Army (PAA) appropriation, which funds “modernization, construction and rehabilitation efforts at [government-owned] plants and commercial facilities as well as preservation of inactive production lines”;³⁹ as well as the Operational Systems Development budget activity of the Research, Development, Test, and Evaluation (RDT&E),

³³ DOS, “Secretary Antony J. Blinken and Ukrainian Foreign Minister Dmytro Kuleba at a Joint Press Availability,” May 15, 2024, <https://www.state.gov/secretary-antony-j-blinken-and-ukrainian-foreign-minister-dmytro-kuleba-at-a-joint-press-availability-5/>.

³⁴ C. Todd Lopez, “DOD Has Seen 'Huge' Increase in Military Sales Since Ukraine Invasion,” DOD press release, April 9, 2024, <https://www.defense.gov/News/News-Stories/Article/Article/3736017/dod-has-seen-huge-increase-in-military-sales-since-ukraine-invasion/>.

³⁵ Congress appropriated \$600 million for this purpose through the Additional Ukraine Supplemental Appropriations Act of 2022 (P.L. 117-128). For more information on the DPA, see CRS Testimony TE10092, *Mission Critical: Restoring National Security as the Focus of Defense Production Act Reauthorization*, by Luke A. Nicastro. Note that DOD reports a total of \$746 million in Ukraine-related DPA Title III funding (see DOD, “Ukraine Security Assistance,” infographic, August 8, 2024).

³⁶ DOD, “Ukraine Security Assistance,” August 8, 2024.

³⁷ Investments in Aerojet Rocketdyne facilities were funded by appropriations made via the Additional Ukraine Supplemental Appropriations Act, 2022 (P.L. 117-128). For more information on this project, see Aerojet Rocketdyne, “Factories of the Future,” press release, May 9, 2024, <https://www.l3harris.com/newsroom/editorial/2024/05>.

³⁸ DOD, “Ukraine Security Assistance,” August 8, 2024.

³⁹ A recent project funded by this line item that may be relevant to Ukraine may be the construction of a “future artillery complex” at Iowa Army Ammunition Plant (\$280.65 million total cost). See Department of the Army, *Department of Defense FY2025 Budget Estimates: Procurement of Ammunition, Army*, March 2024, pp. 782-830.

Defense-wide appropriation, which funds “investment in prime and sub-tier suppliers to mitigate supply chain risks and eliminate production capacity bottlenecks” under the aegis of the Industrial Base Analysis and Sustainment (IBAS) program.⁴⁰ As an example of broader industrial base expansion efforts that may have relevance for Ukraine-related production, in May 2024 the Army opened a new Universal Artillery Projectile Lines facility to produce metal parts for large caliber ammunition in Mesquite, TX (see “155 mm Artillery Round” section of this report for more information).⁴¹

Producing Key Weapon Systems and Munitions

Through the authorities, funding, and other activities described above, the United States has provided and produced a wide array of defense equipment for purposes related to Ukraine. The ability of U.S. suppliers to make this hardware can be understood as a function of the DIB’s *industrial capacity*—that is, the total amount of resources available for the manufacture of defense-related goods. Such resources may include facilities and equipment, labor, and raw materials, as well as less tangible assets such as intellectual property.⁴²

According to DOD, contract awards and grants related to defense production for Ukraine have been made to suppliers in at least 38 U.S. states since February 2022.⁴³ Some media reports and company statements suggest these awards constitute a significant and growing source of revenue for some defense contractors, particularly manufacturers of ammunition, precision-guided munitions, and air/missile defense systems.⁴⁴ Some suppliers have reported increases in production output for certain Ukraine-related defense items, including 155 mm artillery shells, precision-guided munitions, and related systems and components (see **Table 1**). DOD and some defense suppliers have also sought to increase relevant industrial capacity both by making investments in existing sites and by establishing new sites.

Table 1. Production Output for Selected Weapons and Munitions, 2022-2024

Total output figures for producers of selected U.S.-origin defense articles

Item	Monthly output, 2022	Monthly output, 2024	Percentage change
155 mm projectile	14,400	40,000	+178%
155 mm propelling charge	14,494	18,000	+24%
GMLRS	833	1,167	+40%
Javelin	175	200	+14%
PAC-3 MSE (PATRIOT Interceptor)	21	42	+100%
HIMARS	5	8	+60%

⁴⁰ The IBAS program is authorized by 10 U.S.C. §4817 as the Industrial Base Fund. See Office of the Secretary of Defense, *Department of Defense FY2025 Budget Estimates: Research, Development, Test, & Evaluation, Defense-Wide*, March 2024, pp. 1179-1201.

⁴¹ U.S. Army Public Affairs, “Army Inaugurates Universal Artillery Projectile Lines Facility,” May 29, 2024, https://www.army.mil/article/276727/army_inaugurates_universal_artillery_projectile_lines_facility.

⁴² For more information, see discussion in CRS Report R47751, *The U.S. Defense Industrial Base: Background and Issues for Congress*, by Luke A. Nicastro, pp. 24-25.

⁴³ DOD, “Ukraine Security Assistance,” infographic, August 8, 2024.

⁴⁴ See, for example, Doug Cameron, “Ukraine Aid Lifts Defense Industry as Debate Over Profits Reignites,” *The Wall Street Journal*, April 28, 2024.

Item	Monthly output, 2022	Monthly output, 2024	Percentage change
M777 Tubes	11	18	+64%

Source: DOD, “Fact Sheet on Efforts of Ukraine Defense Contact Group – National Armaments Directors,” September 6, 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direct/>.

Notes: For more information on individual items, refer to relevant subsections below. Not all of the output documented above may be intended for direct provision to Ukraine.

The production process varies considerably across different categories of defense equipment. The subsections below describe the manufacture and transfer of seven key U.S.-made weapons or munitions (155 mm artillery rounds, the Javelin anti-tank weapon, the Stinger anti-air weapon, the HIMARS rocket artillery system, the PATRIOT air defense system, select unmanned aerial systems, and the F-16 fighter aircraft).

155 mm Artillery Round

The 155 mm munition is a large caliber field artillery round. The United States produces several varieties of 155 mm ammunition with different warheads and functions, including some with precision guidance (e.g., the Excalibur munition).⁴⁵ The U.S. Army’s general purpose 155 mm round is the M795 High Explosive (HE), first introduced in 1999.⁴⁶

The United States has provided 155 mm ammunition to Ukraine since 2022. In July 2023, the Biden Administration announced that it would transfer 155 mm Dual Purpose Improved Conventional Munitions, a type of cluster munition, to Ukraine.⁴⁷ As of early September 2024, the United States had provided Ukraine more than 3,000,000 155 mm artillery rounds.⁴⁸

Media reporting suggests that Ukraine’s expenditure of artillery ammunition has exceeded the ability of its partners, including the United States, to supply it in quantities sufficient to meet its stated goals.⁴⁹ The UAF relies on artillery to compensate for Russia’s quantitative advantage in personnel and its strategy of massed infantry assaults.⁵⁰ Ukrainian officials have called for as many as 594,000 artillery rounds a month to sustain combat operations.⁵¹ According to one study, “Ukraine will need around 75,000–90,000 artillery shells per month to sustain the war defensively, and more than double that — 200,000–250,000 — for a major offensive.”⁵² Shortages of artillery ammunition have reportedly caused the UAF to ration fire during Russian

⁴⁵ According to DOD, the M982 Excalibur is a precision-guided, extended-range 155-millimeter munition that uses a guidance system comprised of both GPS and an inertial navigation system (INS).

⁴⁶ United States Army, *PEO Ammunition Systems Portfolio Book 2017*, Washington, DC, p. 40, <https://www.dau.edu/sites/default/files/Migrated/CopDocuments/PEO%20Ammo%20Portfolio%20Book%202017.pdf>.

⁴⁷ See CRS Report RS22907, *Cluster Munitions: Background and Issues for Congress*, by Paul K. Kerr and Andrew Feickert.

⁴⁸ DOD, “Fact Sheet on U.S. Security Assistance to Ukraine,” September 6, 2024. See also Appendix A to this report.

⁴⁹ Andrew E. Kramer, “Dwindling Ammunition Stocks Pose Grave Threat to Ukraine,” *The New York Times*, April 5, 2024; Antti Ruokonen, “Ukraine’s Artillery Shell Shortfall,” *Lawfare*, April 3, 2024, <https://www.lawfaremedia.org/article/ukraine-s-artillery-shell-shortfall>; Isobel Koshiw, “We’re Almost Out of Ammunition and Relying on Western Arms, says Ukraine,” *The Guardian*, June 10, 2024.

⁵⁰ Jack Detsch, “Ukraine Is Still Outgunned by Russia,” *Foreign Policy*, April 23, 2024; Gordon Corera, “Ukraine Calls Them Meat Assaults: Russia’s Brutal Plan to Take Ground,” *BBC*, July 3, 2024.

⁵¹ Andy Bounds, “Ukraine Asks EU for 250,000 Artillery Shells a Month,” *Financial Times*, March 3, 2023.

⁵² Franz-Stefan Gady and Michael Kofman, “Making Attrition Work: A Viable Theory of Victory for Ukraine,” *Survival* 66, no. 1 (February-March 2024), p. 19.

offensives and were described by Ukrainian officials as a key factor in the UAF's retreat from the strategically-located town of Avdiivka in February 2024.⁵³

At the outbreak of Russia's full-scale invasion of Ukraine in February 2022, the United States produced an estimated 14,400 155 mm rounds per month.⁵⁴ Since then, the U.S. Army has made efforts to produce greater quantities of 155 mm ammunition than it has in recent years. Colonel Leon L. Rogers II, the project manager for Combat Ammunition Systems, the Army office responsible for managing mortars and artillery ammunition, described these efforts as the "most significant U.S. ramp-up of 155 mm artillery ammunition production since the Korean War."⁵⁵ In September 2023, Assistant Secretary of the Army for Acquisition, Logistics, and Technology Doug Bush said that the Army had set a target of producing 100,000 155 mm rounds per month by the end of 2025.⁵⁶ In September 2024, DOD reported producing 40,000 rounds per month.⁵⁷

Army initiatives to expand production capacity have included scaling production of the steel alloy casing for the 155 mm artillery round. The 78-pound metal body of an M795 155-millimeter round is made of high fragmentation steel, or HF-1. Production of the metal casing has in recent years occurred largely at the Scranton Army Ammunition Plant (SCAAP) in Scranton, Pennsylvania, after which the munition is assembled at other facilities.⁵⁸ As part of the 15-year Army Organic Industrial Base Modernization Plan, the Army committed to investing \$243 million in updating the Scranton facility.⁵⁹ In November 2023, Assistant Secretary of the Army Doug Bush said upgrades to the facilities that produce 155 mm ammunition had "helped double the Army's artillery production rate."⁶⁰ In addition to increasing capacity at its pre-existing facility, in May 2024 the Army opened a new site known as the Universal Artillery Project Lines (UAPL) facility (located in Mesquite, Texas), to produce metal parts for 155 mm ammunition.⁶¹

⁵³ Henry Foy, Felicia Schwartz, and Christopher Miller, "Ukraine Faces 'Gap in the Hose' as Western Ammunition Dries Up," *Financial Times*, February 9, 2024; Mike Eckel, "Ukraine's New War Strategy: Dig In, Hold On, Find More Soldiers, Hope For U.S. Weaponry," *RFE/RL*, March 13, 2024; Special Inspector General Report to the United States Congress, *Operation Atlantic Resolve: Including U.S. Government Activities Related to Ukraine, April 1, 2024-June 30, 2024*, p. 26.

⁵⁴ Abraam Dawoud, "US Army and Industry Partners Mobilize to Boost US Artillery Production," U.S. Army press release, February 8, 2024, https://www.army.mil/article/273152/us_army_and_industry_partners. DOD, "Fact Sheet on Efforts of Ukraine Defense Contact Group – National Armaments Directors," September 6, 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

⁵⁵ Defence iQ, "Mobilizing Artillery Interview with Colonel Leon L. Rogers II," March 2024, <https://www.defenceiq.com/events-futureartillery/downloads/mobilizing-artillery-interview-with-colonel-leon-l-rogers>.

⁵⁶ Audrey Decker, "Pentagon set to make 100K artillery shells a month in 2025," *Defense One*, September 15, 2023, <https://www.defenseone.com/threats/2023/09/pentagon-set-make-100k-artillery-shells-year-2025/390338/>.

⁵⁷ DOD, "Fact Sheet on Efforts of Ukraine Defense Contact Group – National Armaments Directors," September 6, 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

⁵⁸ Richard P. Hanson, "Scranton Army Ammunition Plant Manufactures and Ships Large-Caliber Ammunition Metal Parts," U.S. Army, August 19, 2020, https://www.army.mil/article/238269/scranton_army_ammunition_plant_manufactures_and_ships_large_caliber_ammunition_metal_parts.

⁵⁹ Matthew Wheaton, "Secretary of the Army discusses modernization efforts during SCAAP visit," U.S. Army, February 7, 2023, https://www.army.mil/article/263789/secretary_of_the_army_discusses_modernization_efforts_during_scaap_visit.

⁶⁰ Christopher Hurd, "Strengthened Army industrial base doubles artillery production," U.S. Army, November 14, 2023, https://www.army.mil/article/271572/strengthened_army_industrial_base_doubles_artillery_production.

⁶¹ Matthew Olay, "Army Opens New Munitions Factory," U.S. Department of Defense, May 30, 2024, <https://www.defense.gov/News/News-Stories/Article/Article/3791962/army-opens-new-munitions-facility/>.

Like the SCAAP, the UAPL is a government-owned facility operated by General Dynamics Ordnance and Tactical Systems.⁶²

Additional projects to accelerate production of artillery ammunition include work at other GOCO facilities involved in the production of 155 mm ammunition such as Holston Army Ammunition Plant and Radford Army Ammunition Plant, where the Army produces explosives and propellant charges, respectively, for the 155 mm munition, as well as at the Iowa Army Ammunition Plant, where the Army assembles 155 mm munitions.⁶³ In September 2024, DOD reported having increased production of propellant charges for the 155 mm from 14,494 per month in 2022 to 18,000 per month.⁶⁴ In all, according to one estimate by the Project Director Joint Services, the DOD office in the Joint Program Executive Office Armaments & Ammunition that is responsible for production base activities, the Army has invested \$2.7 billion into the production of 155 mm ammunition as of March 2024.⁶⁵

Javelin

The Javelin is a shoulder-mounted, fire-and-forget anti-tank guided missile system.⁶⁶ The 48-pound Javelin system consists of the FGM-148 Javelin missile, a disposable launch tube assembly, and the command launch unit, a reusable system used to acquire, identify, and track targets. The U.S. Defense Advanced Research Projects Agency (DARPA) and the U.S. Army began developing the Javelin in the early 1980s; low-rate initial production of the system began in 1994.⁶⁷ The primary contractor for the Javelin is the Javelin Joint Venture, a collaboration between Raytheon, an RTX company, and Lockheed Martin.

Some observers have credited the Javelin system with helping Ukraine repel Russia's full-scale invasion in February 2022. For example, NATO Secretary Jens Stoltenberg has stated that the Ukrainians "were able to push back the Russian invaders, not least because they had the Javelins and they played a critical role in those opening weeks of the war."⁶⁸ As of September 2024, the United States had provided Ukraine with more than 10,000 Javelin missiles.⁶⁹

⁶² Steff Chávez, "US defence industry faces uncertainty despite production 'boomlet'," *Financial Times*, June 25, 2024, <https://www.ft.com/content/dc127392-2d98-4571-8ec9-2ed82b510b46>.

⁶³ Roxana Tiron and Tony Capaccio, "US Puts \$2 Billion Into Plants Making Ammo Vital to Ukraine (1)," *Bloomberg Government*, January 25, 2023.

⁶⁴ DOD, "Fact Sheet on Efforts of Ukraine Defense Contact Group – National Armaments Directors," press release, September 6, 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direct/>.

⁶⁵ Joshua Headley and Melissa Markos, "Project Director Joint Services," presentation at NDIA's 2024 Munitions Executive Summit, Parsippany, NJ, March 20, 2024, <https://ndia.dtic.mil/wp-content/uploads/2024/mes/Headley.pdf>.

⁶⁶ "Fire-and-forget" munitions are a type of guided munition that, once launched, do not require additional inputs from the operator to guide the munition to its target. After an operator of the Javelin system designates a target and launches the missile, the missile's onboard infrared seeker, autopilot, and tracking system are designed to maintain the missile's course towards the target even if the target moves to avoid the missile.

⁶⁷ Amael Kotlarski and Thomas Ford, *Janes Infantry Weapons 2021-2022*, (Coulsdon: Jane's Group UK, 2021), pp. 998.

⁶⁸ Jens Stoltenberg, "Remarks by NATO Secretary General Jens Stoltenberg at the Lockheed Martin Facility in Troy, Alabama," North Atlantic Treaty Organization, January 31, 2024, https://www.nato.int/cps/en/natohq/opinions_222260.htm.

⁶⁹ DOD, "Fact Sheet on U.S. Security Assistance to Ukraine," September 6, 2024. See also Appendix A to this report.

The length of time required to manufacture Javelin missiles is among the highest of the U.S. military's portfolio of precision munitions, some analysts have found.⁷⁰ The Army and the Javelin Joint Venture are seeking to reduce manufacturing lead-times by growing the production capacity of the Javelin to 3,960 missiles per year by the end of 2026.⁷¹ As of February 2024, Lockheed Martin reported that production of the Javelin had risen to 2,400 missiles per year from 2,100 missiles annually in 2022 (a 14% increase).⁷²

Stinger

The Stinger is a fire-and-forget man-portable air defense (MANPAD) surface-to-air missile system. Produced by RTX's Raytheon, the 34.5-pound Stinger system consists of a reusable launch tube assembly and an FIM-92 Stinger missile round. The U.S. Army began developing the Stinger in the late 1960s, before fielding the weapon in 1981.⁷³ Originally designed to defend against fixed- and rotary-wing aircraft, the Army has adapted the Stinger for use against other low-altitude aerial threats such as cruise missiles and uncrewed aircraft.⁷⁴ In addition to the man-portable version, vehicle-mounted short-range air defense systems like the U.S. Army's Avenger and Maneuver Short-Range Air Defense systems are also equipped with the Stinger.

The Stinger was among the first weapons provided by the United States to Ukraine following Russia's full-scale invasion of the country in February 2022.⁷⁵ "With Russia's unrelenting and brutal air attacks on Ukrainian civilian and critical infrastructure, additional air defense capabilities are critical," said DOD Deputy Pentagon Press Secretary Sabrina Singh in announcing a November 2022 aid package that included additional Avenger and Stinger systems.⁷⁶ As of September 2024, the United States had provided more than 2,000 Stinger missiles to Ukraine.⁷⁷

In May 2022, the U.S. Army announced that it had awarded Raytheon a \$625-million contract for an estimated 1,300 missiles to replenish its inventory of Stinger missiles.⁷⁸ The contract represented the first such award by the Army for new Stinger missiles in approximately two

⁷⁰ Seth G. Jones, *Empty Bins in a Wartime Environment*, Center for Strategic and International Studies, Washington, D.C., January 23, 2023, p. 14, <https://www.csis.org/analysis/empty-bins-wartime-environment-challenge-us-defense-industrial-base>.

⁷¹ Lockheed Martin, "Ramping Up: Lockheed Martin Steadily Increasing Production of High-Demand Systems," press release, February 15, 2024, <https://www.lockheedmartin.com/en-us/news/features/2024/ramping-up--lockheed-martin-steadily-increasing-production-o.html>.

⁷² Lockheed Martin, "Ramping Up: Lockheed Martin Steadily Increasing Production of High-Demand Systems," press release, February 15, 2024, <https://www.lockheedmartin.com/en-us/news/features/2024/ramping-up--lockheed-martin-steadily-increasing-production-o.html>.

⁷³ Karl E. Cocke, Detmar H. Finke, and James E. Hewes, Jr., et al., *Department of the Army Historical Summary Fiscal Year 1981*, ed. Christine O. Hardyman (Washington, D.C.: Center for Military History, 1988), p. 30.

⁷⁴ Gary Sheftick, "Army prioritizes mobile system to counter drones," United States Army, March 5, 2018, https://www.army.mil/article/201365/army_prioritizes_mobile_system_to_counter_drones; Kevin Jackson, "Stinger maintenance work to increase service life, reliability," United States Army, May 25, 2017, https://www.army.mil/article/188420/stinger_maintenance_work_to_increase_service_life_reliability.

⁷⁵ Joe Gould and Howard Altman, "Amid fears of Russian air dominance, US to send anti-aircraft Stingers to Ukraine," *Defense News*, February 28, 2022.

⁷⁶ Sabrina Singh, "Sabrina Singh, Deputy Pentagon Press Secretary, Holds a Press Briefing," U.S. Department of Defense, November 10, 2022, <https://www.defense.gov/News/Transcripts/Transcript/Article/3216785/sabrina-singh-deputy-pentagon-press-secretary-holds-a-press-briefing/>.

⁷⁷ DOD, "Fact Sheet on U.S. Security Assistance to Ukraine," September 6, 2024. See also Appendix A to this report.

⁷⁸ U.S. Department of Defense, "Contracts For May 27, 2022," press release, May 27, 2022, <https://www.defense.gov/News/Contracts/Contract/Article/3046664/>.

decades; the Army last accepted new Stingers in 2005.⁷⁹ The Stinger missiles ordered by the Army in 2022 are expected to be delivered in 2026, according to the Army's award notice.⁸⁰ Raytheon officials have cited obsolete parts and the lack of trained personnel as among the challenges to re-starting production of the Cold War-era missile.⁸¹

M142 High Mobility Artillery Rocket System (HIMARS)

A self-propelled, wheeled weapon system, the M142 High Mobility Artillery Rocket System (HIMARS) comprises a multiple rocket launcher mounted on an M1140 truck chassis. The U.S. Army introduced the HIMARS in the late 1990s as an alternative to the tracked M270 Multiple Launch Rocket System (MLRS).⁸² The HIMARS is compatible with several families of munitions, including the Guided Multiple Launch Rocket System (GMLRS), Army Tactical Missile System (ATACMS), and the Precision Strike Missile (PrSM). Both the GMLRS and ATACMS families of munitions encompass multiple types of warheads and capabilities, with maximum ranges of up to 150 kilometers and 300 kilometers, respectively.⁸³

The U.S. Department of Defense announced in June 2022 that it would provide the HIMARS and GMLRS ammunition to Ukraine.⁸⁴ President Biden pledged in September 2023 to provide ATACMS ammunition to Ukraine.⁸⁵ As of September 2024, the United States has provided at least 40 HIMARS systems and an unspecified amount of HIMARS ammunition to Ukraine.⁸⁶ Ukrainian officials have credited the HIMARS and, in particular, the long-range capabilities of the ATACMS munitions, for allowing Ukrainian forces to strike targets within Russian-held territory.⁸⁷

DOD and Lockheed Martin, the primary contractor for HIMARS and GMLRS, has sought to accelerate its production of both systems. In September 2024, DOD reported having achieved a production rate of eight HIMARS per month, or 96 per year, a 60% increase over production rates in 2022.⁸⁸ Production of GMLRS munitions, according to DOD, had reached 1,167 per month — the equivalent of 14,000 annually — a 40% increase over 2022.⁸⁹ Production may also be

⁷⁹ Darrell Ames, "PEO Missiles and Space teams up with McAlester Army Depot to revive Stinger inventory," Defense Visual Information Distribution Service, January 23, 2024, <https://www.dvidshub.net/news/462282/peo-missiles-and-space-teams-up-with-mcalester-army-depot-revive-stinger-inventory>.

⁸⁰ U.S. Department of Defense, "Contracts For May 27, 2022," press release, May 27, 2022, <https://www.defense.gov/News/Contracts/Contract/Article/3046664/>.

⁸¹ Marcus Weisgerber, "Raytheon Calls in Retirees to Help Restart Stinger Missile Production," *Defense One*, June 28, 2023.

⁸² Kinsey Lindstrom, "Army celebrates production of 500th HIMARS," Defense Visual Information Distribution Service, November 6, 2020, <https://www.dvidshub.net/news/382526/army-celebrates-production-500th-himars>.

⁸³ Mary Kate Aylward, "Then & Now: Long-range for the modern age," U.S. Army, April 16, 2018, https://www.army.mil/article/203705/then_now_long_range_for_the_modern_age.

⁸⁴ C. Todd Lopez, "Advanced Rocket Launcher System Heads to Ukraine," DOD press release, June 1, 2022, <https://www.defense.gov/News/News-Stories/Article/Article/3050010/advanced-rocket-launcher-system-heads-to-ukraine/>.

⁸⁵ Michael R. Gordon, Nancy A. Youssef, and Gordon Lubold, "Biden Told Zelensky U.S. Is Willing to Provide Long-Range ATACMS Missiles," *The Wall Street Journal*, September 22, 2023.

⁸⁶ DOD, "Fact Sheet on U.S. Security Assistance to Ukraine," September 6, 2024. See also Appendix A to this report.

⁸⁷ Isabelle Khurshudyan, Siobhán O'Grady, and Dan Lamothe, "Ukraine fires long-range ATACMS to strike Russian depot and aircraft," *The Washington Post*, October 17, 2023.

⁸⁸ DOD, "Fact Sheet on Efforts of Ukraine Defense Contact Group – National Armaments Directors," press release, September 6, 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

⁸⁹ *Ibid.*

influenced by Section 8010 of P.L. 118-47, the Further Consolidated Appropriations Act of 2024, which provided the Army with the authority to award multi-year procurement contracts for critical munitions, including GMLRS. According to the accompanying explanatory statement, this authority is intended to help “stabilize the defense supply base with predictable production opportunities.”⁹⁰

Phased Array Tracking Radar to Intercept of Target (Patriot)

The Phased Array Tracking Radar to Intercept of Target (Patriot) is a long-range air and missile defense (AMD) system. The system consists of a radar set, engagement control station, one or more launcher stations, an antenna mast group, and interceptor missiles.⁹¹ The most recent version of the interceptor missile is the Patriot Advanced Capability 3 Missile Segment Enhancement, or PAC-3 MSE, although earlier versions of the PAC-3 and its predecessor, the PAC-2, are still in production and use. The U.S. Army, the primary U.S. military operator of the system, introduced the Patriot in the early 1980s and the PAC-3 MSE in 2015. The militaries of at least 19 other countries reportedly operate the Patriot system.⁹²

Ukrainian officials have described the Patriot as essential to Ukraine’s ability to defend itself from Russia’s aerial attacks, particularly those that involve ballistic missiles.⁹³ DOD first announced in December 2022 that the United States would provide Ukraine with a Patriot battery.⁹⁴ The United States has provided a total of two Patriot batteries and associated munitions to Ukraine, according to the U.S. Department of State. In June 2024, Ukrainian President Volodymyr Zelensky said that Ukraine urgently needed another seven Patriot systems to defend Ukrainian cities from attacks.⁹⁵ On July 10, 2024, the United States, Germany, and Romania pledged to send additional Patriot systems to Ukraine.⁹⁶

In response to growing demand for Patriot interceptors, Lockheed Martin, the primary contractor for PAC-3 MSE, and RTX’s Raytheon, the primary contractor for the PAC-2 GEM-T, have each taken steps to expand production of the missiles. In October 2022, Lockheed opened a new facility, All-Up Round III, in Camden, Arkansas, to support the production of the PAC-3 MSE.⁹⁷ As of early 2024, Lockheed Martin had increased its output of PAC-3 MSE missiles from a pre-2022 level of 300 per year to 500 per year, and had set a target of 650 PAC-3 MSE missiles

⁹⁰ Rep. Kay Granger, “Explanatory Statement Submitted by Ms. Granger, Chair of The House Committee on Appropriations, Regarding H.R. 2882, Further Consolidated Appropriations Act, 2024,” *Congressional Record*, daily edition, vol. 170 (March 22, 2024), p. 2.

⁹¹ See CRS In Focus IF12297, *Patriot Air and Missile Defense System for Ukraine*, by Andrew Feickert

⁹² RTX, “RTX’s Raytheon awarded \$1.2 billion contract to provide Patriot air and missile defense systems to Germany,” press release, March 21, 2024, <https://www.rtx.com/news/news-center/2024/03/21/rtxs-raytheon-awarded-1-2-billion-contract-to-provide-patriot-air-and-missile-d>.

⁹³ James Marson, Doug Cameron, and Ievgeniia Sivorka, “How the U.S. Patriot Missile Became a Hero of Ukraine War,” *Wall Street Journal*, June 11, 2023.

⁹⁴ David Vergun, “Ukraine Getting Patriot Battery, Other Defense Weapons,” DOD press release, December 21, 2022, <https://www.defense.gov/News/News-Stories/Article/Article/3253206/ukraine-getting-patriot-battery-other-defense-weapons/>.

⁹⁵ The White House, “Remarks by President Biden and President Volodymyr Zelenskyy of Ukraine in Joint Press Conference | Fasano, Italy,” press release, June 13, 2024, <https://www.whitehouse.gov/briefing-room/speeches-remarks/2024/06/13/remarks-by-president-biden-and-president-volodymyr-zelenskyy-of-ukraine-in-joint-press-conference-fasano-italy/>.

⁹⁶ *France 24*, “NATO members pledge dozens of air defense systems to Ukraine,” *France 24*, July 10, 2024.

⁹⁷ Lockheed Martin, “New Lockheed Martin Facility to Support Increased PAC-3 Production,” press release, October 4, 2022, <https://news.lockheedmartin.com/2022-10-04-new-lockheed-martin-facility-to-support-increased-pac-3-production>

annually by 2027.⁹⁸ As of April 2024, Raytheon produced 20 PAC-2 GEM-T missiles each month—the equivalent of 240 per year—and planned on expanding production to 35 missiles per month by the end of 2027.⁹⁹

In addition to meeting the current demand from Ukraine and other U.S. allies and partners, U.S. Army officials have cited a need to raise the production of PATRIOT missiles to prepare for future conflicts.¹⁰⁰ In Section 8010 of P.L. 118-47 the Further Consolidated Appropriations Act of 2024, Congress authorized the Army to award multi-year procurement contracts for PAC-3 MSE interceptors and other critical munitions.¹⁰¹ On June 28, 2024, the Army awarded Lockheed Martin a \$4.5 billion multiyear contract for 870 PAC-3 MSE missiles.¹⁰²

Uncrewed Aircraft Systems (Drones)

Ukrainian officials have described uncrewed aircraft systems (UAS), or drones, as playing a critical role in the UAF's efforts to resist Russia's full-scale invasion of the country.¹⁰³ Ukraine has acquired drones from several of its international partners, including the United States. As of July 2024, the United States had provided nine different UAS models to Ukraine.¹⁰⁴ The list of U.S.-provided UAS includes some systems, like the Boeing Insitu ScanEagle, that the U.S. military has used over the past two decades, as well as more recently-developed drones like the CyberLux K8 that are not typically used by the U.S. military. The United States has provided unarmed drones that are used primarily for gathering intelligence, such as the AeroVironment Jump-20, and one-way attack drones—expendable armed drones that are designed to explode upon impact with a target—like the Aevox Aerospace Phoenix Ghost family of systems and the AeroVironment Switchblade 300 and 600.

Aevox Aerospace and AeroVironment appear to be the foremost recipients of DOD contracts for Ukrainian security assistance, according to figures published in August 2024 by Office of the Undersecretary for Acquisition and Sustainment.¹⁰⁵ As of August 2024, DOD had awarded Aevox

⁹⁸ Lockheed Martin, "New Lockheed Martin Facility to Support Increased PAC-3 Production," press release, October 4, 2022, <https://news.lockheedmartin.com/2022-10-04-new-lockheed-martin-facility-to-support-increased-pac-3-production>; Elisabeth Gosselin-Malo, "Lockheed Martin eyes Patriot interceptor parts production in Spain," *Defense News*, April 22, 2024; Lockheed Martin, "Ramping Up: Lockheed Martin Steadily Increasing Production of High-Demand Systems," press release, February 15, 2024, <https://www.lockheedmartin.com/en-us/news/features/2024/ramping-up--lockheed-martin-steadily-increasing-production-o.html>.

⁹⁹ Jen Judson, "How companies plan to ramp up production of Patriot missiles," *Defense News*, April 9, 2024, <https://www.defensenews.com/land/2024/04/09/how-companies-plan-to-ramp-up-production-of-patriot-missiles/>.

¹⁰⁰ Jen Judson, "How companies plan to ramp up production of Patriot missiles," *Defense News*, April 9, 2024.

¹⁰¹ Rep. Kay Granger, "Explanatory Statement Submitted by Ms. Granger, Chair of The House Committee on Appropriations, Regarding H.R. 2882, Further Consolidated Appropriations Act, 2024," *Congressional Record*, daily edition, vol. 170 (March 22, 2024), p. 2.

¹⁰² U.S. Army Public Affairs, "Army awards \$4.5 billion Patriot Advanced Capability-3 Missile Segment Enhancement missile multiyear contract," press release, June 28, 2024, https://www.army.mil/article/277680/army_awards_4_5_billion_patriot_advanced_capability_3_missile_segment_enhancement_missile_multiyear_contract.

¹⁰³ In February 2024, Ukrainian President Volodymyr Zelensky said that drones had "proven their effectiveness in battles on land, in the sky and at sea." In an interview in July 2024, Colonel General Oleksandr Syrskyi, the UAF's commander-in-chief, said that drones played "as big a role as artillery" in the UAF's combat operations. See: David Ingram, "Ukraine creates a branch of its armed forces specific to drone warfare," *NBC News*, February 6, 2024; and Luke Harding, "'I know we will win – and how': Ukraine's top general on turning the tables against Russia," *The Guardian*, July 24, 2024.

¹⁰⁴ DOD, "Fact Sheet on U.S. Security Assistance to Ukraine," July 29, 2024. See also Appendix A to this report.

¹⁰⁵ DOD, "Ukrainian Security Assistance."

Aerospace and AeroVironment \$576 million and \$90 million, respectively, in USAI contracts.¹⁰⁶ Aevex Aerospace has supplied approximately 5,000 one-way attack drones to Ukraine since Russia's renewed invasion of the country.¹⁰⁷ Both companies have said that they are working to increase production of one-way attack drones. In March 2024, AeroVironment CEO said that the company had "significantly increased our Switchblade production capacity."¹⁰⁸ Aevex Aerospace said in July 2024 that its expanded production facility in Tampa, Florida, could produce up to 1,000 Phoenix Ghost aircraft per month when operating at maximum capacity.¹⁰⁹

F-16 Fighting Falcon

The F-16 is a fourth-generation, multi-role fighter aircraft capable of conducting air-to-air and air-to-ground operations.¹¹⁰ The first F-16s were delivered to the U.S. Air Force in 1979; approximately 3,100 are in operation today across 25 countries, according to manufacturer Lockheed Martin.¹¹¹ F-16s are used for a variety of missions, including suppression of enemy air defenses, offensive counter-air, defensive counter-air, close-air support, and forward air control.¹¹²

Prior to Russia's February 2022 full-scale invasion, Ukraine operated mostly Soviet-era, Russian-built planes, although the government had plans to modernize its fighter fleet by acquiring Western jets.¹¹³ Following that invasion, Ukrainian officials began lobbying Western governments to transfer F-16s, arguing that the aircraft could boost air defenses and help intercept Russian combat aircraft using glide bombs in Ukraine.¹¹⁴ Although the U.S. government—citing concerns about the risk of escalation, high costs, and Ukraine's ability to effectively employ F-16s—initially declined these requests, in May 2023 President Biden announced that "the United States, together with our allies and partners, is going to begin training Ukrainian pilots in fourth-generation fighter aircraft, including F-16s."¹¹⁵ Later that summer, 11 NATO governments agreed to provide training for Ukrainian pilots, and the Department of State announced U.S. support for the planned transfer of F-16s to Ukraine by the governments of Denmark and the Netherlands.¹¹⁶

¹⁰⁶ DOD, "Ukrainian Security Assistance," infographic, August 8, 2024.

¹⁰⁷ E-mail from Aevex Aerospace to CRS, July 30, 2024.

¹⁰⁸ AeroVironment Inc, "AVAV.OQ - Q3 2024 AeroVironment Inc Earnings Call," press release, March 4, 2024, <https://investor.avinc.com/static-files/27fa3b4e-8968-4ec0-b1b3-85a2d75b68ef>.

¹⁰⁹ Aevex Aerospace, "Aevex Aerospace Ramps Up Production at Unmanned Systems Tampa Facility," press release, July 10, 2024, <https://aevex.com/aevex-aerospace-ramps-up-production-at-unmanned-systems-tampa-facility/>; Brad Graves, "AEVEX Delivers Phoenix Ghosts, Grows Revenue to \$500M," *San Diego Business Journal*, June 19, 2024, <https://www.sdbj.com/defense/aevex-delivers-phoenix-ghosts-grows-revenue-to-500m/>; E-mail from Aevex Aerospace to CRS, July 30, 2024.

¹¹⁰ Air Combat Command Public Affairs Office, "F-16 Fighting Falcon," U.S. Air Force, September 2021, <https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104505/f-16-fighting-falcon>.

¹¹¹ Lockheed Martin, "F-16 Fighting Falcon Fast Facts," July 2024, <https://www.lockheedmartin.com/content/dam/lockheed-martin/aero/documents/F-16/24-19622>.

¹¹² Air Combat Command Public Affairs Office, "F-16 Fighting Falcon."

¹¹³ Steve Trimble, "How Ukraine's Two-Year Campaign for Fighters Finally Succeeded," *Aviation Week Intelligence Network*, June 15, 2023.

¹¹⁴ Tony Osborne, "European Coalition Forming Around Supply of F-16s to Ukraine," *Aviation Week Intelligence Network*, May 18, 2023.

¹¹⁵ Remarks by President Biden in a Press Conference, May 21, 2023, <https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/05/21/remarks-by-president-biden-in-a-press-conference/>. For information on the Administration's previous stance, see Dan DeLuce and Mosheh Gains, "Biden admin rules out transfer of Polish fighter jets to Ukraine," *NBC News*, March 9, 2022.

¹¹⁶ Government of the Netherlands, "Statement on F-16 Training of the Ukrainian Air Force," July 11, 2023, <https://www.government.nl/documents/diplomatic-statements/2023/07/12/statement-joint-coalition>; and Joseph Clark, (continued...)

Since then, Belgium and Norway have also pledged to provide additional aircraft.¹¹⁷ On July 10, 2024, President Biden, Dutch Prime Minister Dick Schoof, and Danish Prime Minister Mette Frederiksen said in a joint statement that “the transfer process for these [Dutch and Danish] F-16s is now underway, and Ukraine will be flying operational F-16s this summer.”¹¹⁸ Media reports suggest that Ukraine will eventually receive about 80 F-16s, although the majority may not be provided until 2025.¹¹⁹ On July 31, a U.S. official confirmed to the Associated Press that Ukraine had received the first of these aircraft.¹²⁰ By late August, Ukraine was reportedly using transferred F-16s to shoot down Russian missile strikes (one such jet was lost in a crash that killed its Ukrainian Air Force pilot).¹²¹

Although the United States has not announced plans to provide F-16s directly, it is committing related security assistance with implications for U.S. defense production. According to press reports, the United States has agreed to provide Ukraine with several air-to-ground and air-to-air munitions that can be employed by F-16 aircraft. Air-to-ground munitions will reportedly include the AGM-88 High-speed Anti-Radiation Missile (which targets enemy radar emissions), Joint Direct Attack Munition kits (which guide bombs to targets), and small diameter bombs (used to strike stationary targets).¹²² Air-to-air munitions will reportedly include AIM-120 Advanced Medium-range Air-to-Air Missiles and AIM-9X short-range air-to-air missiles.¹²³ A U.S. electronic warfare squadron is also collaborating with Denmark and the Netherlands to help Ukrainian F-16s withstand Russian jamming attacks.¹²⁴ DOD officials have also stated that U.S. suppliers will need to provide spare parts and other logistical and sustainment support for Ukrainian F-16s, and the Department is currently training Ukrainian pilots and ground crews on the aircraft.¹²⁵ It is also possible that the U.S. government may seek to provide F-16s directly to Ukraine in the future.

“U.S. Will Train Ukrainian F-16 Pilots, Ground Crews,” DOD press release, August 24, 2023, <https://www.defense.gov/News/News-Stories/Article/Article/3504621/us-will-train-ukrainian-f-16-pilots>. Because the F-16s in question were originally obtained from the United States, their transfer required congressional notification. See DOS, “Third Party Transfer,” <https://www.state.gov/third-party-transfer-process-and-documentation/>.

¹¹⁷ Alex Horton, “Ukraine’s First F-16s Will See Combat this Summer, Officials Say,” *The Washington Post*, July 10, 2024.

¹¹⁸ Joint Statement on F-16s for Ukraine from U.S. President Joseph R. Biden, Dutch Prime Minister Dick Schoof, and Danish Prime Minister Mette Frederiksen, July 10, 2024, <https://www.whitehouse.gov/briefing-room/statements-releases/2024/07/10/joint-statement-on-f-16s-for-ukraine-from-u-s-president-joseph-r-biden-dutch-prime-minister-dick-schoof-and-danish-prime-minister-mette-frederiksen/>.

¹¹⁹ Lara Seligman, “First F-16 Jet Fighters on Their Way to Ukraine, U.S. and Allies Say,” *The Wall Street Journal*, July 10; and Courtney McBride and Andrea Palasciano, “Ukraine’s F-16 Ambitions Snarled,” *Bloomberg*, July 12, 2024.

¹²⁰ Tara Copp, “Ukraine Receives First F-16 Fighter Jets to Bolster Defenses Against Russia, Officials tell AP,” *Associated Press*, July 31, 2024.

¹²¹ Lara Seligman, “U.S.-Made F-16 Crashed in Ukraine, Killing Pilot,” *The Wall Street Journal*, Aug. 30, 2024.

¹²² Lara Seligman and Allistair MacDonald, “U.S. to Arm Ukraine’s F-16 Jets with Advanced Weapons,” *The Wall Street Journal*, July 30, 2024.

¹²³ *Ibid.*

¹²⁴ Captain Benjamin Aronson, “Dominate the Spectrum: 350th SWW Enables EW Capabilities for Ukrainian F-16s,” 350th Spectrum Warfare Wing, August 26, 2024, <https://www.350sww.af.mil/News/Display/Article/3884560/dominate-the-spectrum-350th-sww-enables-ew-capabilities-for-ukrainian-f-16s/>.

¹²⁵ C. Todd Lopez, “DOD Aims to Ensure Availability of Spare Parts to Sustain Ukraine-Bound F-16s,” DOD press release, November 16, 2023, <https://www.defense.gov/News/News-Stories/Article/Article/3591267/dod-aims-to-ensure-availability-of-spare-parts-to-sustain-ukraine-bound-f-16s/>; and Carla Babb, “First Ukrainian Pilots Graduate From F-16 Training in US,” *Voice of America*, May 29, 2024. These efforts have been criticized by some Members of Congress for the allegedly insufficient number of personnel trained thus far. See, for example, Representative Michael (continued...)

Production Diplomacy

In addition to leveraging suppliers based in the United States, the U.S. government has also sought to encourage and coordinate Ukraine-related defense production by foreign manufacturers.

Coordinating National Production with Foreign Governments

To meet its objectives regarding the provision of materiel to Ukraine, the U.S. government has engaged directly with allied and partner governments. Broadly speaking, the aim of these efforts has been to encourage and align international commitments to defense investment, production, and procurement actions.

One major multilateral forum for this coordination has been the Ukraine Defense Contact Group (UDCG), a group of around 50 nations that first met in April 2022.¹²⁶ As part of the UDCG structure, the National Armaments Directors (NADs) of member nations also agreed to regularly meet to conduct high-level synchronization of national efforts. According to DOD, major lines of effort for UDCG NAD meetings include mapping global production capacity, identifying production constraints and associated mitigation strategies, supporting the sustainment of Ukrainian materiel and manpower, and improving standardization, interchangeability, and ease of integration for equipment produced by UDCG nations.¹²⁷

The UDCG conducts its work, in part, through eight “capability coalitions” (which are each organized around a particular technical or functional defense areas) and four NAD working groups (each aligned to a different functional areas). The current capability coalitions cover air forces, air defense, artillery, maritime security, armor, information technology, de-mining, and drones, and the working groups cover innovation, production, sustainment, and Ukraine’s industrial base.¹²⁸ DOD describes these two organizational schemas as “complementary, not duplicative.”¹²⁹

In June 2024, U.S. Secretary of Defense Lloyd J. Austin III announced that the UDCG had collectively committed more than \$98 billion in security assistance to Ukraine, including “most of the counter-UAS systems provided to Ukraine and most of the 155 mm artillery systems, most of the tanks, most of the armored personnel carriers, most of the infantry fighting vehicles and more.”¹³⁰ Secretary Austin has also stated that the group’s members “remain determined to keep

Turner, “Letter from Representative Michael Turner Secretary Lloyd Austin,” May 20, 2024, https://intelligence.house.gov/uploadedfiles/5.20.24_joint_letter_to_dod_for_urgent_ukraine_aid.pdf.

¹²⁶ As of this writing, the UDCG has convened at least 23 times. C. Todd Lopez, “2-Year Anniversary of Ukraine Defense Contact Group Comes with Billions in New Aid,” DOD press release, April 26, 2024, <https://www.defense.gov/News/News-Stories/Article/Article/3758274/2-year-anniversary-of-ukraine-defense-contact-group-comes-with-billions-in-new/>.

¹²⁷ DOD, “Fact Sheet on Efforts of Ukraine Defense Contact Group – National Armaments Directors,” September 6, 2024, <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

¹²⁸ Senior Defense Official, “Senior Defense Official Holds a Background Briefing on the Outcomes of the 19th Ukraine Defense Contact Group Meeting,” U.S. Department of Defense, February 16, 2024, <https://www.defense.gov/News/Transcripts/Transcript/Article/3680149/>. DOD, “UDCG Fact Sheet,” <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

¹²⁹ DOD, “UDCG Fact Sheet,” <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

¹³⁰ Secretary Lloyd J. Austin III, “Opening Remarks at the 23rd Ukraine Defense Contact Group (As Delivered),” U.S. Department of Defense, June 13, 2024, [https://www.defense.gov/News/Speeches/Speech/Article/3805429/opening-\(continued...\)](https://www.defense.gov/News/Speeches/Speech/Article/3805429/opening-(continued...))

supporting Ukraine while ensuring [their] own military readiness” and are therefore exploring “ways to expand the production of critical munitions and systems and to deepen [their] coordination through the capability coalitions.”¹³¹ According to DOD, as of September 2024 UDCG members have also committed to a range of Ukraine-related production efforts, including:

- Doubling production capacity for ammunition and explosives loading by 2025, doubling capacity of modular charges by 2026, and increasing powder production capacity ten-fold by 2026 (France and Sweden);
- Constructing a new gunpowder factor (Romania/European Commission);
- Constructing a new artillery ammunition facility (Germany);
- Co-producing up to 1,000 PARTRiot GEM-T missiles (Germany, the Netherlands, Romania, and Spain);
- Acquiring 500,000 artillery rounds for provision to Ukraine from various sources (Czech-led consortium of 15 countries); and
- Investing approximately \$92 million to expand artillery production (Norway).¹³²

Other multilateral fora that the U.S. government has sought to leverage for Ukraine-related defense production include the U.S.-European Union (EU) Security and Defense Dialogue and the North Atlantic Treaty Organization (NATO; see the shaded text box below for more information).¹³³

NATO and Defense Production for Ukraine

Since Russia’s full-scale invasion of Ukraine in February 2022, some U.S. policymakers have seen NATO as a key forum for the coordination of defense industrial support for Ukraine. NATO’s national armaments directors (i.e., the officials responsible for weapons procurement and development in each member government) have regularly met to discuss national and alliance-wide efforts to arm Ukraine. In addition, the NATO-Ukraine Council serves as a joint body for NATO and Ukrainian representatives to manage security, economic, and political aid and cooperation, including security assistance and defense production.

During the July 2024 NATO Summit in Washington, D.C., NATO announced several new efforts and commitments related to defense production and security assistance for Ukraine, including:

- **Establishment of the NATO Security Assistance and Training for Ukraine (SATU) organization** to coordinate NATO members’ provision of defense equipment, training, and logistical support;¹³⁴
- **Additional weapons transfers** (notably, F-16s and air defense systems/munitions);¹³⁵
- A pledge of €40 billion (\$43 billion) in security assistance in 2025;¹³⁶ and
- **A commitment to “accelerate the growth of defense industrial capacity and production across the alliance,”** through measures such as expanded investments, improved coordination among NATO

remarks-by-secretary-of-defense-lloyd-j-austin-iii-at-the-23rd-ukraine/; and C. Todd Lopez, “2-Year Anniversary of Ukraine Defense Contact Group,” DOD press release, April 26, 2024.

¹³¹ Secretary Lloyd J. Austin III, “Outcomes of Ukraine Defense Contact Group Presented to the Media,” U.S. Mission to NATO, June 13, 2024, <https://www.youtube.com/watch?v=U9hHfbbbEH8>. Quoted remarks start at 4:28.

¹³² DOD, “UDCG Fact Sheet,” <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

¹³³ For information on the U.S.-EU Security and Defense Dialogue, see U.S. Department of State, “2nd U.S.-EU Security and Defense Dialogue,” December 1, 2023, <https://www.state.gov/2nd-u-s-eu-security-and-defense-dialogue/>.

¹³⁴ NATO, *Washington Summit Declaration*, July 10, 2024, https://www.nato.int/cps/en/natohq/official_texts_227678.

¹³⁵ Ibid.

¹³⁶ Ibid. Note that the declaration text specifies the figure in euros.

governments and industry, greater use of large-scale multinational procurement arrangements, and an increased focus on NATO-wide standardization.¹³⁷

For more information on the 2024 NATO Summit, see CRS Report R48121, *NATO's July 2024 Washington, DC Summit: In Brief*, by Paul Belkin.

In addition to this multilateral coordination, the U.S. government has also sought to encourage Ukraine-related defense production in its bilateral engagements with foreign governments. For example, in June 2024, U.S. Ambassador to Japan Rahm Emanuel called for Japanese assistance in producing Ukraine-related systems and munitions, and in October 2023, the U.S. and Australian governments announced a series of “continuing, coordinated actions to assist Ukraine,” including through defense industrial assistance.¹³⁸ On some occasions, the U.S. government has sought to make arrangements with foreign suppliers to meet immediate Ukraine-related needs. In November 2022, for instance, DOD reportedly concluded a deal to purchase 100,000 155 mm artillery shells from South Korean suppliers.¹³⁹

International Co-Production

To provide materiel for Ukraine, some American defense suppliers have also established industrial partnerships directly with foreign suppliers to collaboratively develop, produce, and sustain various weapons and munitions. These partnerships have involved companies and government organizations in Ukraine itself, as well as in other countries that are providing security assistance.

Production Partnerships with Ukrainian Suppliers

American suppliers have pursued (and the U.S. government has encouraged) production partnerships with Ukraine with an eye toward a number of potential advantages. Locating production within Ukrainian territory may shorten the time to transport equipment to the battlefield, for instance, and the associated influx of American capital, technology, and expertise may increase the capacity of Ukraine’s domestic defense industry, allowing it to produce more and better weapons. In addition, direct coordination with Ukrainian industry and government officials—whether in support of production at facilities in Ukraine itself or elsewhere—may also lead to production efforts that are more responsive to Ukraine’s military needs.

In December 2023, the U.S. government convened the U.S.-Ukraine Defense Industrial Base Conference, a gathering of U.S., Ukrainian, and European industry and government officials intended to “focus on significantly increasing weapons production to support Ukraine’s fight for freedom against Russian aggression, and strengthen Ukraine’s long-term self-defense.”¹⁴⁰

¹³⁷ NATO, *Industrial Capacity Expansion Pledge*, July 10, 2024, https://www.nato.int/cps/en/natohq/official_texts_227504.

¹³⁸ Mari Yamaguchi, “U.S. Envoy Calls for Japan’s Help to Quickly Replenish US Missile Inventory, Repair Warships,” *Associated Press*, June 11, 2024; and The White House, “United States-Australia Joint Leaders’ Statement,” October 25, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/10/25/fact-sheet>.

¹³⁹ Lolita Baldor and Tara Copp, “U.S. to Buy South Korean Howitzer Rounds to Send to Ukraine,” *Associated Press*, November 11, 2022.

¹⁴⁰ The White House, “The White House Announces New Actions to Strengthen Cooperation and Co-Production between U.S. and Ukraine’s Defense Industrial Bases,” December 6, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/12/06/fact-sheet-the-white-house-announces-new-actions-to-strengthen-cooperation-and-co-production-between-u-s-and-ukraines-defense-industrial-bases>.

Following this conference, the White House announced that it would undertake the following steps to strengthen and expand defense industrial cooperation with Ukraine:

1. Embedding a U.S. advisor in Ukraine's Ministry of Strategic Industries to "support and accelerate Ukraine's transition to an interoperable military force, combat corruption, and attract foreign investment in critical industries;"
2. Establishing an interagency team to "support industry, Ukrainian, and other partners who seek guidance on potential deals, and export requirements for Ukraine's defense industry;"
3. Signing a Statement of Intent on Co-production and Technical Data Exchange that would facilitate cooperative work "in the areas of air defense systems, repair and sustainment, and production of critical munitions;" and
4. Providing Ukraine with technical data to allow for the Ukrainian production and integration of air defense systems and components.¹⁴¹

In June 2024, the U.S. and Ukrainian governments signed the U.S.-Ukraine Bilateral Security Agreement, which committed both parties to "increased defense industrial cooperation" and the pursuit of "private industry partnerships in key priority areas of defense production... [including] air defense systems and supporting munitions, artillery ammunition of multiple calibers, supporting barrels and other components, and manufacturing of unmanned aerial vehicles."¹⁴²

Media reports in December 2023 suggested that two unnamed U.S. defense contractors had agreed to produce artillery ammunition inside Ukraine by 2025.¹⁴³ In June 2024, Northrop Grumman announced plans to produce medium caliber ammunition at a facility inside Ukraine, in what appears to be the first publicly-acknowledged instance of a major U.S. defense contractor manufacturing equipment in Ukraine itself.¹⁴⁴ The following month, Boeing signed a memorandum of understanding to collaborate with Antonov—a Ukrainian aerospace firm—on "training, logistical support and overhaul services for tactical Unmanned Aerial Systems utilized by the [UAF], which includes the ScanEagle," and company statements and media reports suggest some of this work will be conducted inside Ukraine.¹⁴⁵ Other instances of cooperation between U.S. and Ukrainian companies include a partnership between Amentum and Ukrainian Defense Industry to restore and maintain U.S.-provided armored vehicles (announced in June 2024) and the construction of an ammunition factory inside Ukraine by D&M Holding Company.¹⁴⁶

In addition to these U.S.-Ukrainian partnerships, several European companies have also established defense industrial cooperation with Ukraine. Rheinmetall—a German defense firm—

¹⁴¹ Ibid.

¹⁴² White House, *Bilateral Security Agreement Between the United States of America and Ukraine*, June 13, 2024.

¹⁴³ Reuters, "Ukraine to Make Shells With US Firms As It Seeks to Develop Defence Sector," December 7, 2023.

¹⁴⁴ The move was announced at the Eurosatory 2024 defense trade show and confirmed during the July 2024 NATO Summit. See Valerie Insinna, "Northrop Planning to Build Munitions Inside Ukraine," *Breaking Defense*, June 18, 2024, <https://breakingdefense.com/2024/06/northrop-planning-to-build-munitions-inside-ukraine/>; and Lee Hudson, "Northrop Grumman Becomes First US Company to Build Weapons Inside Ukraine," *Politico*, July 11, 2024.

¹⁴⁵ Boeing, "Boeing, Antonov to Collaborate on Defense Projects," July 22, 2024, <https://boeing.mediaroom.com/news-releases-statements?item=131463>; and Paul Mcleary, "Boeing Looks to Start Drone Work Inside Ukraine," *Politico*, July 22, 2024.

¹⁴⁶ This effort may have predated the Northrop Grumman partnership, as DOD in a September 2024 press release gave October 2023 as the date of the partnership, but it does not appear to have been publicly acknowledged until September 2024. DOD, "UDCG Fact Sheet," <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

has announced plans to co-produce a variety of weapons and munitions inside Ukraine, and as of July 2024 has confirmed the opening of an armor plant in western Ukraine.¹⁴⁷ The Norwegian defense firm Nammo has announced the licensing of 155 mm round production in Ukraine, and the joint-Franco-German venture KNDS will establish a subsidiary in Ukraine to produce 155 mm rounds and spare parts.¹⁴⁸

Ukraine has also sought to establish production-related liaison missions abroad. In July 2024, Ukraine's state-owned arms manufacturer, Ukroboronprom, opened its first overseas office in Washington, D.C. According to a Ukrainian official, the aim is to "promote joint US-Ukrainian defense projects and enhance our integration into NATO's defense industrial base."¹⁴⁹

Production Partnerships with Other Countries

U.S. defense suppliers have also established partnerships with suppliers in other countries supporting the Ukrainian war effort. As DOD's senior procurement official put it in a Senate hearing in May 2024:

One of the lessons of Ukraine is co-production of munitions. So, right now, we're working a lot across Europe around co-production of 155 [mm ammunition]. Co-production of Patriot in Australia, separate from AUKUS, we're going to be doing co-production, the Army is, of GMLRS and eventually Prism.

And I mentioned earlier about Japan with the Glide [Phase Intercept missile defense system], I think you're going to see much more co-production and co-sustainment with our allies and partners.¹⁵⁰

In addition to the Glide Phase Intercept system, Japanese suppliers are also involved in supporting other Ukraine-related capabilities—Mitsubishi Heavy Industries, for instance, produces PAC-3 interceptor missiles for the PATRIOT air defense system, and is reportedly seeking to increase output to meet heightened demand.¹⁵¹

Other DOD officials have singled out Poland as an example of a country with which U.S. industry is initiating co-production efforts. In April 2024, the then-director of the Defense Security Cooperation Agency stated that the U.S. government had "recently undertaken some new cooperation with Poland in the joint co-production of some defense systems" and was "looking at how to do that with other allies and partners, as well."¹⁵²

¹⁴⁷ Rheinmetall, "Ammunition Factory to be Built in the Ukraine [sic]," press release, July 23, 2024, <https://www.rheinmetall.com/en/media/news-watch/news/2024/07/2024-07-24-rheinmetall-supplies-equipment-for-ammunition-factory-in-ukraine>.

¹⁴⁸ DOD, "UDCG Fact Sheet," <https://www.defense.gov/News/Releases/Release/Article/3897721/fact-sheet-on-efforts-of-ukraine-defense-contact-group-national-armaments-direc/>.

¹⁴⁹ *Reuters*, "Ukraine's State Arms Producer Opens Office in Washington," July 9, 2024.

¹⁵⁰ Remarks of Dr. William LaPlante, Under Secretary of Defense for Acquisition and Sustainment, in U.S. Congress, Senate Appropriations Committee, Subcommittee on Defense, *A Review of Select Department of Defense Acquisition Programs*, Hearings to Examine Selected Acquisition Programs, 118th Cong., 2nd sess., May 15, 2024.

¹⁵¹ According to *Reuters*, however, these efforts have faced challenges due to a component shortage. See Nobuhiro Kubo and Tim Kelly, "Exclusive: US-Japan Patriot Missile Production Plan Hits Boeing Component Roadblock," *Reuters*, July 21, 2024.

¹⁵² C. Todd Lopez, "DOD Has Seen 'Huge' Increase in Military Sales Since Ukraine Invasion," DOD press release, April 9, 2024, <https://www.defense.gov/News/News-Stories/Article/Article/3736017/dod-has-seen-huge-increase-in-military-sales-since-ukraine-invasion/>.

The production of a wide array of Ukraine-related weapon systems and munitions made by U.S. suppliers involve international partnerships, including artillery munitions (various), PATRIOT air defense systems and munitions (various), F-16s (Poland), HIMARS (Germany), and others.¹⁵³

Issues Facing Congress

Congress faces a range of potential issues relating to defense production for Ukraine, including three broad sets of questions:

1. Do U.S. and global suppliers possess adequate industrial capacity to achieve congressional objectives regarding Ukraine?
2. Is the executive branch's use of Ukraine-related production authorities and appropriations meeting congressional intent?
3. What has been the impact of U.S.-produced defense equipment on the conflict? Are U.S. suppliers providing the right kinds of capabilities to achieve congressional objectives regarding Ukraine?

Industrial Capacity

Assessing Capacity Needs

Because of the diversity of defense equipment being produced for Ukraine, the issues and dynamics associated with industrial capacity will necessarily vary (for a system-specific discussion of production, refer to the "Producing Key Weapon Systems and Munitions" section of this report).¹⁵⁴ Nevertheless, some policymakers and commentators have contended that the DIB, considered holistically, lacks sufficient capacity to accomplish the U.S. government's Ukraine-related objectives.¹⁵⁵

In part, this may be due to expanded demand. Compared to the pre-2022 baseline, the U.S. government has increased its requirements for Ukraine-related weapons and munitions, establishing higher output goals that producers may not be able to immediately meet. Some observers have also attributed capacity shortfalls to broader economic and strategic developments over the past 30-40 years. Commonly cited factors include consolidation among major defense contractors, changes in logistics and manufacturing practices, the divestment of government-owned production assets, and a strategic focus on counter-terrorism and low-intensity conflicts at the expense of planning for high-intensity conflict.¹⁵⁶ Some stakeholders have also highlighted

¹⁵³ Elisabeth Gosselin-Malo, "European Nations Team Up to Buy Patriot Missiles," *Defense News*, January 3, 2024; Kubo and Kelly, "US-Japan Patriot Missile Production Plan," *Reuters*, July 21, 2024; PZL Mielec, "PZL Mielec Celebrates Completion of First F-16 Block 70/72 Aft Fuselage," press release, August 29, 2023; Christina MacKenzie, "Rheinmetall, Lockheed unveil GMARS, in talks with European customers," *Breaking Defense*, June 17, 2024; and Vivienne Machi, "Lockheed, Rheinmetall Pair Up," *Defense News*, June 23, 2023.

¹⁵⁴ In the context of this report, industrial capacity refers to the total amount of resources available for the manufacture of defense-related goods.

¹⁵⁵ For examples of this perspective, see U.S. Chamber of Commerce, "NATO Governments on Industrial Cooperation & Challenges," July 10, 2024, <https://www.youtube.com/watch?v=XU7tAoIV8t8>; and PBS News, "Arms Manufacturers Struggle to Supply Ukraine With Enough Ammunition," March 10, 2023, <https://www.pbs.org/newshour/show/arms-manufacturers-struggle-to-supply-ukraine-with-enough-ammunition>; Stephen Grey, John Shiffman, and Allison Martell, "Years of Miscalculations by U.S., NATO Led to Dire Shell Shortage in Ukraine," *Reuters*, July 19, 2024.

¹⁵⁶ See Mike Lofgren, "Why Can't America Build Enough Weapons?" *Washington Monthly*, June 23, 2024; Noah (continued...)

the ongoing policies and actions of particular actors, including the U.S. government—whose allegedly slow and inefficient acquisition process has been characterized by some as a barrier to capacity expansion—and some private defense firms—which some critics argue have prioritized share buybacks and widening profit margins over investing in new production.¹⁵⁷ In addition, GAO has identified capacity issues specific to the replacement of equipment provided to Ukraine via PDA, including “long lead times associated with the delivery of supplier parts and raw materials,” the difficulty of replacing some necessary components or manufacturing tools that have become obsolete, and quality issues.¹⁵⁸

Whether Congress assesses that defense suppliers possess sufficient industrial capacity will ultimately depend on the nature of congressional priorities, goals, and expectations. Congress may determine and communicate these in a number of ways. One approach could be to develop specific output targets for capabilities it deems to be particularly important (e.g., the monthly production of a certain number of 155 mm rounds) and then assess industrial capacity against those metrics.

If Congress were to develop production goals for Ukraine-related systems, several factors may warrant its consideration. Congress may consider what kinds of analysis, projections, and advocacy should inform any metrics it may adopt, and how much importance to attach to these various inputs. Possible sources of information may include executive branch assessments of production requirements and battlefield impact (particularly by DOD, DOS, and the intelligence community), requests for weapons and munitions by Ukrainian government and military officials, and perspectives from U.S. and global defense suppliers. Congress may also consider the degree and pace of potential changes relating to defense production for Ukraine—battlefield developments, technological or industrial advancements, and other unforeseeable developments could rapidly change congressional objectives in this area.

In addition, Congress may consider the interaction of Ukraine-related production with other potential defense requirements. For example, if Congress considers it likely that future geopolitical developments may require new or expanded security assistance to other countries (e.g., Israel, Taiwan), or that the United States may itself become involved in a protracted or intensive conflict, it may factor those possibilities into whatever approach to capacity assessment it chooses to adopt.

Legislative Options

If Congress determines that U.S. defense suppliers possess insufficient industrial capacity, a number of options are available. Congress could consider whether or not to appropriate more funding for the acquisition of capabilities of concern, for instance, which may increase short-term output as well as send a “demand signal” for private industry to invest their own resources into expanding capacity. Another approach could be to change DOD contracting and acquisition practices—as Congress did in 2022, for example, by authorizing multi-year procurement of

Robertson, “The Pentagon Wants Industry to Transform Again to Meet Demand,” *Defense News*, February 20, 2024; and NPR, “The Military Industry... It’s Complex,” *Planet Money* broadcast, January 2024. See also discussion in CRS Report R47751, *The U.S. Defense Industrial Base: Background and Issues for Congress*, pp. 24-33.

¹⁵⁷ For criticism of procurement timelines, see Eric Bazail-Emil, “NATO Members, Industry Execs Bemoan Production Lags,” *Politico*, July 9, 2024. For discussion of potential corporate underinvestment, see Doug Cameron, “Ukraine Aid Lifts Defense Industry as Debate Over Profits Reignites,” *The Wall Street Journal*, April 28, 2024; see also Senator Bernie Sanders, “Defense Contractors Are Bilking the American People,” *The Atlantic*, February 27, 2024.

¹⁵⁸ GAO, *Ukraine: Status and Challenges of DOD Weapon Replacement Efforts*, GAO-24-106649, April 30, 2024, pp. 4-5.

certain Ukraine-related munitions—or to establish or modify programs to incentivize investment in defense firms or support workforce recruitment, retention, and job training programs.¹⁵⁹

Congress could also consider whether or not to appropriate more funding for DIB-wide capacity expansion programs, such as the Industrial Base Fund or DPA Title III, or expand government-owned capacity more directly by establishing additional organic industrial facilities, like the Army’s newly-opened Universal Artillery Projectile Lines facility. Additionally, Congress could also consider whether or not to direct the executive branch to pursue more defense industrial partnerships with foreign governments and industry.

Exercising Oversight

Amid the scale and strategic significance of Ukraine-related defense production and transfer activities, some Members of Congress have called for thorough oversight and monitoring of U.S. security assistance to Ukraine, including in congressional hearings and through proposed and enacted legislation.¹⁶⁰

Existing Oversight Efforts

Ukraine Oversight Interagency Working Group

The Biden Administration has implemented what it characterizes as a “whole of government” approach to providing “comprehensive independent oversight” of U.S. security assistance.¹⁶¹ A centerpiece of this approach has been interagency coordination between various oversight officials and organizations, now consolidated as a partnership of 24 federal oversight agencies under the auspices of the Ukraine Oversight Interagency Working Group (UOIWG).¹⁶² Pursuant to Section 1250B of the National Defense Authorization Act for Fiscal Year 2024 (FY2024 NDAA; P.L. 118-31), the Department of Defense Inspector General (DOD IG) leads this partnership as the Special Inspector for Operation Atlantic Resolve (SIG-OAR), in which capacity he or she—together with the Inspectors General for the Department of State and the United States Agency for International Development (USAID)—must fulfill a number of functions relating to Ukraine oversight. Statutorily-established requirements include the submission of an annual Joint Strategic Oversight Plan for OAR to Congress, as well as quarterly OAR Reports.¹⁶³ These plans and reports, along with an array of other oversight projects conducted by various federal agencies, are available on a publicly-accessible website (www.ukraineoversight.gov). As of this writing, this website contained information on 175

¹⁵⁹ Section 1244(c) of the FY2023 NDAA (P.L. 117-263) authorized multi-year procurement of 16 different munitions. For more information, see discussion in CRS Report R41909, *Multiyear Procurement (MYP) and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress*, by Ronald O'Rourke, p. 13.

¹⁶⁰ Andrew Desiderio, Lara Seligman, and Connor O'Brien, “Pentagon Vs. Congress Tension Builds Over Monitoring Billions in Ukraine Aid,” *Politico*, June 6, 2022; U.S. Congress, House Foreign Affairs Committee, *Oversight, Transparency, and Accountability of Ukraine Assistance*, 118th Cong., 1st sess., March 29, 2023.

¹⁶¹ “About Us,” <http://www.ukraineoversight.gov/about-us/>.

¹⁶² Coordination of Ukraine oversight was initially spearheaded by the DOD, DOS, and United States Agency for International Development (USAID) Inspectors General. The UOIWG was established in June 2022. See “Ukraine Oversight Interagency Working Group,” <https://www.ukraineoversight.gov/Oversight-Work/Ukraine-Oversight-Interagency-Group/>. See also DOD, DOS, and USAID, “Joint Statement on Commitment to Ukraine Response Oversight,” November 1, 2022. <https://oig.usaid.gov/node/5630>.

¹⁶³ According to SIG-OAR and the other Inspectors General, the responsibility to develop an annual joint strategic oversight plan is derived from 5 U.S.C. § 419. The requirement for quarterly OAR reports is established by Section 1250B of the FY2024 NDAA.

oversight projects: of these, 60 were reported to be ongoing, while 115 were listed as completed (this latter number included 7 projects from FY2022 and 45 from FY2023).¹⁶⁴ A plurality of these projects (66, or 38% of the total) were reported to be overseen by DOD.¹⁶⁵

Some Members have called for the designation of a Special Inspector General separate from the DOD IG (an approach similar to that taken for Afghanistan reconstruction), and a bill to that effect was introduced in 2023 (S. 651, 118th Congress).¹⁶⁶

End-Use Monitoring

In addition to oversight of U.S. government efforts, some provision has also been made for oversight of Ukrainian use of U.S.-produced or provided arms (commonly referred to as *end-use monitoring*). For example, the Annex to the 2024 U.S.-Ukraine Bilateral Security Agreement reiterates the U.S. interest in “mitigat[ing] the risk of diversion of advanced conventional weapons,” and commits Ukraine to “ensuring the security of United States-provided defense articles and technology in accordance with DOD’s Golden Sentry enhanced end-use monitoring (EEUM) requirements.”¹⁶⁷ The Annex further commits Ukraine (security conditions permitting) to:

- “Conducting a comprehensive inventory of all remaining EEUM items in Ukraine’s possession;”¹⁶⁸
- “Providing DOD with access to military installations across Ukraine at which EEUM items are stored, to allow for the resumption of all in-person verification activities;”¹⁶⁹ and
- “Supporting future EEUM requirements the United States may identify to maintain reasonable assurances of the security of advanced conventional weapons in a postwar environment.”¹⁷⁰

A DOD IG report released on January 10, 2024, identified several issues with DOD monitoring of Ukraine-transferred defense articles designated as requiring “enhanced end-use monitoring” (EEUM), including an inability to conduct initial inventories of all EEUM-designated articles and a lack of serial number inventories for 59% of the total value of EEUM-designated articles

¹⁶⁴ SIG-OAR, “Ukraine Oversight Dashboard,” September 5, 2024, <https://www.ukraineoversight.gov/Oversight-Work/Oversight-Dashboard/>.

¹⁶⁵ Ibid.

¹⁶⁶ See, for instance, Daniel F. Runde and Madeleine McLean, “Ensuring Oversight to U.S. Aid to Ukraine,” CSIS, July 21, 2023; and Patrick Sullivan, “It’s Time for a Special Inspector General for Ukraine Assistance,” Modern War Institute, September 19, 2023.

¹⁶⁷ The White House, “Bilateral Security Agreement Between the United States of America and Ukraine,” June 13, 2024, <https://www.whitehouse.gov/briefing-room/statements-releases/2024/06/13/bilateral-security-agreement-between-the-united-states-of-america-and-ukraine/>.

¹⁶⁸ Ibid.

¹⁶⁹ The White House, “Bilateral Security Agreement Between the United States of America and Ukraine,” June 13, 2024, <https://www.whitehouse.gov/briefing-room/statements-releases/2024/06/13/bilateral-security-agreement-between-the-united-states-of-america-and-ukraine/>.

¹⁷⁰ Ibid.

transferred to that point.¹⁷¹ Some Members have also expressed concerns about DOD's ability to effectively conduct end-use monitoring.¹⁷²

Legislative Options

Congress may review the efficacy of existing oversight efforts and mechanisms, and consider whether or not to modify existing requirements and mechanisms. If Congress determines it needs more information to inform its oversight, it could consider whether or not to include additional planning and reporting requirements through legislation such as the annual NDAA. It could also consider whether or not to establish new positions or organizations to exercise oversight responsibilities, or direct or request existing entities—both governmental and non-governmental—to conduct reporting on particular issues of concern.¹⁷³ If Congress determines that existing oversight activities are unnecessary or unduly impede Ukraine assistance, it could consider whether or not to reduce or eliminate requirements.

Possible Oversight Questions for Congress

Beyond reviewing the existing oversight efforts described above, Congress may assess how effectively the Administration has implemented and executed production-related authorities and appropriations provided by Congress, and how effective implementation and execution are likely to be in the future. Congress could consider posing the following oversight questions:

Readiness Impacts

- How has the transfer of weapons and equipment to Ukraine affected the size and makeup of U.S. defense stocks?
- Are certain items above, at, or below minimum levels viewed by military commanders as necessary to conduct operations in various combatant commands? If any are below minimum levels, does DOD assess the DIB is able to produce enough to replace these in a timely fashion? What is the basis of DOD's assessment, and does it align with congressional objectives?

USAI Actions

- As of August 8, 2024, DOD reported having obligated \$15.8 billion, or 48%, of the \$32.7 billion it has available for USAI contracting actions.¹⁷⁴ What factors affect DOD's rate of obligation?

PDA Replacement Actions

- How have valuation issues with PDA transfers affected DOD's planning for PDA replacement activities?¹⁷⁵ For example, has DOD's undervaluing prior PDA

¹⁷¹ DOD IG, "Evaluation of the DoD's Enhanced End-Use Monitoring of Defense Articles Provided to Ukraine," January 10, 2024, https://media.defense.gov/2024/Jan/11/2003374323/-1/-1/1/dodig-2024-043-eemu_redacted%20secure.pdf.

¹⁷² Rep. James Comer et al., "Letter to Secretary Austin," February 6, 2024, https://oversight.house.gov/wp-content/uploads/2024/02/Ukraine-DoD-End-Use-Monitoring-Letter_.pdf.

¹⁷³ For example, Inspectors General, GAO, or federally funded research and development centers.

¹⁷⁴ DOD, "Ukraine Security Assistance," infographic, August 8, 2024.

¹⁷⁵ See discussion on p. 6 of this report.

- transfers meant that fewer funds than necessary have been requested or appropriated for PDA replacement?
- As of August 26, 2024, the Department of State reported that \$6.176 billion of the \$7.8 billion in FY2024 PDA remained available, meaning that almost 80% of the authority had not been used five weeks before the end of the fiscal year.¹⁷⁶ What are the implications of this for Ukraine assistance broadly and PDA replacement actions specifically? Is this rate of usage related to the pace or efficacy of PDA replacement actions?
 - As of August 8, 2024, DOD reported having obligated \$21.0 billion, or 46%, of the \$45.8 billion it has available to replace items already transferred to Ukraine via PDA.¹⁷⁷ What factors affect DOD's rate of obligation?

Production Diplomacy

- Media reports suggest that European countries have had difficulty meeting goals for the production of Ukraine-related weapons and munitions (e.g., 155mm rounds).¹⁷⁸ To what extent are executive branch efforts to encourage the expansion of international production working, what is that assessment based on, what areas have been the most challenging, and why?
- Are there statutory or regulatory barriers to executive branch efforts to encourage U.S. defense firms to coordinate with international suppliers to expand Ukraine-related production?

Impact on the Conflict

As noted above, the United States has been the single largest supplier of defense equipment to Ukraine. When assessing the efficacy of U.S. security assistance and considering future defense support Congress may consider the extent to which U.S. defense production and assistance has contributed to Ukrainian battlefield performance and options for congressional oversight of Ukraine's use of U.S.-provided weapons.

Relationship to Battlefield Performance

Since the commencement of Russia's full-scale invasion, the composition of the security assistance that the United States has provided Ukraine has changed. Initially, U.S. security assistance focused on weapons and munitions best adapted for defensive operations and urban environments, such as man-portable anti-tank and anti-air systems (e.g., Javelins and Stingers) and munitions compatible with Soviet/Russian artillery.¹⁷⁹ As the conflict developed, U.S. security assistance has come to include more sophisticated platforms and equipment, including

¹⁷⁶ Office of Management and Budget, "FY2025 Continuing Resolution Appropriations Issues," p. 25.

¹⁷⁷ DOD, "Ukraine Security Assistance," infographic, August 8, 2024.

¹⁷⁸ See, for example, Anna Myroniuk and Valeria Yehoshyna, "EU Shell-Production Capacity, Supplies To Ukraine Fall Far Short Of Promises," *Radio Free Europe*, July 8, 2024. See also Patricia Cohen and Liz Alderman, "Europe Wants to Build a Stronger Defense Industry, but Can't Decide How," *The New York Times*, May 20, 2024.

¹⁷⁹ Karoun Demirjian and Alex Horton, "As War Loomed, U.S. Armed Ukraine to Hit Russian Aircraft, Tanks, and Prep for Urban Combat, Declassified Shipment List Shows," *Washington Post*, March 4, 2022.

artillery and long-range precision strike capabilities (e.g., 155-mm howitzers, HIMARS, and ATACMS), air defense, and ground maneuver systems (see **Appendix** for full list).¹⁸⁰

Throughout the conflict, U.S. decisions on what to provide—and when to provide it—have been informed by the Biden Administration’s assessments of the UAF’s capacity to operate and integrate particular capabilities, as well as other considerations such as Ukrainian requests, the potential for escalatory Russian responses, battlefield conditions, and industrial or logistical constraints.¹⁸¹ Although the stated and assessed needs of the UAF have shifted over the course of war, Ukrainian government officials have consistently requested artillery and artillery ammunition, armored vehicles, and air defense systems.¹⁸² Beyond bolstering Ukrainian performance in the short term, some U.S. aid also has been oriented toward longer-term security objectives: according to U.S. Secretary of Defense Lloyd Austin, his department’s efforts have proceeded “on two tracks: [1] rushing Ukraine the capabilities to meet its urgent battlefield needs and [2] helping Ukraine to build the future force to stave off and deter Russian aggression over the longer term.”¹⁸³

Some analysts have argued that U.S. security assistance provides the UAF with a qualitative edge against Russian quantitative advantages. According to SIG-OAR, “the UAF has demonstrated superior proficiency and innovation in certain areas, such as the employment of small commercial UAV’s for reconnaissance and attack.”¹⁸⁴ The provision of U.S. precision strike munitions (including long-range missiles as well as precision artillery rounds and various types of air launched missiles), for example, has allowed the UAF to target Russian command-and-control and logistics centers, while U.S.-produced air and missile defense systems may have blunted the military effect of Russian offensive strike capabilities.¹⁸⁵ These, and other advanced capabilities, have been most effective, and have had the greatest impact, immediately after deployment, before the Russian military has had time to adjust and adapt to the introduction of the new weapons.¹⁸⁶

¹⁸⁰ Andrew E. Kramer, “With Western Weapons, Ukraine Is Turning the Tables in an Artillery War,” *New York Times*, October 29, 2022; Tim Lister, Fred Pleitgen, and Matthias Somm, “As a Russian Offensive Looms, Ukraine Races to Train Military on New Western Weapons,” CNN, January 23, 2023.

¹⁸¹ Initial assistance, such as anti-tank and anti-air systems, could be operated by an individual after minimal training. Subsequent assistance focused on providing advanced systems such as artillery, tank, armored vehicle, and advanced air defense systems which require extensive training and maintenance support. Further complicating the task is the ability of the recipient to integrate the new weapons into its command structure and doctrine to ensure proper employment. Additionally, decisions to supply new systems are evaluated against the requirements of maintaining a consistent supply of ammunition and steady quantities of already provided systems. As one study notes, “Innovation is therefore an exercise in risk management, a balancing act between the promises of a new capability and the perils of losing older ones.” Kendrick Kuo, “Dangerous Changes: When Military Innovation Harms Combat Effectiveness,” *International Security* 47, no. 2 (2022), p. 53; Thomas Gibbons-Neff and Natalia Yermak, “Potent Weapons Reach Ukraine Faster Than the Know-How to Use Them,” *New York Times*, June 6, 2022. CRS In Focus IF12040, *U.S. Security Assistance to Ukraine*, by Christina L. Arabia, Andrew S. Bowen, and Cory Welt.

¹⁸² Author discussions with Ukrainian government officials.

¹⁸³ Department of Defense, “Secretary of Defense Lloyd J. Austin III and Air Force General Charles Q. Brown Jr., Chairman, Joint Chiefs of Staff, Hold A News Conference Following Virtual Meeting of the Ukraine Defense Contact Group,” press release, April 26, 2024.

¹⁸⁴ Special Inspector General Report to the United States Congress, *Operation Atlantic Resolve: Including U.S. Government Activities Related to Ukraine, April 1, 2024-June 30, 2024*, p. 31.

¹⁸⁵ Siobhan O’Grady, Kostiantyn Khudov, and Serhiy Morgunov, “Ukrainian Attacks on Supply Lines Slowed Russians in Kharkiv, Intercepts Show,” *Washington Post*, July 8, 2024.

¹⁸⁶ The Russian military continues to demonstrate an ability to adapt and learn in response to new battlefield developments. Russia has adapted its logistics and command and control structures in response to effective UAF strikes and Russia’s electronic warfare capabilities reportedly are increasingly effective at mitigating some advanced U.S. munitions. For more see, Paul Schwartz et al., *Russian Military Logistics in the Ukraine War*, CNA, September 2023; (continued...)

U.S.-provided equipment may also bolster the ability of the UAF to replace losses, reconstitute forces, and equip new units, thus allowing for more extensive and successful combat operations.¹⁸⁷ In late 2022, for example, the United States contributed relatively large amounts of new equipment to create new UAF units in preparation for a planned counteroffensive in summer 2023.¹⁸⁸ The UAF continued to create new units but reportedly still faced equipment shortages, especially of armored or protected mobility, resulting in some units lacking equipment or being equipped piece-meal.¹⁸⁹ This reportedly risked undermining the effectiveness of new units, complicating logistics, and potentially forcing the UAF to combine portions of units to compensate for the lack of equipment.

Other factors influencing the battlefield impact of U.S.-origin weapons and munitions have been the ability of the UAF to fix or repair damaged equipment and the speed of U.S. delivery of pledged security assistance. Due to high usage, the UAF reportedly has faced hurdles in quickly repairing equipment.¹⁹⁰ The UAF has received assistance to repair equipment close to the frontlines, but repairs that are substantial or complex may require transportation to facilities in western Ukraine or in Europe.¹⁹¹ Additionally, uncertainty about when pledged security assistance may arrive in Ukraine may affect Ukrainian operational planning.¹⁹²

Biden Administration officials have maintained that U.S. defense production and assistance has played an important role in averting Ukrainian defeat and allowing the UAF to continue its operations.¹⁹³ In March 2024, for example, both Director of National Intelligence Avril Haines and Central Intelligence Agency Director William Burns highlighted the importance of U.S. security assistance to Ukraine and the likelihood of Ukrainian losses in the absence of such aid; in April 2024, U.S. European Command Commander General Christopher G. Cavoli stated that “if we [United States] do not continue to support Ukraine, Ukraine will run out of artillery shells and will run out of air defense interceptors in fairly short order.”¹⁹⁴

Some observers have criticized the pace of U.S. production and assistance, arguing that delays have hindered Ukrainian performance. More specifically, they have contended that delays in approving particular systems, as well as delays in funding, have undermined UAF operations and

Sam Skove, “Another U.S. Precision Guided Weapon Falls Prey to Russian Electronic Warfare, U.S. Says,” *Defense One*, April 28, 2024; Carlotta Gall and Vladyslav Golovin, “Some U.S. Weapons Stymied by Russian Jamming in Ukraine,” *New York Times*, May 25, 2024; Yaroslav Trofimov, “High-Tech American Weapons Work Against Russia—Until They Don’t,” *Wall Street Journal*, July 10, 2024.

¹⁸⁷ Jack Watling, “The War in Ukraine is Not a Stalemate,” *Foreign Affairs*, January 3, 2024.

¹⁸⁸ Isabelle Khurshudyan and Kamila Hrabchuk, “NATO-Trained Units Will Serve as Tip of Spear in Ukraine’s Counteroffensive,” *Washington Post*, June 4, 2023; Cristian Segura, “Ukraine’s Star Brigade in Dire State Due to Lack of Weapons and Its Own Mistakes,” *El Pais*, April 22, 2024.

¹⁸⁹ Economist, “Ukraine Will Hold if it Gets the Arms It Needs, Says a Top General,” May 10, 2024; Institute for the Study of War, “Russian Offensive Campaign Assessment, July 3, 2024.”

¹⁹⁰ For example, Ukraine’s artillery tubes require frequent repair due to heavy usage. Alistair MacDonald, “Ukraine Plunders Howitzer Graveyard to Keep Big Guns Firing,” *Wall Street Journal*, February 28, 2024.

¹⁹¹ Bojan Pancevski and Alistair MacDonald, “Many of Ukraine’s Western Weapons Await Repairs Far From the Front Line,” *Wall Street Journal*, December 10, 2022; Lolita Baldor, “How to Fix a Howitzer: U.S. Offers Helpline to Ukraine Troops,” *Associated Press*, January 28, 2023.

¹⁹² Constant Meheut, “Ukraine Retreats From Villages on Eastern Front as It Awaits U.S. Aid,” *New York Times*, April 29, 2024.

¹⁹³ Special Inspector General Report to the United States Congress, *Operation Atlantic Resolve: Including U.S. Government Activities Related to Ukraine, April 1, 2024-June 30, 2024*, p. 26.

¹⁹⁴ U.S. Congress, Senate Intelligence (Select) Committee, *Worldwide Threats*, 118th Cong., 2nd sess., March 11, 2024; and Testimony of Gen. Christopher G. Cavoli, in U.S. Congress, House Committee on Armed Services, *U.S. Military Posture and National Security Challenges in Europe*, hearings, 118th Cong., 2nd sess., April 10, 2024.

prevented it from capitalizing on successes on the battlefield.¹⁹⁵ However, others have cautioned that the character of U.S. assistance is not the only determinant of material availability: for example, some U.S. officials have claimed that the UAF's "reliance on artillery has contributed to the UAF's persistent shortage of munitions and overuse of weapon systems."¹⁹⁶

While acknowledging the importance of the aid already provided, some Ukrainian officials, including Ukrainian President Volodymyr Zelensky, have also criticized the scale and character of Western assistance (for example, Zelensky stated in July 2024 that "the decision to transfer F-16s to Ukraine was strategic, but their number was not strategic").¹⁹⁷ A related but distinct debate—and one largely beyond the scope of this report—concerns the limitations placed by the U.S. government on the use of U.S.-origin weapons and munitions, which have been the subject of considerable disagreement among stakeholders in the United States, Ukraine, and elsewhere.¹⁹⁸

Depending on the sense of Congress regarding the battlefield impact of U.S. aid, a number of options are available. Congress could, for instance, consider whether or not to direct the executive branch or another organization (e.g., the Government Accountability Office or a federally-funded research and development center) to review the efficacy of U.S.-origin weapons and munitions, either *in toto* or for specific capabilities. If Congress determines that certain capabilities or recipients are more effective than others in producing desirable battlefield effects, it could consider whether or not to direct DOD to focus on increasing relevant production and transfer efforts. More broadly, Congress may consider assessing the extent to which U.S. production is aligned with congressional priorities for U.S. strategic goals in Ukraine.

¹⁹⁵ Eliot Cohen, "It's Not Enough for Ukraine to Win. Russia Has to Lose," *Atlantic*, May 19, 2023; Andrew Radin, "How to Win in Ukraine: Pour It On, and Don't Worry About Escalation," *Defense One*, May 22, 2024. Some of this criticism has focused on the debate to provide particular systems or technologies to Ukraine. However, some scholars argue a single system or technology on its own is unlikely to prove decisive in a conflict. "Although technological superiority can be very important in war, its effect is not equally great under all circumstances, and even where it is very great, technology on its own will seldom decide a war." Martin van Crevald, *Technology and War: From 2000 B.C. to the Present* (New York, NY: Free Press, 1989), p. 232.

¹⁹⁶ U.S. Army Europe and Africa response to DOD IG request for information cited in Special Inspector General Report to the United States Congress, *Operation Atlantic Resolve: Including U.S. Government Activities Related to Ukraine, Jan 1, 2024-March 31, 2024*, p. 30.

¹⁹⁷ Isabel van Brugen, "Zelensky Issues Stark Warning Over F-16s," *Newsweek*, July 15, 2024, <https://www.newsweek.com/zelensky-warning-ukraine-f16-fighter-jets-1925290>. Earlier that month, Zelensky seemed to suggest in a July 11 tweet that Ukraine would need twice the number of F-16s committed thus far. <https://x.com/ZelenskyyUa/status/1811532850497261967>.

¹⁹⁸ For more information on this debate, see, for example, Koen Verhelst, "US Pushes Back Against Ukraine Please to Lift Weapon Restrictions," *Politico*, September 7, 2024; and Idrees Ali and Steve Holland, "Complications Loom for U.S. Arms Policy as Ukraine Moves Deeper Into Russia," *Reuters*, August 15, 2024.

Appendix. U.S. Security Assistance to Ukraine

Table A2. Defense Articles and Services Provided to Ukraine, 2022-2024

February 2022-September 2024

Article/Service	Quantity (if known/applicable)
<i>Air Defense</i>	
PATRIOT air defense batteries and munitions	2
National Advanced Surface-to-Air Missile Systems (NASAMS) and munitions	12
HAWK air defense systems and munitions	-
AIM-7, RIM-7, and AIM-9M missiles for air defense	-
Stinger anti-air missiles	At least 2,000
Avenger air defense system	-
VAMPIRE counter-Unmanned Aerial Systems (c-UAS) and munitions	-
C-UAS gun trucks and ammunition/mobile c-UAS laser-guided rocket systems	-
Anti-aircraft guns and ammunition	-
Air surveillance radars	21
<i>Fires</i>	
High Mobility Artillery Rocket Systems (HIMARS) and ammunition	At least 40
Ground-Launched Small Diameter Bomb launchers and guided rockets	-
155mm Howitzers	At least 200
155mm artillery rounds	At least 3,000,000
Precision-guided 155mm artillery rounds	At least 7,000
Remote Anti-Armor Mine (RAAM) 155 mm rounds	At least 60,000
105mm Howitzers	72
105mm artillery rounds	At least 800,000
203mm artillery rounds	10,000
152mm artillery rounds	At least 400,000
130mm artillery rounds	Approximately 40,000
122mm artillery rounds	40,000
122mm GRAD rockets	60,000
Mortar systems	At least 200
Mortar rounds	At least 600,000
Counter-artillery/counter-mortar radars	At least 100
Multi-mission radars	50
<i>Ground Maneuver</i>	
Abrams tanks	31
T-72B tanks	45

Article/Service	Quantity (if known/applicable)
Bradley Infantry Fighting Vehicles	At least 300
Bradley Fire Support Team Vehicles	4
Stryker Armored Personnel Carriers	189
M113 Armored Personnel Carriers	At least 800
M1117 Armored Security Vehicles	250
Mine Resistant Ambush Protected (MRAP) Vehicles	At least 1,000
High Mobility Multipurpose Wheeled Vehicles (HMMWVs)	At least 3,000
Light tactical vehicles	At least 200
Armored medical treatment vehicles	300
Trucks and trailers to transport heavy equipment	80 and at least 200, respectively
Tactical vehicles to tow and haul equipment	At least 1,000
Tactical vehicles to recover equipment	153
Command post vehicles	10
Ammunition support vehicles	30
Armored bridging systems	18
Logistics support vehicles and equipment	20
Fuel tankers and fuel trailers	239 and 105, respectively
Water trailers	58
Armored utility trucks	6
125mm, 120mm, and 105mm tank ammunition	-
25mm ammunition	At least 1,800,000
Mine-clearing equipment	-
<i>Aircraft and Unmanned Aerial Systems</i>	
Switchblade, Phoenix Ghost, CyberLux K8, Altius-600, Jump-20, Hornet, Puma, Scan Eagle, and Penguin unmanned aerial systems (UAS)	-
UAS radars	2
High-speed anti-radiation missiles	-
Zuni aircraft rockets	At least 6,000
Hydra-70 aircraft rockets	At least 20,000
UAS munitions	-
Precision aerial munitions	-
<i>Anti-armor and small arms</i>	
Javelin anti-armor systems	At least 10,000
Non-Javelin anti-armor systems and munitions	At least 120,000
Tube-Launched, Optically Tracked, Wire-Guided (TOW) missiles	At least 9,000
Grenade launchers and small arms	At least 40,000
Small arms ammunition and grenades	At least 400,000,000

Article/Service	Quantity (if known/applicable)
Laser-guided rocket systems and munitions	-
Rocket launchers and ammunition	-
Anti-armor mines	-
<i>Maritime</i>	
Harpoon coastal defense systems and anti-ship missiles	2
Coastal and riverine patrol boats	90 ^a
Unmanned Coastal Defense Vessels	-
Port and harbor security equipment	-
<i>Other capabilities</i>	
M18A1 Claymore anti-personnel munitions	-
C-4 explosives, demolition munitions, and demolition equipment for obstacle clearing	-
Obstacle emplacement equipment	-
Counter air defense capability	-
Body armor and helmets	At least 100,000
Tactical secure communications systems and support equipment	-
Satellite communications (SATCOM) antennas	4
SATCOM terminals and services	-
Electronic warfare (EW) and counter-EW equipment	-
Commercial satellite imagery services	-
Night vision devices, surveillance and thermal imagery systems, optics, and rangefinders	-
Explosive ordnance disposal equipment and protective gear	-
Chemical, Biological, Radiological, Nuclear protective equipment	-
Medical supplies, including first aid kits, bandages, monitors, and other equipment	-
Field equipment, cold weather gear, generators, and spare parts	-
Support for training, maintenance, and sustainment activities	-

Source: Department of State, “U.S. Security Cooperation with Ukraine,” fact sheet, September 6, 2024, <https://www.state.gov/u-s-security-cooperation-with-ukraine/>.

Notes:

- a. Four of these boats were provided using the Excess Defense Articles (EDA) program, which allows the President to transfer excess equipment to foreign governments. See Defense Security Cooperation Agency, “EDA,” <https://www.dsca.mil/programs/excess-defense-articles-eda>.

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