

# CNAS Drone Proliferation Dataset

## CODEBOOK

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Molly Campbell  
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Center for a  
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Security

**Center for a New American Security**  
1701 Pennsylvania Avenue NW, 7th Floor  
Washington, DC 20006  
T: 202.457.9400 | [CNAS.org](https://CNAS.org) | [@CNASdc](https://twitter.com/CNASdc)

## About the Author



**Molly Campbell** is a research assistant for the Defense Program at the Center for a New American Security (CNAS).

Molly graduated from Stanford University with dual degrees in Political Science and History, having focused on American politics, military history, and international security. Prior to joining CNAS, Molly researched emerging national security technology at Stanford University's Center for International Security and Cooperation (CISAC). She has also worked on Capitol Hill, staffed multiple political campaigns, served in the non-profit sector, and conducted independent research with Stanford's Bill Lane Center for the American West.

## About the Defense Program

Over the past 15 years, CNAS has defined the future of U.S. defense strategy. Building on this legacy, the CNAS Defense Program team continues to develop high-level concepts and concrete recommendations to ensure U.S. military preeminence into the future and to reverse the erosion of U.S. military advantages vis-à-vis China and, to a lesser extent, Russia. Specific areas of study include great power competition, developing a force structure and innovative operational concepts adapted for this more challenging era, and making hard choices to effect necessary change.

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## Introduction

The Center for a New American Security (CNAS) Drone Proliferation Dataset tracks global transfers of military-grade aerial drones, regardless of size and capability, from 1995, through September 1, 2023. This codebook accompanies the dataset and provides an in-depth explanation of the methods used to identify, organize, and code the data so that others may analyze and expand on it.

This dataset was created as part of larger research project by the CNAS Defense Program examining trends in drone proliferation and drone use in recent conflicts, as well as their likely effect on a potential future conflict over Taiwan. This research culminated in a June 2024 report, *Swarms Over the Strait: Drone Warfare in a Future Fight to Defend Taiwan*, by Stacie Pettyjohn, Hannah Dennis, and Molly Campbell.<sup>1</sup> The authors utilized the Drone Proliferation Dataset in their analysis of the role drone diplomacy plays in the strategic competition between the United States and the People's Republic of China (PRC).

## Methodology

Each of the 720 entries in the CNAS Drone Proliferation Dataset includes the following information: seeker, supplier, and region; platform model and type; transfer status; year of interest, order, or first delivery; and year of identification, completion, or cancellation.

### SEEKER, SUPPLIER, AND REGION

The data includes the seeking actor (**Seeker**) and the supplying nation (**Supplier**). The seeker may be a nation or a nonstate actor and is the requestor and/or recipient of imported drones and drone technology. The supplying nation is the nation providing, though not necessarily producing, the drones. There are a few instances of secondhand proliferation and resale, such as Jordan's sale of its six Chinese CH-4Bs to the Libyan National Army (LNA).<sup>2</sup>

The **Region** variable geographically categorizes the seeking nation. Given that regional affiliations are difficult to determine in some areas, the author uses the United States' regional combatant command delineations.

### PLATFORM MODEL AND TYPE

The variable **Platform Model** refers to the specific model of military drone (e.g., MQ-9B SeaGuardian), while the variable **Platform Type** categorizes drones by whether they are reusable armed drones (Armed UAV), reusable unarmed drones (UAV), or one-way kamikaze drones (loitering munition). The data includes only military-grade aerial drones, defined as aerial drones built specifically for professional military personnel use in a combat setting. Platform model designation is derived from the manufacturer and is based on the most specific model information available. Whenever possible, the author distinguishes between different configurations of drone models, such as delineating MQ-9A Predators from the MQ-9B SeaGuardian maritime version. Some agreements include the transfer of multiple platform models. In these instances, a new data entry was made for each model with a comment explaining the context. Due to the scope of the research question, commercial off-the-shelf drones or do-it-yourself drone technologies are not tracked in this dataset, nor are uncrewed systems for other domains, such as ships, submarines, or ground vehicles.

Type is based on the overall capability of the drone, as well as the specific configuration of the acquired system. Other datasets, such as that by Matthew Fuhrmann and Michael Horowitz in 2017, are less inclusive of platform type, and instead focus on medium-altitude long-endurance (MALE) systems that meet the 20-hour/16,000-foot elevation and endurance capabilities of the Chinese Wing Loong.<sup>3</sup> As has since been seen in Ukraine, smaller drones can have a notable impact on the battlefield. Therefore, tracking transfers of small, handheld, and nanodrone types offers critical perspective into the actual uncrewed capabilities of a particular seeker state.

A platform is categorized as unarmed when the acquired system was not configured to carry a lethal payload at the time of transfer. However, drones of all types can be modified after acquisition. Both armed drones and loitering munitions carry a lethal payload and have many similarities, but loitering munitions are intended to fly single one-way missions and crash into the target. Many, if not most, MALE systems can be optionally armed. Though the author considered categorizing all systems that had the capability to be armed as armed drones, the final dataset reflects the actual configuration acquired. In its transfer lists, the Stockholm International Peace Research Institute (SIPRI) includes in the weapon description whether it was armed or unarmed. However, there is room for error in the armed-unarmed typology, as instances identified through open-source blogs, news reports, and social media often document platform model in the most general sense, leaving an incomplete picture of the true type. There is only one instance of

contradictory reports in the dataset, in the case of Pakistan's 2019 purchase of Chinese CH-4 drones. SIPRI reports that it was the unarmed CH-4A, while other sources report sightings of the armed CH-4B within Pakistan.<sup>4</sup>

Additionally, target drones are not included in the dataset. While the United States has used target drones for decades, and they can be converted into kamikaze drones, the author found their inclusion was tangential to the research question and had the potential to skew final analysis.

**Figure 2: Drone Type Definitions**

Type	Definition
<b>Unarmed Drone</b> <i>Dataset Label "UAV"</i>	Any military drone that is not configured to carry a lethal payload at the time of transfer. This includes multirotor quadcopters and fixed wing aircraft.
<b>Armed Drone</b> <i>Dataset Label "Armed UAV"</i>	Any military drone that is transferred in an armed configuration. Unarmed configurations of weapons-capable systems, such as the MQ-9B, are categorized as unarmed.
<b>Loitering Munition/ Kamikaze Drone</b> <i>Dataset Label "Loitering Munition"</i>	Armed drones designed for single, one-way use.

## TRANSFER STATUS

The dataset broadly distinguishes between two types of proliferation: drone transfers and drone pursuit. It is critical to note that this dataset does not track indigenous drone development and acquisition and focuses solely on actors who have sought and sometimes obtained drones from another country.

In this dataset, the term "transfer" captures completed and ongoing foreign military sales, direct commercial sales and leases and gifts of military-grade drone systems between 1995 and September 2023. The Defense Security Cooperation Agency (DSCA) defines foreign military sales as "the U.S. Government's program for transferring defense articles, services, and training to international partners and international organizations," using the Department of Defense's (DoD's) "acquisition system to procure defense articles and services on behalf of its partners."<sup>5</sup> DSCA defines direct commercial sales as those in which "U.S. companies obtain commercial export licenses from the Department of State, allowing them to negotiate with, and sell directly to partners."<sup>6</sup> Some suppliers such as Israel commonly make lease agreements instead of sales, as leasing outsources operations at a reduced cost to customers.<sup>7</sup> Therefore, since not all the transactions captured were formal sales, the author uses the term "transfer" rather than "sale." Article 2 of the United Nations Arms Trade Treaty applies a similar definition, in which "the activities of the international trade comprise export, import, transit, trans-shipment and brokering" are referred to as "transfers."<sup>8</sup>

The **Status** variable, detailed in Figure 3, indicates whether a recipient is interested in acquiring drones, has successfully obtained military drones or is waiting for the final execution of an agreement, or was unable to obtain drones. The status variable provides a better understanding of a country's drone pursuit by including instances of expressed interest in drone acquisition as well as attempts at drone acquisition

that never resulted in the transfer of a weapons system. This distinction helps establish the timelines in which a country pursued drones and how they may have approached different potential suppliers.

To maximize analytic accuracy, a fifth transfer status definition—**Additional Sources Required**—was added to qualify entries that the author determined lacked verifiable or high-fidelity sources. Source quality standards are described in greater detail in the sources section of the methodology.

**Figure 3: Drone Transfer Status Definitions**

Status	Definition
<b>Yes</b>	The full deal is confirmed, and delivery of the systems has begun or has been completed. The seeking nation has taken possession of the drone system.
<b>Pending</b>	Either: <ul style="list-style-type: none"> <li>▪ A deal has been signed but delivery has not yet begun; or</li> <li>▪ A deal has been signed and the date of projected completion has passed, but the ultimate status of the order is unclear.</li> </ul>
<b>Interest</b>	A legitimate government representative makes a credible action, legal attempt, or verbal indication of intent to acquire a specific weapons system. General comments expressing interest in purchasing a drone capability without reference to a specific system or supplying nation are not included. An entry is only marked “Interest” if no subsequent orders, successful or unsuccessful, were made.
<b>No</b>	Either: <ul style="list-style-type: none"> <li>▪ A formal request for purchase of military drones was rejected by the supplying nation;</li> <li>▪ Ongoing agreement discussions were terminated; or</li> <li>▪ Signed agreements were terminated or canceled.</li> </ul>
<b>Additional Sources Required</b>	The status of the transfer cannot be determined with a high degree of confidence due to the quality of the information currently available.

#### **YEARS OF INTEREST, ORDER, AND FIRST DELIVERY, AND YEAR OF IDENTIFICATION, COMPLETION, OR CANCELLATION**

The dataset covers the period from 1995, through September 1, 2023.<sup>9</sup> While there are a few documented sales of early drone systems in the 1980s, they are outliers to the trend of modern proliferation tracked in this dataset. The dataset captures four time stamps: **Year of Interest**; **Year of Order**; **Year of First Delivery**; and **Year of Identification, Completion, or Cancellation**. Figure 4 defines each of these terms. To the extent possible, the dataset includes, at a minimum, both the year of order and year of completion for each transfer. When available, the year of first delivery is also included, as many orders are fulfilled over a long period of time. Many entries lack year of order, as some transfers

only become public upon completion, and the year of the initial agreement is not publicized. Furthermore, some transfers go unpublicized all together. Those entries may lack a year of order and a year of completion. This is especially true for illicit transfers to isolated regimes or terrorist organizations. Many transfers of small, unarmed reconnaissance drones, like the Israeli Skylark and American RQ-11 Raven, lack years of order and/or years of completion, since such tactical systems often fall below export restriction and reporting thresholds. In these cases, the dataset records the year of identification—that is, the year in which it was publicly identified that a seeker possessed a particular nonindigenous weapons system. Entries which use year of identification do not have inputs for years of interest, order, or first delivery. The author has noted in the comments when year of identification is used.

For entries in which no year could be ascertained, the transfer is labeled “NA,” or not applicable. To facilitate data analysis, years of identification, completion, and cancellation are grouped together, as all represent the end point of a transfer.

**Figure 4: Time Stamp Definitions**

Variable	Definition
<b>Year of Interest</b>	The earliest known year that a seeking nation made a credible action, legal attempt, or verbal indication of intent to acquire a specific drone system. Expressions of interest that did not result in an order are indicated with a transfer status of “Interest.”
<b>Year of Order</b>	The year the specific agreement was signed.
<b>Year of First Delivery</b>	The first year the seeking nation was in possession of the acquired drone system.
<b>Year of Identification, Completion, or Cancellation</b>	<ul style="list-style-type: none"> <li>▪ <u>Identification</u>: The year it was publicly identified that a nation was in possession of a particular drone system.</li> <li>▪ <u>Completion</u>: The year the specific agreement was completed, and all systems were delivered to the seeker.</li> <li>▪ <u>Cancellation</u>: The year a confirmed agreement was publicly identified as terminated.</li> </ul>



## SOURCES

Literature on drone proliferation and open-source databases on international arms transfers provided the initial basis for data collection. Key resources include:

- “Who’s Prone to Drone? A Global Time-Series Analysis of Armed Uninhabited Aerial Vehicle Proliferation,” by Michael Horowitz, Joshua A. Schwartz, and Matthew Fuhrmann<sup>10</sup>
- “Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles,” by Matthew Fuhrmann and Michael C. Horowitz<sup>11</sup>
- The SIPRI Arms Transfers Database from the Stockholm International Peace Research Institute<sup>12</sup>
- *The Drone Databook*, by Dan Gettinger<sup>13</sup>
- The Operational Environment Data Integration Network (ODIN) from the U.S. Army<sup>14</sup>
- Open-source intelligence website Oryx<sup>15</sup>

Combined, these sources provide robust data. However, key information such as the year of transfer and the broader context of the transfer is lacking or is unavailable for more recent years. Additionally, canceled transfers or rejected solicitations are not captured in any of the previously mentioned datasets. To fill these gaps, the author uses news reports, social media, government documents, and company websites. All data entries are verified across multiple sources, with a preference for primary evidence of acquisition, such as a press release by the company or purchasing nation, or photographic evidence of a system’s presence in-country.

As discussed in the transfer status section, the author determined that some transfer entries lack sufficient evidence and qualified their inclusion in the dataset, based on the quality and quantity of sources, with “NA.” For some, reputable sources and news outlets describe the transfers as unconfirmed. For others, there is a burst of initial media coverage of an order, but there is no subsequent documentation confirming the transfer’s outcome. Other instances of insufficient sources are classified based on the quality of the source. Military Africa, for example, delivers critical defense reporting in Africa, a region chronically neglected by mainstream defense trades. However, the author determined that, in instances where no additional evidence could be found, its reporting alone is insufficient to confidently determine transfer status. This is not to say the reports cited are inaccurate, but that at the time of the dataset’s creation, not enough information was available on a particular transfer. By including lower-confidence entries, the dataset becomes a dynamic resource that can be updated as more information becomes available.

## COMMENTS

Some entries include comments intended to provide context and clarity on the specific transfer. Entries sourced from the SIPRI Arms Transfers Database include all original comments and are attributed to as such. In some instances, relevant transfer information is not immediately evident in a source. In these cases, the author attempted to provide direct source quotes in the comments. Other comments without direct attributions are qualitative summaries written by the author, and generally accompany less straightforward transfers, such as those with co-production agreements, and entries with statuses of “No” or “Additional Sources Required.”

## LIMITATIONS

Limited available information on certain seekers imposes constraints on this dataset. Nonstate actors and authoritarian regimes have significant motivation to keep details of their international arms transfers secret, which results in ambiguous data. For this reason, it can be assumed that sales and acquisitions by

countries such as Russia, Iran, and North Korea are much higher than documented. Additionally, information on unsuccessful military drone transfers is difficult to identify for military drone suppliers other than the United States.

## Additional Summary Charts

Below are summative tables totaling the number of entries broken down by variable. These are intended as quick reference guides to offer a simple snapshot of the data.

**FIGURE 5: TRANSFER STATUS, 1995–2023**

Transfer Status	Number of Entries
Yes	550
Pending	84
Interest	44
No	16
Additional Sources Required	24

**FIGURE 6: PLATFORM TYPE, 1995–2023**

Platform Type	Number of Entries
UAV	513
Armed UAV	147
Loitering Munition	60

**FIGURE 7: SEEKER REGION, 1995–2023**

Region	Number of Entries
Africa	106
Central	151
Europe	279
Indo-Pacific	125
North America	22
South America	37

<sup>1</sup> Stacie Pettyjohn, Hannah Denis, and Molly Campbell, *Swarms over the Strait: Drone Warfare in a Future Fight to Defend Taiwan* (Washington, DC: Center for a New American Security, June 20, 2024), <https://www.cnas.org/publications/reports/swarms-over-the-strait>.

<sup>2</sup> Schiebel, “UAV Success for OAO Gorizont and Schiebel in Russia,” press release, June 30, 2011, [https://schiebel.net/wp-content/uploads/2015/07/2011-06-30\\_uav\\_success\\_for\\_oao\\_gorizont\\_and\\_schiebel\\_in\\_russia.pdf](https://schiebel.net/wp-content/uploads/2015/07/2011-06-30_uav_success_for_oao_gorizont_and_schiebel_in_russia.pdf).

<sup>3</sup> Matthew Fuhrmann and Michael C. Horowitz, “Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles,” *International Organization* 71, no. 2 (2017): Appendix, 13–14, <http://www.jstor.org/stable/44651946>.

<sup>4</sup> Sakshi Tiwari, “Chinese CH-4B Drone Spotted over Balochistan; Reports Indicate Pakistan Army Is Using Them to Crush Rebellion,” *The EurAsian Times*, November 18, 2022, <https://www.eurasiantimes.com/chinese-ch-4b-drone-spotted-over-balochistan-reports-indicate>.

<sup>5</sup> “Foreign Military Sales FAQ,” Defense Security Cooperation Agency, accessed November 10, 2023, <https://www.dsca.mil/foreign-military-sales-faq>.

<sup>6</sup> “Foreign Military Sales FAQ.”

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- <sup>7</sup> Seth J. Frantzman, "Greece and Israel Deal Spotlight Leasing Model for Military UAVs," Defense News, May 8, 2020, <https://www.defensenews.com/global/europe/2020/05/08/greece-and-israel-deal-spotlight-leasing-model-for-military-uavs>.
- <sup>8</sup> The Arms Trade Treaty, United Nations, December 24, 2014, 13-27217, (December 24, 2014), 3, [https://thearmstradetreaty.org/hyper-images/file/ATT\\_English/ATT\\_English.pdf](https://thearmstradetreaty.org/hyper-images/file/ATT_English/ATT_English.pdf).
- <sup>9</sup> Horowitz et al., 2020 only records through 2019, and SIPRI through 2022.
- <sup>10</sup> Michael Horowitz, Joshua A. Schwartz, and Matthew Fuhrmann, "Who's Prone to Drone? A Global Time-Series Analysis of Armed Uninhabited Aerial Vehicle Proliferation," *Conflict Management and Peace Science* 39, no. 2 (March 2022): 119–142, <https://doi.org/10.1177/0738894220966572>.
- <sup>11</sup> Fuhrmann and Horowitz, "Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles," 397–418.
- <sup>12</sup> "SIPRI Arms Transfers Database," Stockholm International Peace Research Institute, <https://www.sipri.org/databases/armstransfers>.
- <sup>13</sup> Dan Gettinger, *The Drone Databook* (Annandale-on-Hudson, NY: The Center for the Study of the Drone at Bard College, 2019), <https://dronecenter.bard.edu/projects/drone-proliferation/databook>.
- <sup>14</sup> "Operational Environment Data Integration Network (ODIN)," U.S. Army, <https://odin.tradoc.army.mil>.
- <sup>15</sup> Oryx, <https://www.oryxspioenkop.com>.

