**Online Appendix for “Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles”**

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# Robustness Tests

## Alternative Measure Of Security Threats: Borders

Given potential concern that the measure of security threats in the paper, border disputes, might be too limited, we turn to an alternative measure of security threats that is independent of national behavior – the number of national borders. Countries with more borders are naturally more likely to get involved in disputes, but not for any reason that would correlate with our variables of interest. This provides a broader way to look at security threats. Appendix Table A.1 below shows that our results are robust to using a national borders variable instead of a territorial disputes variable. The most significant difference is that the borders variable is significant in models of armed drone proliferation, whereas *territorial disputes* was insignificant in Table 1. After all, countries might also use drones for other types of cross-border operations. A report published in February 2013 suggested, for example, that China seriously considered conducting a UAV strike against a drug lord in Burma (Perlez 2003).

Moreover, security threats measured by number of borders also appear important for armed UAV proliferation in this framework, extending the results in the paper.

**Appendix Table A.1: Robustness With National Borders Variable**

|  |  |  |
| --- | --- | --- |
|  | (1) | (2) |
|  | Advanced | Pursing Armed |
|  | B/SE | B/SE |
|  |  |  |
| Number of Borders | 0.0796\*\* (0.0378) | 0.142\*\*\* (0.0451) |
| Logged Terrorist Attacks (5 year avg) | 0.103\* (0.0583) | 0.317\*\*\* (0.0775) |
| Autocracy | 0.556 (0.525) | 1.620\*\* (0.703) |
| Democracy | 0.370 (0.454) | 1.673\*\*\* (0.601) |
| Logged GDP Per Capita | 0.297\*\*\* (0.104) | 0.459\*\*\* (0.127) |
| Alliance with UAV Producer | -0.217 (0.392) | -0.588 (0.398) |
| Constant | -4.585\*\*\* (0.878) | -8.077\*\*\* (1.188) |
| Observations | 156 | 156 |
| Pseudo *R*2 | 0.197 | 0.473 |
| Log Pseudo-Likelihood | -57.69 | -37.85 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

## Alternative Measures of Regime Type

Appendix Table A.2 below adds a dummy for personalist regimes to test how autocratic regime type may influence our results. Specifically, given Way and Weeks’ findings on autocratic regime type and nuclear proliferation, it is possible that personalist regimes are more likely to seek advanced or armed drones. As described in the paper, our results are robust to including this variable and personalism does not appear to significantly explain advanced or armed drone proliferation.

**Appendix Table A.2: Personalist Regimes Robustness Test**

|  |  |  |
| --- | --- | --- |
|  | (1) | (2) |
|  | Advanced | Pursing Armed |
|  | B/SE | B/SE |
|  |  |  |
| Number of Active Disputes | 0.175\*\*\* (0.0678) | 0.0803 (0.0622) |
| Logged Terrorist Attacks (5 year avg) | 0.137\*\* (0.0624) | 0.340\*\*\* (0.0818) |
| Personalist Regime (GWF) | -0.135 (0.521) | 0.532 (0.691) |
| Single Party Regime (GWF) | 0.956\*\* (0.442) | 0.846 (0.603) |
| Military Regime (GWF) | 0 (.) | 0 (.) |
| Monarchy (GWF) | 0.590 (0.596) | 1.255\* (0.732) |
| Democracy |  | 1.120\*\* (0.563) |
| Logged GDP Per Capita | 0.360\*\*\* (0.104) | 0.593\*\*\* (0.132) |
| Alliance with UAV producer | 0.208 (0.367) | -0.474 (0.408) |
| Constant | -5.107\*\*\* (1.080) | -8.131\*\*\* (1.476) |
| Observations | 139 | 139 |
| Pseudo *R*2 | 0.246 | 0.383 |
| Log Pseudo-Likelihood | -50.53 | -42.20 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

Table A.3, in turn, shows that the results are consistent even when using a less restrictive definition of democracy and autocracy. In Table A.3, regimes are coded as autocrats if they are -6 or below on the Polity2 scale, and democrats if they are 6 or above.

**Appendix Table A.3: Alternative Regime Type Cutoff Robustness Test**

|  |  |  |
| --- | --- | --- |
|  | (1) | (2) |
|  | Advanced | Pursing Armed |
|  | B/SE | B/SE |
|  |  |  |
| Number of active disputes | 0.186\*\*\* (0.0666) | 0.0833 (0.0660) |
| Logged Terrorist Attacks (5 year avg) | 0.108\* (0.0557) | 0.373\*\*\* (0.0806) |
| autocrat6 | 0.486 (0.497) | 1.906\*\*\* (0.669) |
| democrat6 | 0.217 (0.413) | 1.745\*\*\* (0.565) |
| Logged GDP Per Capita | 0.330\*\*\* (0.0938) | 0.505\*\*\* (0.120) |
| Alliance with UAV Producer | -0.0980 (0.380) | -0.412 (0.393) |
| Constant | -4.709\*\*\* (0.847) | -8.053\*\*\* (1.318) |
| Observations | 158 | 158 |
| Pseudo *R*2 | 0.226 | 0.427 |
| Log Pseudo-Likelihood | -55.91 | -41.43 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

Table A.4 demonstrates that the results do not result from the use of democracy and autocracies dummies. Here, we substitute the dummies for the continuous polity2 measure and an additional variable that is polity2 squared. This is designed to capture the non-linearity of our regime type argument, but in more continuous fashion. The results are consistent with our main models.

**Appendix Table A.4: Continuous Regime Type Measure Robustness Test**

|  |  |  |
| --- | --- | --- |
|  | (1) | (2) |
|  | Advanced | Pursing Armed |
|  | B/SE | B/SE |
|  |  |  |
| Number of active disputes | 0.190\*\*\* (0.0659) | 0.104\* (0.0623) |
| Logged Terrorist Attacks (5 year avg) | 0.103\* (0.0531) | 0.303\*\*\* (0.0693) |
| Polity Score | -0.104 (0.151) | -0.301\* (0.158) |
| Polity Score Squared | 0.00404 (0.00614) | 0.0132\*\* (0.00636) |
| Logged GDP Per Capita | 0.312\*\*\* (0.119) | 0.412\*\*\* (0.127) |
| Alliance with UAV Producer | -0.104 (0.361) | -0.333 (0.369) |
| Constant | -3.864\*\* (1.571) | -4.678\*\*\* (1.575) |
| Observations | 158 | 158 |
| Pseudo *R*2 | 0.223 | 0.370 |
| Log Pseudo-Likelihood | -56.14 | -45.52 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

## Alternative Measures of Economic Capacity

The paper shows that our results are robust to two different ways of measuring economic capacity: logged GDP per capita and high-technology exports. Here, we test the results on a third measure of economic capacity, science and technology journal articles published by a given country. While not as clear a measure of capacity as logged GDP per capita or high-technology exports, science and technology journal publications are also a potential proxy for high-technology economic capacity. Appendix Table A.5 shows that this alternate measure of economic capacity is positively associated with UAV proliferation as well. Notice also that the two security variables are no longer significant when we analyze advanced UAV possession. At the same time, the findings are broadly similar in the case of armed UAV pursuit.

**Appendix Table A.5: Alternative Measure of Economic Capacity**

|  |  |  |
| --- | --- | --- |
|  | (1) | (2) |
|  | Advanced | Pursing Armed |
|  | B/SE | B/SE |
|  |  |  |
| Number of Active Disputes | 0.126 (0.0788) | -0.0846 (0.0868) |
| Logged Terrorist Attacks (5 year avg) | 0.0753 (0.0546) | 0.301\*\*\* (0.0706) |
| Autocracy | 0.783\* (0.431) | 2.051\*\*\* (0.583) |
| Democracy | 0.523 (0.416) | 1.256\*\* (0.497) |
| S&T Journal Articles | 0.0000352\*\* (0.0000177) | 0.0000828\*\*\* (0.0000243) |
| Alliance with UAV Producer | -0.160 (0.385) | -0.331 (0.444) |
| Constant | -1.916\*\*\* (0.344) | -2.970\*\*\* (0.464) |
| Observations | 159 | 159 |
| Pseudo *R*2 | 0.221 | 0.422 |
| Log Pseudo-Likelihood | -56.40 | -42.74 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

## Tactical UAV Proliferation and Status Seeking

The main analysis focuses on the most strategically relevant drones, excluding basic systems. It is worth considering, however, whether our findings vary when we examine drones based on less sophisticated technology. Basic drones, especially unarmed basic drones, could diffuse for different reasons. Cheaper and easier to acquire than advanced or armed UAVs, tactical UAVs have spread much more quickly around the world. We therefore replicate our main model using an alternate dependent variable that measures whether a state currently fields basic drones.

In this analysis, we include one additional driver of drone proliferation: a desire to increase status internationally. Countries might seek basic drones, in particular, to signal their ``modernness.'' Tactical systems are the cheapest, placing the least pressure on national military budgets, while allowing countries and leaders to signal to their domestic population and the international community that they are ``keeping up'' by fielding drones. For example, Rodrigo Hinzpeter, Chile's defense minister, stated that his country's development of UAVs ``gives us a lot of pride and satisfaction,'' implying that international prestige played a role in Chile's drone program (Majumdar 2012).

As a proxy, following Early, we measure status-seeking behavior based on a country's performance at the Olympic Games (Early 2014). First, we estimate the predicted number of medals a country should have won in 2012 based on its GDP, population, regime type, and other factors. We then compare the predicted number of medals to the number of medals states actually won. This variable is coded 1 if the actual number of medals exceeds the predicted number and 0 if not.

Results in the online appendix show that status-seeking behavior is positively associated with the proliferation of ``basic'' systems. However, as expected, this variable is statistically unrelated to advanced drones and armed UAV programs. Major powers may be less motivated by prestige-related considerations, but a robustness test below shows similar results when we limit the sample to non-major powers only.

Although our status seeking measure is admittedly a crude proxy, these results suggest that a desire for greater prestige internationally partially motivates states to seek basic drones. The other findings are broadly consistent with what we reported in Table 1. Thus, while basic and advanced drones vary in their sophistication, similar variables seem to explain the spread of both types of drones. Appendix Table A.6 shows that our general results replicate in the context of tactical proliferation. An additional variable not relevant for advanced or armed proliferation, status seeking, also helps explain tactical proliferation, as explained in the paper.

**Appendix Table A.6: Tactical UAV Proliferation and Status Seeking**

|  |  |  |  |
| --- | --- | --- | --- |
|  | (1) | (2) | (3) |
|  | Basic | Advanced | Pursing Armed |
|  | B/SE | B/SE | B/SE |
|  |  |  |  |
| Number of Active Disputes | 0.191\*\* (0.0754) | 0.196\*\*\* (0.0686) | 0.0917 (0.0658) |
| Logged Terrorist Attacks (5 year avg) | 0.216\*\*\* (0.0639) | 0.118\*\* (0.0559) | 0.356\*\*\* (0.0800) |
| Autocracy | -0.256 (0.518) | 0.754 (0.491) | 1.724\*\*\* (0.617) |
| Democracy | 0.222 (0.323) | 0.443 (0.444) | 1.478\*\*\* (0.536) |
| Logged GDP Per Capita | 0.627\*\*\* (0.131) | 0.298\*\*\* (0.101) | 0.479\*\*\* (0.125) |
| Alliance with UAV Producer | 0.394 (0.293) | -0.158 (0.396) | -0.425 (0.406) |
| Olympic Over-performance | 0.796\*\* (0.327) | 0.180 (0.319) | -0.100 (0.384) |
| Constant | -6.350\*\*\* (1.109) | -4.632\*\*\* (0.866) | -7.463\*\*\* (1.286) |
| Observations | 157 | 157 | 157 |
| Pseudo *R*2 | 0.428 | 0.241 | 0.420 |
| Log Pseudo-Likelihood | -61.97 | -54.69 | -41.80 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

Appendix Table A.7 focuses on the possibility that our status seeking results might be influenced by whether a country is a major power. It therefore utilizes a split-sample approach looking at the impact of status seeking just for non-major powers. The results are substantively similar to the broader results.

**Appendix Table A.7: Tactical UAV Proliferation and Status Seeking (Non Major Powers Only)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | (1) | (2) | (3) |
|  | Basic | Advanced | Pursing Armed |
|  | B/SE | B/SE | B/SE |
|  |  |  |  |
| Number of Active Disputes | 0.182\*\* (0.0808) | 0.214\*\* (0.0900) | 0.0561 (0.0964) |
| Logged Terrorist Attacks (5 year avg) | 0.214\*\*\* (0.0637) | 0.0766 (0.0549) | 0.326\*\*\* (0.0790) |
| Autocracy | -0.276 (0.527) | 0.718 (0.506) | 1.751\*\*\* (0.665) |
| Democracy | 0.212 (0.321) | 0.487 (0.453) | 1.549\*\*\* (0.562) |
| Logged GDP Per Capita | 0.624\*\*\* (0.131) | 0.258\*\* (0.104) | 0.412\*\*\* (0.121) |
| Alliance with UAV Producer | 0.391 (0.292) | -0.173 (0.413) | -0.415 (0.401) |
| Olympic Over-performance | 0.796\*\* (0.326) | 0.143 (0.333) | -0.210 (0.412) |
| Constant | -6.304\*\*\* (1.115) | -4.252\*\*\* (0.912) | -6.770\*\*\* (1.217) |
| Observations | 150 | 150 | 150 |
| Pseudo *R*2 | 0.405 | 0.168 | 0.357 |
| Log Pseudo-Likelihood | -61.82 | -50.55 | -39.07 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

## Alternative Measure of Capacity: Defense Spending

Another way to think about national capacity to acquire advanced or armed UAVs is defense spending, since countries that spend more on their militaries might naturally be more capable of absorbing new technologies. This would specifically potentially be an issue for armed UAVs, since they are the more expensive and complex of UAVs. Appendix Table A.8 therefore replicates our armed proliferation model with two tweaks. First, we include a defense spending variable drawn from the Stockholm International Peace Research Institute for 2014. Second, we swap out the territorial disputes variable for the total national borders variable used in Appendix Table A.1 above. We do this due to potential collinearity between defense spending and territorial disputes (since states facing more territorial disputes would presumably spend more on their militaries). The robustness of our results below in this framework provides additional evidence supporting the arguments made in the paper.

**Appendix Table A.8: Controlling for Defense Spending**

|  |  |
| --- | --- |
|  | (1) |
|  | Pursing Armed |
|  | B/SE |
|  |  |
| Number of Borders | 0.0923\* (0.0495) |
| Logged Terrorist Attacks (5 year avg) | 0.231\*\*\* (0.0792) |
| Autocracy | 1.452\*\* (0.666) |
| Democracy | 1.792\*\*\* (0.680) |
| Logged GDP Per Capita | 0.200 (0.142) |
| Alliance with UAV Producer | -1.044\*\* (0.452) |
| Logged Military Spending (SIPRI) | 0.468\*\*\* (0.160) |
| Constant | -8.785\*\*\* (1.277) |
| Observations | 156 |
| Pseudo *R*2 | 0.536 |
| Log Pseudo-Likelihood | -33.32 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

## Alternative Measures of UAV Proliferation

It is possible that the particular definition of advanced UAVs, described in detail below, skews the results by not focusing on the category most relevant for politics at present – UAVs such as the MQ-9 Reaper flown by the United States and others, which are advanced and armed. We therefore replicated the main model from the paper with a modified dependent variable that is 1 if a country has a UAV that is armed and advanced, and 0 otherwise. The results are below in Appendix Table A.9 and are consistent with the broader results reported in the paper.

**Appendix Table A.9: Alternative DV: Advanced + Armed Possession**

|  |  |
| --- | --- |
|  | (1) |
|  | Possess Armed, Advanced Drone: 1 = Yes, 0 = No |
|  | B/SE |
|  |  |
| Number of active disputes | 0.728\* (0.423) |
| Logged Terrorist Attacks (5 year avg) | 1.390\*\* (0.602) |
| Autocracy | 11.68\*\*\* (3.323) |
| Democracy | 8.335\*\*\* (2.257) |
| Logged GDP Per Capita | 1.959\* (1.186) |
| Alliance with UAV Producer | -4.007 (3.321) |
| Constant | -38.10\*\* (17.58) |
| Observations | 160 |
| Pseudo *R*2 | 0.762 |
| Log Pseudo-Likelihood | -5.295 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

We also show that the models are consistent even when we employ a more restrictive definition of what it means to pursue UAVs. We could find only limited evidence that three countries coded by the RAND Corporation (Davis 2014) as pursuing armed drones were actually pursuing armed drones (Lebanon, South Africa, and Tunisia). Given the reputation of the RAND Corporation, we code these countries 1 in the main model. Model 1 below in Table A.10 shows our results are consistent even when coding those countries as 0 for armed pursuit, rather than 1. Model 2 below excludes both those countries and countries whose pursuit of UAVs may be more tentative, such as experimental R&D programs that several countries in the EU participate in. The results are also consistent.

**Appendix Table A.10: Alternative DV: More Restrictive Coding Of Armed Pursuit**

|  |  |  |
| --- | --- | --- |
|  | (1) | (2) |
|  | More Restrictive Armed Pursuit | Most Restrictive Armed Pursuit |
|  | B/SE | B/SE |
|  |  |  |
| Number of active disputes | 0.122\* (0.0663) | 0.152\*\* (0.0669) |
| Logged Terrorist Attacks (5 year avg) | 0.359\*\*\* (0.0854) | 0.384\*\*\* (0.0947) |
| Autocracy | 2.036\*\*\* (0.644) | 1.997\*\*\* (0.642) |
| Democracy | 1.442\*\*\* (0.554) | 1.215\*\* (0.586) |
| Logged GDP Per Capita | 0.523\*\*\* (0.144) | 0.422\*\*\* (0.156) |
| Alliance with UAV Producer | -0.0915 (0.422) | 0.166 (0.481) |
| Constant | -8.289\*\*\* (1.559) | -7.693\*\*\* (1.753) |
| Observations | 158 | 158 |
| Pseudo *R*2 | 0.446 | 0.465 |
| Log Pseudo-Likelihood | -37.30 | -31.05 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

## 

## Alternative Model of UAV Proliferation

As described in the paper, our dependent variables are not ordered. States can acquire armed UAVs before advanced, and vice versa. However, to address concern that our models may be ordered, we estimate a seemingly unrelated regression model to demonstrate robustness. The results below in Table A.11 are consistent with the main findings in the paper. While the equations are correlated, there are a number of states with armed UAV programs as of the end of 2014 that did not have advanced UAVs. This includes: Spain, Poland, Greece, Saudi Arabia, North Korea, and Pakistan. One issue is that the small size of the dataset, n=158, makes interpretation difficult. Future research based on time-series UAV proliferation data may be able to unpack these results in greater detail.

**Appendix Table A.11: Seemingly Unrelated Probit**

|  |  |
| --- | --- |
|  | (1) |
|  | B/SE |
| *DV = Advanced* |  |
| Number of Active Disputes | 0.196\*\*\* (0.0625) |
| Logged Terrorist Attacks (5 year avg) | 0.109\* (0.0600) |
| Autocracy | 0.733 (0.472) |
| Democracy | 0.483 (0.377) |
| Logged GDP Per Capita | 0.300\*\*\* (0.114) |
| Alliance with UAV Producer | -0.168 (0.337) |
| Constant | -4.602\*\*\* (1.029) |
| *DV = Pursing Armed* |  |
| Number of Active Disputes | 0.0903 (0.0723) |
| Logged Terrorist Attacks (5 year avg) | 0.349\*\*\* (0.0774) |
| Autocracy | 1.583\*\*\* (0.605) |
| Democracy | 1.306\*\* (0.520) |
| Logged GDP Per Capita | 0.509\*\*\* (0.146) |
| Alliance with UAV Producer | -0.375 (0.389) |
| Constant | -7.607\*\*\* (1.506) |
| athrho |  |
| Constant | 0.555\*\* (0.241) |
| Observations | 158 |
| Pseudo *R*2 |  |
| Log Pseudo-Likelihood | -93.91 |

Standard errors in parentheses

\* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01

# Distinguishing Between UAVs

The precise line drawn in the paper between advanced and basic UAVs is inevitably somewhat arbitrary. Yet it is useful for our analysis, the first to systematically examine drone proliferation. We arrived at this threshold by examining the capabilities of drones that are widely viewed as being in the same class as the Predator. Such UAVs are often characterized as Medium Altitude Long Endurance (MALE) vehicles, although there is no agreed upon definition of what constitutes a MALE drone. We ultimately used the elevation and endurance capabilities of the Chinese Wing Loong as the basis for the 20-hour/16,000-foot cut-point.[[1]](#footnote-1) Our weight requirement comes from the US Air Force’s UAV classification system.[[2]](#footnote-2) Prominent UAVs our criteria defines as advanced include the Israeli Heron 1, the Israeli Hermes 900, the Iranian Shahed 129, and the Turkish ANKA.[[3]](#footnote-3)

We thought the existing criteria suffered from two key limitations.

1. MTCR Category I UAVs are those that can carry a 500kg payload at least 300km. This designation is supposed to capture the most advanced drones. However, in our view, the bar set by the MTCR is too high: 300km is well beyond the distance required for over-the-horizon, the relative distance category for advanced UAVs, and the 500kg payload line is arbitrary. The US government treats the MQ-1 Predator as a Category I system, but it arguably is not since, according to its manufacturer, the UAV’s payload capacity is less than 500kg. By focusing on only Category I UAVs, therefore, we would fail to capture many military-relevant UAVs.
2. The US Air Force UAV classification for the most advanced platforms only focuses on weight (1320 lbs for Group 4 and Group 5) and altitude (less than FL 180, or 18000 feet for Group 4, more than that for Group 5). A definition that included all Group 4 and Group 5 would have been less restrictive than the definition we use (which includes endurance and elevation of at least 16000 feet), because the USAF definition does not place an elevation restriction on Group 4 systems. While we could have restricted our definition just to Group 5 systems by requiring elevation of 18000 feet, that would have excluded the MQ-1 Predator as well, which seemed too restrictive.

This section lists some of the UAVs that are classified as advanced based on the criteria set forth in our article. It includes some systems in development at the time our database was created, as well as some not deployed widely, but the purpose of the table is to outline an expanded universe of “advanced” UAVs. While the information on each of these systems is not perfect, it is based on the best publicly available data representing capabilities on December 31, 2014. The table below also indicates which country developed each advanced drone.

In the database that we will release upon publication of the paper, we will include the UAV capabilities of each country. For those with advanced or armed UAVs, we will also outline the key systems they had by December 31, 2014. This will provide more complete and useful information than the table below.

**Appendix Table A.12: UAVs Classified as Advanced**

|  |  |
| --- | --- |
| **UAV Name** | **Country** |
| Altius\* | Russia |
| Altus II | USA |
| ASN-229A | China |
| Bateleur\* | South Africa |
| Buraq\* | Tunisia |
| BZK-005 (Giant Eagle) (Sea Eagle) | China |
| Centaur\*\* | USA |
| CH-4 | China |
| Dominator | Israel |
| Dozor-600 (Watch-600/ Watch 3) | Russia |
| European UAS (Talarion)\* | Germany, France, Spain |
| Falco EVO | Italy |
| Falcon Eye | Israel |
| Fotros | Iran |
| Global Hawk (RQ-4 Blocks 20/30/40) | USA |
| Global Observer | USA |
| Gray Eagle MQ 1C (Warrior/ Sky Warriors) | USA |
| Harfang (Eagle 1) | Germany, France |
| Hermes 900 | Israel |
| Hermes 1500 | Israel |
| Heron I/Mahatz 1 | Israel |
| Heron TP/ IAI Eitan (Eagle 2) | Israel, France |
| Hummingbird (A160 and A160T) | USA |
| Hunter MQ 5B | Israel, USA |
| I-GNAT ER/Sky Warrior Alpha | USA |
| Mantis\* | UK |
| Mariner | USA |
| Milano\* | Spain |
| Mobius | USA |
| Model 395\* | USA |
| Molynx (BlackLynx)\* | Italy |
| MQ-1C Gray Eagle (Sky Warrior) | USA |
| MQ-4C Triton\* | USA |
| Patroller (R, M, S) | France |
| Perseus B | USA |
| Phantom Eye\* | USA |
| Predator (RQ-1A/MQ-1) | USA |
| Predator B (MQ-9 Reaper) | USA |
| Rustom II\* | India |
| Ruston-H\* | India |
| SA03\* | UK |
| SARA III\* | Argentina |
| Shahed 129 | Iran |
| SkyRaider\* | USA |
| Solar Eagle (Vulture II)\* | USA |
| Taranis \* | UK |
| Telemos (SDM Euromale)\* | France, UK |
| Theseus | USA |
| TiHA (Anka)\* | Turkey |
| United 40 (Smart Eye 2) | UAE |
| Wing Loong (Pterodactyl) | China |
| Zond-2\* | Russia |

Notes:

\* In development

# Case Descriptions and Sources for the UAV Dataset

Our article presents new data on the global proliferation of drones. The dataset provides information on the UAV capabilities of all countries. It identifies, in particular, whether a state has short-range tactical drones, more advanced UAVs, or armed UAV programs.[[4]](#footnote-4)

This appendix provides additional details about our dataset. It describes each country’s UAV capabilities, and lists the sources we used to make coding decisions. We exclude states from this list if we found no evidence that they possessed a UAV capability of any kind.

Algeria

Algeria possesses the tactical Seeker UAV. The country has expressed interest in advanced drones, including the UAE-built United 40, but it does not currently field a medium altitude long endurance (MALE) UAV. Algeria has an armed UAV acquisition program: the Algerian Defense Ministry indicated that the country is pursuing attack drones, including the Chinese CH-4, which can be equipped with two AR-1 laser guided missiles and two FT-5 bombs.

Sources:

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Angola

Angola operates Israeli Aerostar tactical drones. It recently entered into negotiations for the purchase of advanced Heron I UAVs from Israel. However, there is no firm evidence that Angola currently possesses these (or any other) advanced drones. We likewise found no evidence of an armed drone program in Angola.

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Argentina

The Argentine army fields the indigenously developed Lipan M3 tactical UAV. The country has demonstrated a growing interest in drone technology, but it does not appear to presently possess advanced drones or have an armed UAV program.

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Armenia

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Australia

Australia operates advanced Heron UAVs in Afghanistan, and possesses smaller tactical drones (including the ScanEagle). Australia is also pursuing more advanced UAVs through the purchase of American Tritons. Australian Defense Force chief General David Hurley indicated that the country is pursuing an armed UAV capability, and other media reports substantiate this claim.

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Austria

Austria operates tactical Camcopter UAVs, but does not possess advanced drones. There is no evidence of an Austrian armed UAV program.

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Azerbaijan

Azerbaijan possesses the Hermes 450, among other tactical drones. It signed a $1.6 billion arms deal with Israeli Aerospace Industries in 2011 or 2012, which reportedly included the sale of five advanced Heron drones. Local news outlets reported in 2013 that these UAVs were to be featured in an upcoming military parade, but there is no firm evidence of the Herons being operational at this time. There has been some speculation that Israel is operating these drones from within Azerbaijan, though Azerbaijan officials have insisted this is not the case. Azerbaijan has armed UAV ambitions: it is pursuing a lethal version of the Turkish Anka UAV.

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Bangladesh

The Bangladesh Navy has started to produce indigenously constructed tactical UAVs, but no UAVs were operational in 2013.

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Belarus

Belarus is developing a number of tactical UAVs domestically. The Grif-1 and Berkut UAVs completed flight-testing and are due for delivery to the government in 2015. The larger Burevestnik UAV completed testing in July 2014, and plans are underway to jointly manufacture this model with Turkmenistan. Vietnam is apparently also interested in acquiring Belarusian tactical drones. None of these drones were operational in 2013.

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Belgium

Belgium has tactical B-Hunter UAVs, a less-advanced variant of the MQ-5B Hunter. Belgium does not possess advanced drones nor does it have an armed program.

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Belize

The Fisheries Department in Belize began using drones to track illegal fishing in 2014. None of these tactical UAVs were in operation in 2013 however.

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Bhutan

Bhutan is testing small tactical UAVs for delivering medicine and for environmental surveillance, but none of these drones were operational in 2013.

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Bolivia

Bolivia has the South Korean made Ucon System Remoeye-006 UAV. It does not have more sophisticated drone capabilities.

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Botswana

Botswana has Hermes 450 tactical UAVs from Israel. It does not have an armed UAV program, nor does it possess advanced drones.

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Brazil

Brazil operates the largest number of drones in Latin America. It has Hermes 900 advanced UAVs, and it recently ordered the Heron from Israel. Brazil does not appear to have an armed UAV program, and it has been critical of the United States’ use of drones to attack suspected terrorists. In August 2014 FT Sistemas S.A. announced the first export of an indigenous drone. The tactical FT-100 mini UAV will be operated by an unnamed African country.

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Bulgaria

A domestic firm (Armstechno) has built tactical UAVs. In 2013 the Bulgarian defense minister announced the government was in the process of choosing UAVs for future efforts, through it is not clear that Bulgaria currently fields any drones.

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Burundi

The United States has supplied tactical Raven UAVs to Burundi. This appears to be the extent of the country’s drone capabilities.

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Canada

Canada fields tactical drones, including the Skylark. It also leased Heron TP advanced UAVs for use in Afghanistan from 2008 to 2011, at which time Canada turned them over to Australia. In 2012 Canada’s CAE and Israel’s IAI began testing the advanced Israeli Dominator XP in Canada. The project is a joint effort to demonstrate how the Dominator can be used for civil purposes. The Canadian government gave permission for the flight tests, but the advanced UAV is operated by private enterprise. Ottawa would like to acquire MALE UAVs, but they did not have that capability by the end of 2013. Canada has announced plans to arm its drones.

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Chile

Chile possesses the advanced Hermes 900. It has also purchased smaller UAVs from Israel, and developed a tactical drone indigenously (Lascar). There is no evidence of an armed UAV program in Chile.

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China

China’s UAV program has made great strides over the last five years. Beijing currently fields a variety of drones, ranging from small tactical systems to advanced combat vehicles. It possesses an indigenously developed armed drone called the Wing Loong (also known as the Pterodactyl) that closely resembles the American Predator. China also possesses the indigenously developed CH-4, said to be more advanced than the Wing Loong. China also has other combat drones under development, and it has emerged as a key exporter of UAVs.

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Colombia

Colombia operates the American tactical ScanEagle UAV, as well as the advanced Hermes 900. It has also announced plans to develop drones domestically. The Hermes 900 could, in theory, be modified to carry missiles, but there are no indications of a Colombian lethal drone program.

Sources:

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Croatia

Croatia operates Hermes 450 tactical drones. It does not currently possess advanced UAVs or have an armed UAV program.

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Cyprus

Cyprus operates tactical UAVs, including the Hermes 450 and the Searcher Mk II. It does not, however, possess advanced drones. In addition, we found no evidence of a Cypriot armed UAV program.

Sources:

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Czech Republic

The Czech Republic operates tactical drones, including the American Raven and a domestically built UAV. It does not currently field advanced UAVs. There also does not appear to be armed drone program in the country.

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Denmark

Denmark possesses Sperwer, Puma, and Raven tactical UAVs. We found no evidence of more advanced UAVs in Denmark, nor indications of an armed program.

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Dominican Republic

Though the Dominican Republic does not posses its own UAVs, it does have an agreement with the US to allow Predator drones flown by USDA and Dominican authorities to track drug smugglers.

Sources:

“Dominican Authorities Unleash a US Predator on Drug Trafficking (Update),” *Dominican Today,* July 16, 2012; <http://www.dominicantoday.com/dr/technology/2012/7/16/44386/Dominican-authorities-unleash-a-US-Predator-on-drug-traffickingUpdate>; Rachel Glickhouse, “Explainer: Drones in Latin America,” Americas Society/ Council of the Americas (AS/COA), August 28, 2013, <http://www.as-coa.org/articles/explainer-drones-latin-america>; “U.S. Employs Drones in Caribbean Drug War,” *Fox News Latino*, April 27, 2013, <http://latino.foxnews.com/latino/news/2013/04/27/us-employs-drones-in-caribbean-drug-war/>.

Ecuador

Ecuador operates the Israeli advanced Heron UAV and the tactical Searcher Mk II. It does not have an armed drone program.

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Egypt

Egypt has tactical UAVs, including the Skyeye and the Camcopter. The country announced plans to purchase 10 advanced Anka UAVs from Turkey in 2012. However, it does not appear that Egypt possessed these drones at the end of 2013. We also did not find concrete evidence of an Egyptian armed UAV program.

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Estonia

Estonia operates the American Raven and a domestically produced tactical drone. It does not have more advanced drone capabilities.

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Ethiopia

Ethiopia acquired BlueBird drones from Israel, but it does not have advanced UAVs or an armed UAV program.

Sources:

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Finland

Finland has several tactical drones, including the Ranger and the Patria MASS MUAV. It does not currently field advanced UAVs, nor does it have an armed program.

Sources:

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France

France possesses tactical and advanced UAVs. It operates a sophisticated surveillance drone similar to the Israeli Heron, known as the Harfang. In addition, a French outfit has fitted the Sperwer B UAV with Israeli precision strike missiles. And France is developing the nEUROn armed UAV in conjunction with several European allies.

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Georgia

Georgia has the Hermes 450 UAV, among other tactical drones (including one that is domestically built). The country also announced plans in 2012 to produce armed drones indigenously. Georgia did not possess advanced UAVs at the end of 2013.

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Gary Mortimer, “Georgia to be Protected by Armed Drones,” sUAS News, April 18, 2012, <http://www.suasnews.com/2012/04/14722/georgia-to-be-protected-by-armed-drones/>; Guy Anderson, “Elbit Sues Georgia Over Alleged Non-Payment of USD 100 Million,” *IHS Jane’s Defence Weekly,* April 11, 2011, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1186645&Pubabbrev=JDW>; <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1116450&Pubabbrev=IWR>;

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Germany

Germany possesses numerous drones of varying capabilities. It operated Heron drones in Afghanistan. The country is developing sophisticated UAVs, like the EuroHawk, a derivative of the U.S. Global Hawk surveillance drone. Germany is also working on the Barracuda with Spain. This drone is intended to demonstrate combat capabilities. Some officials in Berlin have lobbied for acquiring armed drones from Israel or the United States.

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Greece

Greece operates the Sperwer-A, among other tactical drones. There is no evidence that the country presently fields advanced UAVs, either for surveillance or combat. However, Greece participates in the pan-European nEUROn UCAV program.

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Hungary

Hungary has built tactical UAVs domestically. In 2006, it ordered Sofar drones from Poland. Hungary does not have advanced drones. There is also no evidence of an armed UAV program.

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India

India has a number of domestically developed tactical UAVs and a robust drone development program. It obtained the advanced Heron UAV from Israel. India is currently developing the AURA, a stealth drone with precision strike capabilities. The Rustom II, a drone similar to the Predator, is also in development.

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Indonesia

Indonesia has acquired tactical UAVs, including the Searcher II. The country is also developing tactical drones indigenously. Some of these UAVs, according to Defense Minister Purnomo Yusgiantoro, could be upgraded to carry missiles and bombs. Officials at the Indonesian Defense Ministry say there are long-term plans for an offensive model of the Wulung UAV. The advanced Israeli Heron is reportedly operating in the country.

Sources:

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Ireland

Ireland acquired tactical Orbiter UAVs from Israel. It does not have more advanced drones, nor does it have an armed program.

Sources:

Don Lavery, “Defence Forces to Use Israeli Robot Spy Planes,” *Independent*, January 8, 2007, <http://www.independent.ie/irish-news/defence-forces-to-use-israeli-robot-spy-planes-26308432.html>; Siemon Wezeman, “UAVs and UCAVs: Developments in the European Union,” European Parliament Subcommittee on Security and Defence, October 2007, <http://www.europarl.europa.eu/RegData/etudes/etudes/join/2007/381405/EXPO-SEDE_ET(2007)381405_EN.pdf>.

Iran

Iran has developed tactical, advanced, and armed UAVs indigenously. The Ababil, the Karrar, and the Shahad 129 are among its most significant drones. Of these, the latter is the most sophisticated; it is the first Iranian MALE UAV, and it is capable of carrying out both long-range surveillance and attack missions.

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Iraq

Iraq has previously had an indigenous UAV program. Following failures to convert piloted planes to UAVs in the 1980s and 1990s, Iraq began focusing on the development of smaller UAVs. There were two parallel programs in the 1990s, the Ibn Fernas and Al-Quds programs. The most successful of the Ibn Fernas UAVs was the al Musayara-20, which passed test flights and was in the process of being delivered to the Iraqi government in 2002. There are indications that Iraq was hoping to arms its UAVs, perhaps even with chemical or biological weapons. More recently, there are indications that as of 2012 the US agreed to sell tactical Scan Eagle UAVs to the Iraqi navy, though these were not delivered by the end of 2013.

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Israel

Israel has one of the most advanced UAV programs in the world. It has developed numerous tactical systems, including the Shadow, Orbiter, Aerostar, Skylark, and Hermes 90. Israel’s advanced UAVs include the Hermes 900, Heron I, and Heron TP. Some of these drones have been equipped with missiles. Israel is one of the few countries known to have carried out an attack with an armed UAV. It reportedly used armed drones to take out targets in Lebanon, Egypt, and the Gaza Strip, and to attack a convoy in Sudan in 2009.

Sources:

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Italy

Italy has produced the FALCO and other tactical drones domestically. It operates unarmed Reaper UAVs obtained from the United States. Italy has publicly expressed its desire to arm these drones, but there is no evidence that its Reapers were equipped with missiles by the end of 2013. The country is also part of the nEUROn project.

Sources:

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Ivory Coast

Ivory Coast operates the Israeli Aerostar, but it lacks more advanced UAV capabilities.

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Japan

The United States has leased RQ-4 Global Hawks to Japan so that Tokyo can monitor Chinese military deployments near Okinawa. Tokyo has plans to purchase RQ-4s, too. Japan also fields tactical UAVs, like the Yamaha RMAX IIG. There is no firm evidence of an armed drone program in Japan.

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Jordan

Jordan operates the CamCopter tactical UAV. It does not yet possess advanced drones. We also did not find firm evidence of an armed UAV program.

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Kazakhstan

Kazakhstan operates the Orbiter and the Russian Irkut, which are both tactical UAVs. The country is ramping up its UAV capabilities. It is interested in acquiring Predator XPs from the United States, but Kazakhstan does not yet field an advanced drone. Adilbek Dzhaksybekov, the Kazakh defense minister from 2009 to 2014, was reportedly “very interested” in obtaining armed UAVs. Interest in armed drones from a senior government official qualifies as having an armed drone program, based on our criteria. Yet we should note that the evidence pointing to such a program is weaker than in other cases.

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Kenya

Israel’s IAI systems may have sold UAV systems to Kenya, though evidence is limited. Kenya was also interested in American Raven drones, though it is unclear if any of these UAVs were obtained. In 2013 Kenya apparently began training UAV operators, and some sources note that Kenya will soon have an operational capability. There is no firm evidence of an operational capability in 2013. There is weak evidence that Kenya might be interested in the Chinese CH-4 attack drone, but not enough to determine this with certainty.

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Arie Egozi, “The Next Destination: Africa,” Israel Defense, October 31, 2011, <http://www.israeldefense.com/?CategoryID=472&ArticleID=660>; Dan Parsons, “Worldwide, Drones are in High Demand,” *National Defense*, May 2013, <http://www.nationaldefensemagazine.org/archive/2013/May/Pages/Worldwide,DronesAreinHighDemand.aspx>; Harrison Menke, “Commentary: Africa’s Window into the Drone Age,” DefenseNews, January 20, 2014, <http://www.defensenews.com/article/20140120/DEFREG04/301200039/Commentary-Africa-s-Window-Into-Drone-Age>; Phil Muncaster, “China’s Cut-Price Drones Attract Asian and African Buyers,” *The Register,* November 16, 2012, <http://www.theregister.co.uk/2012/11/16/china_drones_cheap_us/>.

Latvia

Latvia has produced the Penguin B mini-UAV indigenously. The country does not have advanced UAVs, whether armed or unarmed, nor is it likely to pursue them in the near future.

Sources:

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Lebanon

Lebanon obtained Raven tactical UAVs from the United States. Hezbollah reportedly has Iranian-supplied drones. We exclude these from Lebanon’s capabilities since the militant group is distinct from the Lebanese government (although the political wing of Hezbollah has representation in government).

Sources:

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Libya

Libya operates tactical drones for surveillance. It does not possess advanced UAVs, and there is no evidence of an armed drone program.

Sources:

Dan Alex, “Shiebel Camcopter S-100 Rotary-Wing Unmanned Aerial Vehicle,” Military Factory, August 14, 2014, <http://www.militaryfactory.com/aircraft/detail.asp?aircraft_id=898>; “Libyan Drones Take to Skies for First Time,” *Libya Herald*, March 17, 2013, <http://www.libyaherald.com/2013/03/17/libyan-drones-take-to-skies-for-first-time/#axzz2tWFPTnVY>; “Red-White-Red Drones in Gaddafi’s Services,” der Standard, March 1, 2011, <http://derstandard.at/1297819293825/Austro-Kriegsmaterial-Rot-weiss-rote-Drohnen-in-Gaddafis-Diensten>; Robert Hewson, “Rise of Falco: Selex-Galileo Increases Size and Payload Capacity for Next UAV,” *IHS Jane’s International Defence Review*, April 8, 2009, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1106221&Pubabbrev=IDR>.

Lithuania

Lithuania obtained ScanEagles from the United States. In addition, the country’s special forces used U.S.-supplied tactical UAVs in Afghanistan. Lithuania does not have advanced drones, nor has it shown any interest in lethal UAVs.

Sources:

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Malaysia

Malaysia has a robust domestic UAV industry. It currently operates the tactical Aludra UAV. The country also leases Yabhon Aludra MALE UAVs, which were jointly developed with the UAE, for counterterrorism purposes. Malaysia does not appear to have an armed drone program.

Sources:

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Malta

In 2014 the government and police force of Malta began using drones to monitor bird hunting. There is no evidence suggesting UAVs were used before this point.

Sources:

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Mexico

Mexico has the tactical Hermes 450 and the advanced Hermes 900, both of which came from Israel. It has also placed an order for two of Israel’s advanced Dominator XP UAVs. Mexico produces a number of tactical UAVs indigenously. The country may have previously been interested in an armed UAV program. President Calderon reportedly requested armed UAVs from the US to fight drug smugglers, though it is unclear if Mexico was hoping to acquire and operate these UAVs themselves. No further evidence of an armed program was found.

Sources:

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<http://www.defenseindustrydaily.com/israel-is-hermes-900-uav-launch-customer-as-iaf-expands-its-fleets-06363/>; <http://www.aviationweek.com/Blogs.aspx?plckBlogId=blog:27ec4a53-dcc8-42d0-bd3a-01329aef79a7&plckPostId=Blog:27ec4a53-dcc8-42d0-bd3a-01329aef79a7Post:4982f0e0-5d66-4eb6-97c1-5dbe7bd65c54>;

Morocco

Morocco operates tactical R4E-50 Skyeye drones. It also acquired advanced Israeli-made Harfang drones via France. The country may also receive unarmed Predators from the United States in the future. At this time, Morocco does not seem to have an armed UAV program.

Sources:

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Mozambique

Mozambique may be interested in pursuing tactical drones to assist with maritime security, with sources reporting that the US or Portugal might be willing to help. There is no evidence of operational UAVs in 2013.

Sources:

“Drone Project Sees NASA, Portugal, Mozambique Join Forces,” *The Portugal News Online*, December 9, 2013, <http://theportugalnews.com/news/drone-project-sees-nasa-portugal-mozambique-join-forces/29362>; “Mozambique Mulls Producing Drones for Maritime Surveillance,” China.org, September 7, 2013, <http://www.china.org.cn/world/Off_the_Wire/2013-09/07/content_29954541.htm>.

Myanmar

Malaysian officials reportedly expressed interest in Chinese CH-4s at an air show, but no other evidence was found indicating the country was interested in acquiring UAVs.

Sources:

Phil Muncaster, “China’s Cut-Price Drones Attract Asian and African Buyers,” The Register, November 16, 2012, <http://www.theregister.co.uk/2012/11/16/china_drones_cheap_us/>.

Namibia

In 2014 the Namibian government deployed three Falcon UAVs for anti-poaching operations. There is no evidence that Namibia deployed UAVs before this point.

Sources:

Megan Gannon, “Drones Enter the Battle Against Elephant, Rhino Poachers,” livescience, February 5, 2014, <http://www.livescience.com/43134-drones-track-elephant-rhino-poachers.html>; “Namibia Deploys UAVs for Anti-Poaching…” *Safari Magazine*, September 12, 2014, <http://safari-magazine.com/kenya/namibia-deploys-uavs-for-anti-poaching/>; Oscar Nkala, “Namibia Deploys UAVs for Anti-Poaching Operations,” defenceWeb, September 10, 2014, <http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=36222:namibia-deploys-uavs-for-anti-poaching-operations&catid=35:Aerospace&Itemid=107>.

Nepal

Beginning in 2012 the World Wildlife Fund for Nature began testing tactical UAVs and training Nepali park rangers and army personnel in the use of these UAVs for monitoring poaching. The UAVs were reportedly transferred to Napoli authorities, though it is unclear if they were in operation by the end of 2013.

Sources:

James Holloway, “World Wildlife Fund turns to Drones in Bid to Tackle Poaching,” ars technica, February 22, 2013, <http://arstechnica.com/science/2013/02/world-wildlife-federation-turns-to-drones-in-bid-to-tackle-poaching/>; Neal Ungerleider, “The Google-Funded Drones that Hunt Illegal Hunters,” Fast Company, <http://www.fastcompany.com/3003870/google-funded-drones-hunt-illegal-hunters>; “Nepal Launches Drones to Combat Poachers,” *The Telegraph*, June 20, 2012, <http://www.telegraph.co.uk/news/worldnews/asia/nepal/9343444/Nepal-launches-drones-to-combat-poachers.html>; “Nepal Tests New Unmanned Aerial Vehicle Technology to Stop Wildlife Crime,” WWF, September 12, 2012, <http://wwf.panda.org/?206154/Nepal-tests-new-unmanned-aerial-vehicle-technology-to-stop-wildlife-crime>; “New Technology to Fight Wildlife Crime,” WWF, September 12, 2012, <http://www.worldwildlife.org/stories/new-technology-to-fight-wildlife-crime>; Sunir Pandey, “Game of Drones,” *Nepali Times*, May 28, 2014, <http://nepalitimes.com/article/nation/Game-of-drones,1329>; “Unmanned Aerial Vehicle to Aid Nepal’s Conservation Efforts,” WWF, June 18, 2012, <http://wwfnepal.org/?205266/Unmanned-Aerial-Vehicle-to-aid-Nepals-Conservation-Efforts>.

Netherlands

The Netherlands operates a number of tactical UAVs, including the Sperwer, Raven, and ScanEagle. It ordered an unarmed Reaper in 2013, but it has not yet been delivered (and likely will not be until 2016). The country has not shown a discernable interest in armed drones.

Sources:

“Aerostar Tactical Unmanned Aerial Vehicle, Israel,” airforce-technology, <http://www.airforce-technology.com/projects/aerostaruav/>; “Dutch to Rent Israeli UAVs for Afghanistan,” Defense Industry Daily, March 25, 2009, <http://www.defenseindustrydaily.com/Dutch-to-Rent-Israeli-UAVs-for-Afghanistan-05254/>; “Israeli Mini-UAV Struts its Stuff in the Netherlands,” Military Photos, June 22, 2004, <http://www.militaryphotos.net/forums/archive/index.php/t-15517.html>; Menno Steketee, “Netherlands Selects MQ-9 Reaper,” *IHS Jane’s 360 Defence*, November 21, <http://www.janes.com/article/30605/netherlands-selects-mq-9-reaper>.

New Zealand

New Zealand operates the Phoenix, among other tactical UAVs. It does not possess advanced drones, nor has it shown an interest in armed UAVs.

Sources:

Michael Field, “Eye Spy Disaster in the City Sky,” Stuff, January 26, 2014, <http://m.stuff.co.nz/national/9650496/Eye-spy-disaster-in-the-city-sky>; Michael Morrah, “Police Confirm Spy Drone Purchase,” *3 News*, December 23, 2012, <http://www.3news.co.nz/Police-confirm-spy-drone-purchase/tabid/423/articleID/281359/Default.aspx>; “New Zealand’s Home-Grown Un-manned Aircraft,” UAS Vision,

<http://www.uasvision.com/2011/08/10/new-zealands-home-grown-unmanned-aircraft/>; Rupert Pengelley, “Forewarned is Forearmed: The Unified NZDF Keeps an Electronic Eye on the Future,” *IHS Jane’s International Defence Review*, August 28, 2013, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1584834&Pubabbrev=IDR>.

Nigeria

Nigeria introduced the domestically produced Gulma in 2013. It is interested in acquiring the Hermes 900, but there is no evidence that the country currently has advanced drones. We also did not find evidence of a Nigerian armed UAV program.

Sources:

Jeremy Binnie, “Nigerian Air Force Unveils UAV,” *IHS Jane’s Defence Weekly*, December 20, 2013, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1596479&Pubabbrev=JDW>; Michael Goldfarb, “Drone Sales Skyrocket Globally, Nigeria Looking to Acquire Israeli-Made Hermes ‘Attack’ UAV,’ Global Post, September 23, 2012, <http://beegeagle.wordpress.com/2012/09/24/drone-sales-skyrocket-globally-nigeria-looking-to-acquire-israeli-made-hermes-attack-uav/>; “Nigeria Develops Unmanned Coastal Capability,” *IHS Jane’s Defence Weekly*, April 7, 2006, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1153291&Pubabbrev=JDW>; “Nigeria: Jonathan Unveils Nigeria’s First Indigenous Gulma UAV,” All Africa, December 17, 2013, <http://allafrica.com/stories/201312171671.html>; “Update: Nigeria’s Unmanned Aerial Vehicle to be Deployed by end of March 2014,” Pana Press, December 17, 2013, <http://www.panapress.com/UPDATE--Nigeria-s-unmanned-aerial-vehicle-to-be-deployed-by-end-of-March-2014--13-890188-0-lang2-index.html>.

North Korea

North Korea possesses tactical Pchela-1 (Shmel) drones. In May 2014, Seoul announced that some of North Korea’s UAVs had crashed in South Korea. Some analysts are concerned that North Korea will use armed UAVs in the future. However, we were unable to locate any clear evidence of an armed drone program.

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Norway

Norway has acquired tactical UAVs, including the German Aladin. It has also shown interest in the MQ-4C Triton, the Naval version of the Global Hawk. It is part of the NATO Alliance Ground System (AGS) program, which will eventually provide an advanced UAV capability throughout the alliance. Yet Norway does not currently possess advanced drones, nor is it pursuing armed UAVs.

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Pakistan

Pakistan operates tactical UAVs obtained from Europe, notably the Luna and the Falcon. It inducted the armed Burraq and the unarmed Shahpar into service in November 2013. These UAVs closely resemble the Chinese CH-3, a tactical UAV, but Pakistan claims that they are indigenously produced. Pakistan sought to obtain Predators from the United States as early as 2002, but appears to have been unsuccessful. It therefore decided to develop armed drones indigenously. We did not find evidence that the country currently fields advanced UAVs, whether armed or unarmed.

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Panama

Panama operates tactical UAVs, and it expressed an interest in the advanced Israeli Heron as early as 2009. The country does not currently possess advanced drones, however, and there is no evidence of an armed program.

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Paraguay

Paraguay developed the Taguato-I tactical UAV indigenously. This drone conducted its first test flight in 2011 and the Paraguayan air force presented a prototype to the ministry of defense in 2012. The Attorney General of Paraguay recently announced plans to create a drone unit within the police force. No UAVs are currently in operation.

Paraguay lacks other, more advanced UAV capabilities.

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Peru

Peru possesses indigenously developed tactical drones, as well as the MicroFalcon and the Orbiter 2. It is reportedly seeking an advanced UAV capability, but it does not currently field sophisticated drones. The country does not have an armed UAV program.

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Philippines

There are reports that the Philippines own and operate the Heron B RQ 5 UAV. The Stimson Center reports that the US sold two of these secondhand UAVs to the Philippines in 2009, though it is unclear if these would be the E-Hunter advanced UAV or the tactical design. There have also been claims that the Predator A operates in the Philippines, though it is likely the US would operate these drones. The Philippine army has developed two small drones that they use for surveillance (Raptor and Knight Falcon). They are developing a third, larger drone. The country employs the American Raven and some tactical Israeli UAVs. It does not currently have an armed program.

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Poland

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Portugal

Portugal developed a tactical UAV indigenously (ANTEX-M). The air force began conducting test flights of the ANTEX-M in 2009. Portugal does not have more advanced drone capabilities, and it has shown no interest in armed UAVs.

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Qatar

Turkey sold Qatar tactical Bayraktar UAVs in 2011-2012. Reports from 2014 indicate that military pilots in Qatar received training for operating UAVs. There is no indication that UAVs were in use in 2013.

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Romania

Romania operates the Shadow and produces tactical UAVs indigenously. We did not find evidence of other, more sophisticated UAV capabilities in the country.

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Russia

Russia’s UAV program lags significantly behind those of other industrialized countries, like Israel and the United States. Moscow obtained tactical Bird-Eye 400, I-View Mk 150, and Searcher II UAVs from Israel in 2010. The country does not currently field advanced UAVs. It hoped to obtain the advanced Heron I from Israel, but there is no evidence that these efforts were successful. Russia postponed a test of another advanced drone – the UAE United 40 Block 5 – in 2014. Russia does, however, have an ambitious armed drone program. It is developing several armed UAVs, including the Skad, Altius, and Dozor 600.

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Saudi Arabia

Saudi Arabia’s UAV capabilities are currently modest: the country has developed tactical drones indigenously, but it does not yet have advanced UAVs. However, its capabilities are likely to increase rapidly in the coming years. Saudi Arabia attempted to purchase armed drones from the Unite

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Serbia

Serbia possesses Orbiter tactical drones, and it has developed Sparrow UAVs indigenously. It does not have advanced UAVs, nor is there evidence of an armed program.

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Singapore

Singapore has a fairly large UAV arsenal. It operates tactical Hermes 450, ScanEagle, Skylark, Bird-Eye, and Searcher drones, in addition to advanced Herons. The country also has produced tactical drones indigenously. We did not find evidence of an armed drone program in Singapore.

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Slovakia

Slovakia operates Skylark tactical UAVs, but it currently lacks more advanced drones. It is part of the NATO AGS, so it will likely acquire an advanced UAV capability in the future. The country is not pursuing armed drones.

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Slovenia

Slovenia has developed a tactical drone domestically, but it does not possess advanced UAVs nor have an interest in armed vehicles currently.

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South Africa

The South African air force currently operates Seeker II tactical UAVs for surveillance. A domestic firm (Denel) has developed an advanced UAV called the Bateleur. The South African military may field this UAV in the future, as it desires a MALE drone. There is no evidence that it currently operates an advanced drone, however. Denel manufactured an armed version of the Seeker 400, and it plans to sell this UCAV to Saudi Arabia (see above).

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South Korea

South Korea deploys Searcher and Night Intruder tactical UAVs. It has ordered advanced UAVs from Korean Air, but these drones are not yet in operation. South Korea is also seeking to purchase Global Hawks from the United States. The country operates Harpy UAVs from Israel, but we do not classify suicide drones as UAVs since they are not reusable (the Harpy is more similar to a cruise missile than a UAV).

Sources:

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Spain

Spain operates Searcher and Raven tactical UAVs. It (along with France and Germany) has funded the development of the advanced Talarion MALE drone, but this UAV is not currently operational. In addition, Spain is part of the nEUROn project, which is aimed at developing armed drones.

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Sri Lanka

Sri Lanka employs tactical Searcher Mark II and III UAVs as well as Super Scout UAVs for surveillance and reconnaissance missions. Sri Lanka has been accused of using these Israeli-acquired UAVs to conduct surveillance of Tamil Tiger rebel groups. Sri Lanka is also developing its own tactical UAV program. The indigenous Superstar may already be in use. There is no evidence of more advanced UAVs, nor of an armed drone program.

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Sudan

The Sudan Armed Forces are apparently operating Iranian-supplied tactical UAVs. It is possible Iran is operating the UAVs, but evidence in this regard is unclear. There is no evidence that Sudan operates advanced UAVs, and no evidence of armed UAV ambitions.

Sources:

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Sweden

Sweden operates tactical UAVs, including the Sperwer and the RQ-7 Shadow. It has pursued advanced UAVs, including the Israeli Eagle 2, for the last decade or so. However, Sweden does not currently operate MALE or HALE drones. The country is also pursuing an armed UAV capability through its membership in the European nEUROn initiative.

Sources:

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Switzerland

Switzerland operates Ranger tactical UAVs, and it is part of the nEUROn project. In December 2012 the American Aurora Flight Sciences delivered a Centaur optionally piloted aircraft to Switzerland. In its unmanned formation, the UAV is classified as advanced. The UAV is suited to surveillance and reconnaissance missions, and was purchased by Switzerland to test UAV technologies and sensors. The aircraft was expected to be in operation by 2013, but it is unclear if Switzerland has proceeded beyond flight tests. The country purchased Hermes 900 advanced drones from Israel in 2014, but it did not have MALE or HALE drones in operation at the end of 2013.

Sources:

“ADS 95 Ranger,” Swiss Air Force, <http://www.lw.admin.ch/internet/luftwaffe/en/home/dokumentation/assets/aircraft/ads95.html>; “Chapter 4: Europe,” in *Military Balance*, Vol. 114, No. 1, 2014; “Diamond DA42 Centaur Optionally Piloted Aircraft (OPA), Switzerland,” Airforce-Technology, <http://www.airforce-technology.com/projects/diamond-da42-centaur-optionally-piloted-aircraft-opa/>; “Global Exports of Unmanned Aerial Vehicles/ Systems,” *Stimson Center*, April 2014; Nicholas de Larrinaga, “Switzerland Selects Hermes 900 MALE UAV,” *IHS Jane’s 360 Defence,* June 5, 2014, <http://www.janes.com/article/38803/switzerland-selects-hermes-900-male-uav>; Siemon Wezeman, “UAVs and UCAVs: Developments in the European Union,” European Parliament Subcommittee on Security and Defence, October 2007, <http://www.europarl.europa.eu/RegData/etudes/etudes/join/2007/381405/EXPO-SEDE_ET(2007)381405_EN.pdf>; “Swiss Department of Defence Becomes Centaur Launch Customer,” Aurora Flight Sciences, January 25, 2012, <http://www.aurora.aero/Media/Press/Item.aspx?id=APR-286>.

Syria

In April 2014, media reports indicated that an Iranian Shahad 129 drone flew over Syria. However, it is not clear that Iran sold this UAV to the Syrian government (Iran may have been operating the drone to collect intelligence on behalf of Syria). Whether this drone appeared in Syria prior to the end of 2013 is also unclear. We therefore do not code Syria as possessing an advanced UAV capability. Syria does, however, possess tactical drones, including the Iranian Ababil and Mohajer, as well as the Russian TU-143. These UAVs are reportedly being used in the ongoing Syrian civil war.

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Taiwan

A state-owned defense firm has developed and delivered 32 tactical drones to the Taiwanese government. Media reports from 2014 indicated that Taiwan used some of these drones to collect intelligence in Mainland China. Taiwan is also developing armed drones domestically. The government is interested in acquiring a HALE UAV, like the US Global Hawk, but it does not currently possess advanced drones.

Sources:

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Tanzania

Israel’s IAI apparently sold UAV systems to Tanzania, including ‘more advanced systems,’ though it is unclear if there were operational UAVs by the end of 2013. There is no evidence of advanced or armed UAV capabilities.

Sources:

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Thailand

Thailand operates tactical UAVs, including the Raven, the Aerostar, and the Searcher. In addition, DRDO is producing domestic UAVs for the Royal Thai Army. Thailand does not have advanced UAV capabilities.

Sources:

Adam Baddeley, “AMR UAV Directory 2012,” Asian Military Review, October 1, 2012, <http://www.asianmilitaryreview.com/amr-uav-directory-2012/>; Guy Martin, “Asian Region UAV Capability on the Rise,” Defence Review Asia, December 20, 2012, <http://www.defencereviewasia.com/articles/195/Asian-region-UAV-capability-on-the-rise>; Siva Govindasamy, “Thailand Outlines Plan for Indigenous UAV Family,” Flightglobal, November 4, 2009, <http://www.flightglobal.com/news/articles/thailand-outlines-plan-for-indigenous-uav-family-334366/>; “The IAI Searcher UAV Replaced Both the IAI Scout and Tadiran Mastiff UAV Types in Israeli Army Service,” Military Factory, July 9, 2013, <http://www.militaryfactory.com/aircraft/detail.asp?aircraft_id=1064>.

Trinidad and Tobago

Trinidad and Tobago has operated tactical drones for surveillance purposes.

Sources:

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Tunisia

Tunisia was the first Arab country to develop a drone industry domestically. It has several UAVs under development indigenously, including the advanced Buraq. The military does not currently field any of the domestically developed drones, but it does operate the American ScanEagle, a small tactical UAV. Some of the drones being developed by Tunisia Aero Technologies Industries (including the Buraq) could be armed with missiles.

Sources:

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<http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=32333:the-scan-eagle-as-a-combat-asset-shaping-a-new-business-model&catid=113:international-news&Itemid=248>; “Rotary Wing UAV: Jinn,” Tunisia Aero Technology, <http://tati-uas.com/uav-projects/rotary-wing-uav/>.

Turkey

Turkey has a developed UAV program. It was the third country, after Israel and the United States, to develop an advanced drone indigenously (the Anka). In addition, it operates foreign-built tactical UAVs (like the Israeli Aerostar) and advanced drones (like the Israeli Heron). Turkey is also aggressively pursuing armed drones. It attempted to acquire armed Reapers from the United States but was unsuccessful. The country has plans in the works to weaponize the Anka.

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Turkmenistan

In 2009 Turkmenistan contracted with the Russian company Zala Aero for tactical UAVs. No evidence was found indicating these UAVs were operational in 2013. Turkmenistan has also agreed to jointly develop UAVs with Belarus, and plans are underway to build a drone factory in Turkmenistan.

Sources:

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Uganda

Uganda operates Raven tactical UAVs, but lacks advanced drones.

Sources:

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Ukraine

Ukraine operates an old Soviet tactical UAV, the Tupolev. A state-owned firm has also produced a tactical drone.

Sources:

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UAE

The UAE is a leader of drone technology in the Arab world. It indigenously developed the United 40, an advanced drone, and acquired the Wing Loong from China. The UAE also possesses tactical UAVs, including the Seeker II. It attempted to acquire armed Predators from the United States, but was rebuffed (Washington did agree to sell the Predator XP, which is unarmed). The UAE has weaponized the United 40, making it capable of carrying Namrod missiles.

Sources:

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UK

The United Kingdom is one of the few countries to carry out an armed attack using a UAV. British operated Reapers have launched more than 300 missiles and laser-guided bombs in Afghanistan. The UK also possesses unarmed drones, including tactical systems such as the Black Hornet the Hermes 450.

Sources:

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USA

The United States is a global leader in UAV technology. It operates all types of UAVs, from small tactical drones to the world’s most sophisticated armed systems. Washington’s frequent use of armed drones in Pakistan, Yemen, and elsewhere has sparked global interest in UAV technology.

Sources:

“2011 Worldwide UAV Roundup,” Aerospace America, <http://www.aerospaceamerica.org/Documents/March%202011%20AA%20PDFs/UAV_CHART_2011.pdf>; Andrew Callam, “Drone Wars: Armed Unmanned Aerial Vehicles,” *International Affairs Review*, Vol. 28, No. 3, Winter 2010, <http://www.iar-gwu.org/node/144>; David Hambling, “Air Force Completes Killer Micro-Drone Project,” *Wired*, January 5, 2010, <http://www.wired.com/dangerroom/2010/01/killer-micro-drone/>.

Uruguay

Uruguay operates the domestically produced Charrua tactical UAV.

Sources:

“El Ejercito del Uruguay Evaluara Vehiculos Aeros no Tripulados en Kuwait,” Infodefensa, December 4, 2013, <http://www.infodefensa.com/latam/2013/12/04/noticia-ejercito-uruguay-evaluara-vehiculos-aereos-tripulados-kuwait.html>; Jose Higuera, “Border Control, Internal Security Drive UAV Market,” DefenseNews, March 25, 2014, <http://www.defensenews.com/article/20140325/DEFREG02/303250024/Border-Control-Internal-Security-Drive-UAV-Market>; Patricio Barnuevo, “The Future Role of Drones in Latin America,” Council on Hemispheric Affairs (COHA), November 6, 2012, <http://www.coha.org/the-future-role-of-drones-in-latin-america/>; “Uruguay: New Police UAVs Enter Service,” iHLS, January 5, 2014, <http://i-hls.com/2014/01/uruguay-new-police-uavs-enter-service/>.

Uzbekistan

The United States has reportedly exported tactical UAVs to Uzbekistan, and the country has introduced the advanced Chinese Wing Loong into service. The Wing Loong can deliver missiles, but there is no evidence that the drones in Uzbekistan are armed. We were unable to locate firm evidence of an armed UAV program in the country.

Sources:

“China Claims Six Potential Customers for Wing Loong,” Pakistan Defence, Blog, October 5, 2013, <http://defence.pk/threads/china-claims-six-potential-customers-for-wing-loong.281533/>; “China Claims Six Potential Customers for Wing Loong,” sUAS News, June 26, 2013, <http://www.suasnews.com/2013/06/23533/china-claims-six-potential-customers-for-wing-loong/>; Joshua Kucera, “Are the U.S. and Russia Fueling Tension Between Uzbekistan and Its Neighbors,” Eurasia Net, <http://www.eurasianet.org/node/66742>; “Uzbekistan: Capitol Hill Coddles Karimov,” Eurasia Net, February 28, 2013, <http://www.eurasianet.org/node/66620>; “Uzbekistan Purchases Military Drones from China,” *Central Asian News Service,* June 5, 2014.

Venezuela

Venezuela has produced tactical UAVs jointly with Iran. We did not find evidence of advanced drones in the country, or indications of an armed UAV program.

Sources:

“Iran has Sent Drones, Thousands of Advisors to Venezuela,” *World Tribune*, June 21, 2012, <http://www.worldtribune.com/2012/06/21/iran-has-sent-drones-thousands-of-advisors-to-venezuela/>; Joanna Paraszczuk, “Iran Admits Exporting Drone Tech to Venezuela,” *The Jerusalem Post*, December 12, 2012, <http://www.jpost.com/Iranian-Threat/News/Iran-admits-exporting-drone-tech-to-Venezuela>; Robert Beckhusen, “Don’t Freak Out, But Iran is Helping Venezuela Build Drones,” *Wired*, March 8, 2012, <http://www.wired.com/2012/03/iran-venezuela-drones/>; “Venezuela Builds 1st Drone with Iran Help: Chavez,” Press TV, June 15, 2012, <http://www.presstv.com/detail/2012/06/15/246290/venezuela-builds-1st-drone-with-iran-aid/>; https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1511545&Pubabbrev=JIWK

Vietnam

Vietnam has apparently flight-tested six indigenously produced drones, though we have not found evidence that they are in operation. Vietnam is also interested in purchasing tactical UAVs from Belarus, and Belarus may have already agreed to this transfer.

Sources:

“Debate Over the First UAV Manufactured in Vietnam,” sUAS News, May 15, 2013, <http://www.suasnews.com/2013/05/22871/debate-over-the-first-uav-manufactured-in-vietnam/>; Greg Waldron, “Sweden to Assist Vietnam’s UAV Development,” Flightglobal, November 26, 2012, <http://www.flightglobal.com/news/articles/sweden-to-assist-vietnam39s-uav-development-379431/>; Rohit Wadhwaney, “Vietnam Builds Six Drones,” Asia Pacific Defense Forum, June 6, 2013, <http://apdforum.com/en_GB/article/rmiap/articles/online/features/2013/06/06/vietnam-adds-drones>; “Vietnam Begins its UAV Era,” Vietnam Net, May 25, 2013, <http://english.vietnamnet.vn/fms/science-it/74965/vietnam-begins-its-uav-era.html>; “Vietnam Successfully Tests First Unmanned Aircraft,” *Tuoitre News,* April 5, 2013, <http://tuoitrenews.vn/society/9281/vietnam-successfully-tests-first-unmanned-aircraft>; “Vietnam to Buy Unmanned Aerial Vehicles From Belarus,” *Thanhnien News*, May 17, 2013, <http://www.thanhniennews.com/education-youth/vietnam-to-buy-unmanned-aerial-vehicles-from-belarus-18747.html>; Zachary Keck, “OK Drone: Vietnam Enters the UAV Market,” The Diplomat, May 21, 2013, <http://thediplomat.com/2013/05/ok-drone-vietnam-enters-the-uav-market/>.

Yemen

Yemen has requested armed drones from the United States. It is one of the few countries to have an armed UAV acquisition program without fielding unarmed drones. Yemen is supposed to receive tactical Ravens, but it is not clear that those drones were delivered at the end of 2013.

Sources:

Carlo Munoz, “Yemen Requests Armed Drones from US to Combat al Qaeda,” The Hill, August 22, 2013, <http://thehill.com/policy/defense/318313-yemen-requests-armed-drones-from-us->; Casey L. Coombs, “Yemen to Get UAVs from the U.S.,” Aviation Week, September 26, 2012, <http://aviationweek.com/awin/yemen-get-uavs-us>; Gareth Jennings, “Yemen Acquires Caravan Reconnaissance Aircraft,” *IHS Jane’s Defence Weekly*, September 19, 2013, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1586700&Pubabbrev=JDW>.

1. The Wing Loong is a relatively new system that designed to emulate the Predator and other successful MALE UAVs. It is also one of the least-capable UAVs in the Predator’s class. Thus, setting the line for “advanced” systems based on the capabilities of the Wing Loong allows us to capture the most military-relevant drones currently in development. [↑](#footnote-ref-1)
2. Specifically, the Group 4 and Group 5 weight limit. United States Air Force. *RPA Vector: Vision and Enabling Concepts, 2013-2038*. February 17, 2014:<http://www.defenseinnovationmarketplace.mil/resources/USAF-RPA_VectorVisionEnablingConcepts2013-2038_ForPublicRelease.pdf>, p. 14. [↑](#footnote-ref-2)
3. There are questions about the veracity of the capabilities of some of these systems, which we bracket for the time being but which is a useful question for future research. [↑](#footnote-ref-3)
4. As discussed in the article, we classify states as having an armed program if at least one of three conditions is met: (1) an entity within the country is currently developing an armed UAV, (2) the government has purchased or attempted to purchase an armed UAV, or (3) a leader or senior government official has made a public statement expressing interest in an armed drone capability. [↑](#footnote-ref-4)