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Rebel Drones: UAV Overmatch in the Ukrainian Conflict

James Harvey

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Introduction

During the escalating and complicated military conflict in eastern Ukraine, UAVs have become increasingly common and important to operations for either side. Ukrainian forces are at a considerable disadvantage, mainly because Ukraine's armed forces were ignored and underfunded by former President Yanukovych for years. After the removal/flight of Yanukovych, the newly-formed Government of Ukraine (GoU) found itself trying to reestablish a state while warding off a Russian invasion. After ten months of conflict in the eastern states of Luhansk and Donetsk, technical overmatch is becoming the deciding factor in battle. This article will pertain to the conflict's UAVs tactics, Russia's emphasis on UAVs, and counter-UAV techniques.

Ukrainian Disadvantage

Ukrainian forces have had minimal UAV and counter-UAV success in the conflict. Ukraine has sporadically used the Soviet-built Reys drone and other UAVs, but with very limited results. Ukrainian troops in the Anti-Terrorist Operation (ATO) do not have a UAV with night-time reconnaissance and/or artillery fire adjustment capability. Several Ukrainians and organizations are attempting to bridge the UAV gap but financial support and production limitations are hindering the attempts. Even if UAVs were obtained, Ukraine lacks the trained personnel and integration capabilities to make them effective. ⁱ

Patterns

A UAV-to-attack pattern is emerging in the region. Ukrainian forces report that prior to attacks from rebel forces, UAVs are spotted immediately prior.ⁱⁱ In January, at least nine UAVs were seen over towns in the Donbass region, all of which experienced indirect fire or firefights afterwards. ⁱⁱⁱ

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Rebel UAVs are being used for target identification and reconnaissance of key terrain. Six of the towns over which UAVs have been sighted have significant rail stations. These towns also have assets such as machining factories, rail repair facilities, airfields, and access to the Sea of Azov. It seems clear that the rebels intend to use Ukraine's rail system as logistical support and expansion of operations. This idea is substantiated by Ukrainian national statistics. Of the 105 convoys that entered Ukraine from Russia between 30 October to 9 December, 2014 were by rail. These routes were likely via the Uspenska Point of entry (POE) which provides rail access to Donetsk. The road from Uspenska to Donetsk is also of the best roads in all of Ukraine. Rail makes sense tactically, as IEDs are now being seen in the region.^{iv}

Counter-UAV Tactics in Ukraine

Thus far, counter-UAV tactics in the conflict have involved small arms, anti-air rockets and electronic warfare (EW). The most recent EW incident took place in March 2015. The Organization for Security and Cooperation – Europe (OSCE) reported that its UAV was jammed as it conducted its Special Monitoring Mission (SMM) in eastern Ukraine.

There have been multiple incidents involving the alleged shooting down of UAVs in eastern Ukraine, (see list below). The most recent shoot-down incident involved the OSCE. Twice between October and December, the OSCE reported that after identifying rebel assets such as APCs, its UAVs came under fire. The UAVs were not struck and were able to confirm the Air Defense weapons ZU-23 (23mm gun) and a MANPADS.^v

UAV Defense

Part of the reason behind UAV success is the lack of counter-UAV weapon systems. Typically, Air Defense systems are designed against high-flying, high-speed aircraft and missiles. Currently, the techniques defined in FM 44-3 provide the best counter-UAV defensive techniques available to troops on the ground. Methods include firing in various increments in front of low, slow moving craft with small arms munitions. This is likely the method used by GoU forces that claim to have brought down 'Russian

drones'. Ukrainian soldiers claim to have downed as many as five Russian drones. A U.S.-equivalent method would be to fire at a UAV with a mounted M2 .50 cal. Theoretically this method would work. The .50 cal manual describes engaging aircraft with the weapon at a distance of 880 meters,^{vi} within range of ground troops.

According the Ukrainian National Defense Security Council, (NSDC), Ukraine will soon produce armored personnel vehicles based on the Soviet T-64 chassis. This vehicle would include the ZTM-1 30mm automatic cannon, 7.72 machine gun, and GSh-23mm cannon, all of which have counter-UAV potential.^{vii} Even if the UAV were flying at a low altitude however, the key to successful engagement by ground troops is detection. GoU troops will also need; on-hand M2 equivalent weapons, trained operators, maintenance, and as always, luck.

EW as Counter-UAV

Russia seems to be on-board with the EW approach to countering UAVs. In a March 2015, interview, Air Defense Troops Chief Lieutenant-General Aleksandr Petrovich Leonov gave some insight regarding Russia's current counter-UAV (mid-range) assessment.

“This perhaps will be an unexpected revelation for some, but there is no special weapon in the tactical air defense inventory to combat UAV's. Existing SAM complexes cope successfully with this mission. The fact is that combating those types of airborne targets is not the prerogative of air defense; this mission is accomplished in an integrated manner with the involvement of electronic warfare, engineer, and other troops. In general, stopping the flight of a UAV by suppressing its command and control radio channels or distorting the GPS navigational field is one of the most attractive methods.”^{viii}

Another option for disrupting the UAV link could be the use of an air detonation. An airburst of conventional munitions would certainly disrupt if not destroy a UAV. Although hypothetical, a localized

EMP-type blast would render a UAV mission In-Op regardless of its guidance system. The inherent problem would be how to deliver the round, but proximity fuse rounds would fit the requirement. Any type of munitions would however require a method of acquiring the correct location of the UAV. This refers again to triangulation/detection capability as the best option.

Russia Invests in UAVs

Russia is obviously intent on advancing the capabilities and strategic operations of their UAVs. Russia acquired 170 UAVs in 2014, twice as many UAVs as in 2013. ^{ix} Russia's Ministry of Defense announced that the 'Orlan-10' will be tested under arctic conditions this year. ^x The testing is in preparation for protection of Russian assets in the Arctic. Orlan-10 units will also be emplaced in the recently annexed Crimean peninsula to augment their naval capacity in the Black Sea. ^{xi} A Russian company is currently developing a UAV that will use an alternate space-based guidance system, GLONASS ^{xii}. The system may be immune to current guidance-jamming systems. This system operates 'low and slow' which have proven to be characteristics very difficult to counter.

The Way Ahead for UAVs in Ukraine

Ukraine is attempting to counter the rebels' on-going UAV operations in the east. In October Ukrainian-produced UAVs were tested for fielding consideration. GoU realizes it is overmatched in UAV and intelligence capabilities. They also acknowledge that their immediate survival against the threat will require foreign assistance. ^{xiii} Ukrainian bureaucracy and UAV production pose insurmountable obstacles to being effective against the present threat. UAV production would be an expensive, fruitless endeavor for the Ukrainian government to attempt. In contrast, the rebels indicate that they will continue UAV use and even expand their scope. We can expect to see Ukraine purchase foreign UAVs, in addition to those already used by the OSCE.

The conflict in Ukraine serves as a wake-up call pertaining to UAV use and the lack of counter measures against them. For some countries, air superiority will be a quick answer for mitigating enemy UAVs. This response however, is complicated when the conflict involves non-NATO countries, hybrid-warfare, and murky end-states. The counter-UAV problem exists in-part because of the lack of foresight for its necessity. Rebel UAVs will continue to be successful due to the lack of a clear and immediate defense plan against them.

Record of UAV incidents in the conflict:

MAR 2015	Jamming Incident - March 8, 2015, (U.S, Embassy – Kyiv, Ukraine), The OSCE also report discovering Luhansk People’s Republic artillery concealed at a mine and that their UAV was jammed over separatists territory
FEB 2015	Jamming Incident - February 24, 2015, (U.S, Embassy – Kyiv, Ukraine), Thirteen UAVs were spotted by Ukrainian forces in the past 24 hours, including four which were observed crossing the border from Russia. The NSDC also reported that an OSCE surveillance UAV was jammed while observing the Donetsk airport area. <i>(This is the first known jamming incident in the conflict)</i>
	Shoot Down - Weapon type unknown. February 20, 2015, (U.S, Embassy – Kyiv, Ukraine), The NSDC reported that 4 UAVs were spotted in the past 24 hours, including in the Yalta – Manhush areas west of Mariupol, the Kyrlyivka – Ozoria areas north of Mariupol, and the administrative boundary with Crimea. The SBU reportedly shot down one UAV, and is currently identifying its country of origin.
	Shoot Down - Weapon type unknown. ‘Air Defense forces shot Down a Drone near the Luhansk People’s Republic – source’, <i>Luganskiy Informatsionnyy Tsent</i> r in Russian, 03 Feb 2015, http://lug-info.com/news/one/sily-pvo-lnr-sbili-v-raione-irmino-bespilotnyi-letatelnyi-apparat-istochnik-1390
JAN 2015	Shoot Down – Weapon: Ground-to-Air rocket. Ukrainian forces claim to have shot down two UAVs with ground-to-Air rocket. Two enemy UAVs shot down in the Anti-Terrorist Zone (ATO), <i>Ukrainian truth</i> , 2 January 2015, http://www.pravda.com.ua/news/2015/01/2/7053992/
DEC 2014	Shoot Down Attempt - Weapon: ZU-23 (a 23mm anti-aircraft gun). 4 DEC, OSCE Special Monitoring Mission (SMM) UAV was three kilometers South-East of Pavlopil (25km North-East of Mariupol). It spotted a military-style truck with six people around it. Almost immediately eight to 10 rounds – assessed to have been from a ZU-23 (a 23mm anti-aircraft gun) – were fired at the SMM UAV. None hit the UAV. Latest from OSCE Special Monitoring Mission (SMM) to Ukraine based on information received as of 18:00 (Kyiv time), 2 December 2014, http://www.osce.org/ukraine-smm/129301
	Shoot Down Attempt – Weapon: ZU-23 (a 23mm anti-aircraft gun) OSCE Monitoring Drone Fired upon in Southeastern Ukraine’, <i>Sputnik News</i> , December 4, 2014 http://sputniknews.com/military/20141204/1015471985.html

	<p>Shoot Down - Weapon: Pantsir Air Defense Missile. Russia Downs 'Several' Ukrainian Drones Over Or Near Crimea In One Month, Moscow <i>RIA Novosti</i> in Russian 0826 GMT 09 Dec 2014, http://ria.ru/defense_safety/20141209/1037299957.html</p> <p>Shoot Down – Weapon: Avtobaza 1L222. ‘Russian Air Defense Reportedly Downed Two US Israeli-Made UAV's During March Events in Crimea’, <i>Vzglyad Online</i> in Russian, 08 December 2014, http://www.vz.ru/news/2014/12/8/719320.html</p> <p>Shoot Down - Weapon: Pantsir Air Defense Missile. ‘Russian Pantsirs Shoot Down Ukrainian Drones Over Perekop’, 10 December 2014 http://www.novoross.info/politiks/29594-rossiyskie-panciri-sbivayut-ukrainskie-bespilotniki-nad-perekopom-video.html</p>
NOV 2014	<p>Shoot Down Attempt – Weapon: “Anti-Aircraft Gun”. ‘U. S. Accuses 'Russia-Backed' Separatists of Firing at OSCE Drone’, <i>The Moscow Times</i>, 4 November 4, 2014, http://www.themoscowtimes.com/news/article/us-accuses-russia-backed-separatists-of-firing-at-osce-drone/510585.html</p> <p>Shoot Down Attempt – Weapon: Anti-aircraft gun (probably a ZU-23). ‘Anti-Aircraft Rounds Fired at OSCE Drone in Eastern Ukraine’, <i>Sputnik News</i>, 3 November 2014, http://sputniknews.com/europe/20141103/1014237047.html</p>
JUL 2014	<p>Shoot Down – Weapon: Probably small arms. ‘Ukrainian Military in the Anti-Terrorist Operation Zone Again Shoot Down a Russian UAV’, July 2014, Unian Information agency, http://www.unian.net/politics/943057-ukrainskie-voennyye-v-zone-ato-snova-sbili-rossiyskiy-bespilotnik.html#ad-image-0</p>

Enclosure: *Worldwide Equipment Guide, Vol 2: Airspace and Air Defense Systems, August 2014*, TRADOC Intelligence Support Agency (TRISA), U.S. Army TRADOC G2

<p>Krasuha EW System</p> 	<p>Krasuha 2 (Russian): EW System with jamming capabilities. Target: Defends against AWACS, E-8 Joint Star, modern UAVs: Predator, Global Hawk.</p>
<p>Russian 23-mm Towed AA Gun ZU23</p> 	<p>Alternative Designation: ZU-23-2 Date of Introduction: 1962 (Russian) Proliferation: At least 50 countries Gun: Caliber, Type: 23-mm, gas-operated gun, 2A14 or 2A14M Number of Barrels: 2, Breech Mechanism: Vertical VARIANTS ZU-23-2M: Russian upgrade variant replaces optical sight with an EO fire control system, Hit probability increases 10-fold over the ZU-23.</p>

<p>Avtobaza ELINT System</p> 	<p>Target: Designed to locate and intercept pulsed airborne radars including Fire Control radars and missile data links Can be used against radar guidance of low-flying craft (UAV)</p>
<p>Orlan-10</p>  <p>Photo: http://www.janes.com/article/47732/russia-plans-orlan-10-uav-arctic-deployment</p>	<p>Reconnaissance, target identification, and Surveillance platform Country of Origin: Russia Max Load capacity: 18kg Each Orlan-10 can act as a signal repeater to control additional UAVs Can be configured for video, still camera Wingspan: 3.10 m Speed: 100-150 kn.hr Range (Radius) :150 km Operational window: 10-18 hrs Ceiling: 6000</p>
<p>GLONASS (Global Navigation Satellite System) Source: Russian Federal Space Agency – Information-Analytical Centre http://www.glonass-center.ru/en/</p>	<p>Initiated October 1982 with the launch of the Kosmos-1413. The system provides continuous global navigation of all types of users with different levels of quality requirements for navigation support. Reduction in funding for the space industry in 1990 led to degradation of the GLONASS constellation. 24 Total GLONASS satellites in operation</p>

ⁱ ‘Website looks at prospects for Ukrainian military unmanned aircraft sector’, *Kyiv Defense-Express* in Russian 23 December 2014, <http://www.defense-ua.com>

ⁱⁱ ‘Ukrainian “Cyborg” says Army to Rise if Authorities Freeze Donbas Conflict’ *LB.UA* in Russian, 19 December 2014, http://society.lb.ua/war/2014/12/19/289842_krimskiy_kiborg_armiya.html

ⁱⁱⁱ ‘Kyiv and militia report shelling in Donbas in past 24 hours’, *Interfax* in Russian, 02 January 2015, <http://www.interfax.ru/world/416586>

^{iv} ‘Ukrainian Army, Donetsk Militia Trade Shelling Accusations’, *Interfax* in English, 13 January 2015, <http://www.interfax.com/news.asp?y=2015&m=1&d=13&pg=2>

^v Spot report by the OSCE Special Monitoring Mission to Ukraine (SMM), 2 November 2014: Anti-Aircraft Rounds Fired at SMM UAV, 3 November 2014, <http://www.osce.org/ukraine-smm/126265>

‘Anti-Aircraft Rounds Fired at OSCE Drone in Eastern Ukraine’, *Sputnik News*, 3 November 2014, <http://sputniknews.com/europe/20141103/1014237047.html>

‘U. S. Accuses 'Russia-Backed' Separatists of Firing at OSCE Drone’, *The Moscow Times*, 4 November 4, 2014, <http://www.themoscowtimes.com/news/article/us-accuses-russia-backed-separatists-of-firing-at-osce-drone/510585.html>

‘OSCE Monitoring Drone Fired in Southeastern Ukraine’, *Sputnik News*, December 4, 2014 <http://sputniknews.com/military/20141204/1015471985.html>

^{vi} FM 3-22.65: p 6-20, *Official Department of the Army Publications and Forms* http://armypubs.army.mil/doctrine/Active_FM.html

^{vii} Nicholas de Larrinaga, *IHS Jane's 360*, <http://www.janes.com/article/47949/ukraine-restarting-t-64-based-ifv-development>

^{viii} Interview with Ground Troops Air Defense Troops Chief, Lieutenant-General Aleksandr Petrovich Leonov by Oleg Falichev Moscow *VPK Voyenno-Promyshlennyy Kuryer Online* in Russian 11 Mar 2015, <http://vpk-news.ru/articles/24155>

^{ix} Russian Agency Reports Military Aviation Movements and Events on 12 January, *Interfax-AVN Online* in Russian, 12 January 2015, <http://www.militarynews.ru/default.asp?pid=0&rid=0&more=1>

^x ‘Russia: Orlan-10 UAV To Go on Experimental Alert on Chukotka in 2015’, *Ministry of Defense of the Russian Federation* in Russian, 31 December 2014, http://function.mil.ru/news_page/country/more.htm?id=12004803@egNews

^{xi} ‘“Orlans” will protect the skies above Crimea’, *Zvezda TV* in Russian, 15 January 2015, <http://tvzvezda.ru/news/forces/content/201501150759-f4i7.htm>

^{xii} ‘Russian Company Developing UAVs Capable of Flight Without GPS’, *Rossiyskaya Gazeta Online* in Russian 24 December 2014, <http://www.rg.ru/2014/12/24/bespilotniki-site-anons.html>

^{xiii} Serhiy Zhurets, ‘UAVs. A Call to War’, *Defense-Express* in Russian 23 December 2014, <http://www.defense.ua.com/rus/search/?words=%D1%E5%F0%E3%E5%E9+%C7%C3%D3%D0%C5%D6&x=11&y=11>