ACADEMY OF CRIMINAL JUSTICE SCIENCES - POLICE SECTION

Police Forum

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From the Editor

Hello reader!

It has been a while since you received an issue of *Police Forum*, but we are happy to get this to you in time for our annual meeting next week. In addition to annual meeting details, this issue includes updates to the Police Section executive board, announcements from our members, and a timely article on the use of drones in terrorist attacks.

As always, this newsletter is yours, and I include here a call for you to submit your policing articles, any police/policing-related announcements, essays, book reviews, job openings, etc. for inclusion in future issues. We have a varied and large readership that will benefit from your additions. You may email your submissions to acjspoliceforum@gmail.com.

I hope you can enjoy a visit to ACJS-Baltimore, and a happy reading of *Police Forum*!

Michael J. Jenkins
Editor, *Police Forum*

From the Chair

Hello everyone,

As 2019 gets underway, I will finish my tenure as Chair of the Police Section. Jeff Rush of Troy University will assume the duties of Chair at our Baltimore meeting. I wish him the best and pledge my support as he continues to move the Police Section forward

We have an election in the works for Vice-chair and two open Executive Counselor positions. There are two interested members for each position. Richard Donahue, a doctoral student from UMass Lowell, will remain as our student representative through 2020. Keep an eye on your email for election information forthcoming in the following weeks.

We will continue to explore adding a peer reviewed section to the *Police Forum* newsletter. Plans are also underway to have a much larger police section presence at the 2020 ACJS conference.

The Police Section could also use your active involvement. We seek innovative ideas, volunteers, and award nominees, as well as contributions to *Police Forum*. Please contact any member of the Police Section Executive Board to get more involved.

All the best,

Steve Morreale

Stephen A. Morreale, D.P.A
Chair — ACJS Police Section
Worcester State University

In this Issue

Featured Article

The Terror Threat of Unmanned Aerial Vehicles and Techniques to Defend Against Them

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Abstract
Unmanned Aerial Vehicles (i.e., drones) have been used in Syria by the Islamic State (IS) to drop grenades on the opposition and non-combatants. In 2018, drones were used to attempt a political assassination in Venezuela. Terrorists are likely to make increasing use of drones as weapons. This paper reviews potential defense-in-depth techniques to stop a drone attack. Tactics include detection, electronic fences, jammers, and birds of prey. The concept of defense-in-depth is also described.

Keywords
Unmanned aerial vehicle, drone, quadcopter, defense-in-depth strategy, Skywall 100

The Terror Threat of Unmanned Aerial Vehicles and Techniques to Defend Against Them

Imagine being responsible for the security of a public gathering, such as a concert, political rally, or sports event. There is a new weapons platform that poses a threat to this venue for which most law enforcement agencies are currently powerless to stop. This threat is found in the form of unmanned aerial vehicles (UAVs), more commonly referred to as drones. Drones exist in three categories: military drones, commercial drones, and hobby-level drones. This paper will focus on the threat of hobby-level drones[1] used as a weapon and the potential techniques to counter this threat.

Hobby-level drones can be built from components or purchased ready-to-fly. The majority of these drones are obtained for purposes of recreation, such as aerial photography and videography or racing competitions. Drones can be operated by radio-control or can be programmed to fly a pre-determined course using global positioning system (GPS) waypoints. Most drones have between four and eight battery-powered electric motors.

UAV Threats

One-way drones might be used to commit mass casualties is by converting them into a weapons platform, attaching explosives, radioactive material, a biological weapon or chemical weapon as a payload. The drone could then be flown over a large gathering of people, such as a sports stadium or market place, and the attached weapon could be exploded or deployed. The result of detonating an explosive in a large crowd, even one with a small yield, could cause mass casualties and effect even greater psychological damage (Cruickshank & Lister, 2011).

[1] As part of this exploration, several products are mentioned. This paper should not be viewed as an endorsement of any product, system or device.

This method was at the heart of planned terrorist attacks in the United States. Agents from the Federal Bureau of Investigation's (FBI) Boston Division arrested and charged Rezwan Ferdaus, a U.S. citizen, in connection with his plot to damage or destroy the Pentagon and U.S. Capitol using a large remote-controlled aircraft filled with C-4 plastic explosives in September 2011 (FBI, 2011). The FBI arrested Ferdaus before he could construct the weaponized UAV.

Similarly, in April 2014 FBI New Haven Division arrested a Moroccan national, El Mehdi Semlali Fahti and detained him for immigration violations (Mayko, 2014). Prior to this arrest, Fahti had several conversations with an FBI undercover agent concerning his plans to build a radio-controlled airplane, arm it with explosives and crash it into a school or federal building. Others have been successful in carrying out their plans.

The Network for Social Change, hosted by the Oxford Research Group, produced a report in January 2016 that analyzed how UAVs could pose a threat to British targets. Abbot, Clarke, Hathorn, and Hickie (2016) noted UAVs "…will be used as simple, affordable, and effective airborne improvised explosive devices" (p. 10). This prediction proved accurate when two drones, each carrying a kilogram of plastic explosives, were used in an attempted assassination of the President of Venezuela (Koetti & Marcolini, 2018). Clarke (2018) identified this attack as "… [ushering] in a foreboding new era–terrorism by unmanned aircraft" (p. 1).

The Islamic State (IS) used hobby-level drones in the fight for control of Syria. Kesling and Adnan (2017) advised that IS used commercially available quadrocopters (drones with four motors) that were modified to carry hand grenades. The drone was flown over the opposition and the grenades were dropped. While the use of drones by IS did not have a major impact on the fighting, it did demonstrate a novel use of hobby-level drones as an attack platform.

Two limitations to the use of a drone as a weapon delivery platform are the speed of the drone and its capability of lifting a payload. According to the website *Dronethusiast*, factory-made drones can achieve speeds of 100 mph (Justin, 2019). The fastest recorded racing drone speed is 163.5 mph. Typical top speed for factory-made drones is in the range of 20 - 40 mph. Drone payload weight limitations vary by the number of motors on the drone. The maximum payload weight for a factory-made drone is 18 kg (40 pounds) (Dronelli, 2017).

Drones also present a threat to commercial flights. Between January and October 2018, pilots reported seeing over 2,000 drones while flying in the US (Ortiz, 2019). London's Gatwick Airport was shut down after drones were sighted flying over the runways of the airport (Mueller & Tsang, 2018). To counter this threat, police sharpshooters were deployed around the airport. Newark Liberty International Airport flight operations were disrupted by a similar sighting of a drone that came within 30 feet of an aircraft (Ortiz, 2019). Even if it is not the intent of the drone operator, a near-ground plane-drone collision could result in serious damage to the plane.

Defending Against UAV Threats

The Federal Aviation Administration (FAA) has taken steps to ensure hobby-level UAVs do not interfere with the safe operation of aircraft. The FAA has initiated a registration program and flight restrictions for UAVs within five miles of an airport. The flight restrictions rely upon cooperation by UAV operators.

During the 2019 Super Bowl LIII, the FAA declared the area surrounding Mercedes-Benz Stadium in Atlanta a 'no drone-zone.' The Federal Aviation Administration (FAA) placed a temporary flight restriction around the stadium restricting drone operation within 30 nautical miles and altitudes to 17,999 feet. FBI Atlanta warned that drone operators could face fines or arrests by violating this flight restriction (O'Kane, 2019).

As the concern surrounding UAVs continues to rise in priority in counterterrorism efforts, different strategies and countermeasures have emerged to combat the threat of UAVs. As the threat is relatively new, some proposed techniques are still in the concept phase. All means of stopping malicious UAVs are being considered.

Defense industry contractors are developing anti-drone weapon platforms. Lockheed Martin is developing a weapon platform that combines laser weapons with radar systems for military applications (*Technology that Counters Drone Swarms*, 2016). Raytheon is also developing anti-drone systems in the form of vehicle mounted laser weapons and expendable anti-drone drones (Baker, 2018). This research has focused on military defense applications.

Defense against a drone for a specific venue, such as a public gathering, outdoor concert, or sporting event, requires a defense-in-depth strategy. This strategy has the public event or protected target at the center of a set of concentric rings of defense. The outer ring is considered the long-range defense zone. The primary purpose in this zone is to detect an inbound threat. The next zone is the medium-range defense zone. In this zone, tactics to address an inbound drone are used to try and stop the drone from getting near the event. The short-range zone is the last defense before the drone gets to the event or target.

Geofencing is one system that could be deployed in the long-range defense zone. Patterson (2017) describes geofencing as a virtual barrier created by combining GPS and low radio frequency identifier systems. Hobby drone company DJI uses a geofencing system called Geospatial Environment Online (GEO). The GEO database allows DJI to restrict operation of DJI manufactured drones from entering restricted airspaces. Drone manufacturer, Yuneec has its own geofencing system, which can be disengaged by the user. GoPro has also entered the hobby-level drone market. GoPro's geofencing system is called Karma. Karma is a restriction of height and

distance from the drone operator. As described, geofencing protects the operator from violating restricted airspace, but does not prevent the motivated attacker from flying a drone into that area. Geofencing is ineffective against the drone assembled from components.

A jamming system could be deployed in the medium-range defense zone. A jammer is intended to interrupt and sever the radio link between the operator and the drone, making the vehicle inoperable by the malicious actor. Commandeering a drone would involve hacking into the operating system and taking control from the operator. Jammers work when the drone is being manually operated by radio control. If the drone has been programmed to follow a pre-defined flight path, the jammer would have to interrupt the GPS signal to disrupt the flight path. Quantum Aviation provided this type of jamming technology to counter drones at the 2012 London Olympics (*How countries counter the drone threat*, 2018).

Pavluk and Cole (2016) suggest that it is possible for a team of UAVs under the control of law enforcement to intercept and capture a rogue UAV by using a net or some similar restraining device. This countermeasure would be deployed in the mid-range defense zone. Tokyo Police have experimented with this technique, using other UAVs to catch the attacking UAV (Liberatore, 2015). Additionally, high velocity radio controlled (RC) aircraft can be deployed and used to engage and stop inbound drones by intercepting and crashing into it. These RC controlled aircraft are quick to launch and fast enough to intercept most hobby-level drones.

The inner defense zone is the last chance to stop an inbound drone from reaching its target. One way to stop this drone is to shoot it down. Any firearm (including shotguns) using conventional rounds has the problem of being a danger to the public. Several companies have developed shoulder fired devices that fire expanding nets to capture or disable a drone (*How countries counter the drone threat*, 2018). One such handheld system produced by British

company Openworks Engineering LTD is a shoulder fired portable system that can net or disable a drone; it is known as Skywall 100 (*SkyWall 100 Handheld Drone Capture System*, 2018). The Skywall 100 fires a gas operated projectile that nets and parachutes the disabled drone to the ground. This type of system could be deployed in the inner defense zone.

The Dutch police are currently testing a different way to combat rogue UAVs in their airspace. They are training birds of prey (eagles) to fly and grab threatening UAVs out of mid-air and land with them in a safe area (*Dutch police are training*, 2016). Impressed by the results of the Dutch trials, the London Metropolitan Police Department (Met) also considered using birds of prey as a countermeasure to rogue UAVs. In 2016, Met Commissioner Sir Bernard Hogan-Howe announced his plans to copy the Dutch techniques (*Scotland Yard mulls deploying*, 2016).

Another inner defense zone weapon is the use of bean bag rounds fired from shot guns. Bean bag rounds, also known as flexible baton rounds, are considered less than lethal projectiles. A drone hit with a bean bag round would be disabled to complete its flight. The use of bean bag rounds reduces the danger to the public by rounds that miss the target. Bean bag rounds are considered a short-range defense weapon. Water cannons offer another non-lethal defense. Water cannons have been used in riots to repel rioters. A stream of water can be aimed at the drone, to sweep it from the sky. Water cannons can be deployed in the inner defense zone.

UAV Defense Challenges

Pavluk and Cole (2016) identified four challenges for technological development to counter drones: 1. detection of the drone, 2. jamming or commandeering the drone's control system, 3. capturing the drone, and 4. blocking the drone. Detecting a drone through a radar system is complicated, as drones are too small and too low to be observed. Drones are similar in size to birds and radar is limited in detecting objects of that size (Whittle, 2015). Potential detection

systems could focus on a drone's heat signature, acoustics, or radio frequency signal. Drones produce a distinctive whirling sound, like a large bumble-bee. This sound offers a distinct possibility for detection. The detection system would be deployed in the long-range defense zone.

The intentional (and potentially accidental) threat that drones pose is new, real, and evolving. Defense against the drone threat is still "up in the air," but the time to develop anti-drone tactics and to obtain effective anti-drone tools is now.

References

Abbot, C., Clarke, M., Hathorn, S., & Hickie, S. (2016). Hostile Drones: The Hostile Use of Drones by Non-State Actors Against British Targets. London: *Oxford Research Group, Remote Control Project.*

Baker, B. *(2018, Nov. 1).* Taking out drone threats: Raytheon showcases counter UAS technology. *Air Force Technology*. Retrieved from https://www.airforce-technology.com/features/taking-drone-threats-raytheon-showcases-counter-uas-technology/

Clarke, C.P. (2018). Approaching a 'New Normal': What the Drone Attack in Venezuela Portends. *Rand Corporation.* Retrieved from: https://www.rand.org/blog/2018/08/approaching-a-new-normal-what-the-drone-attack-in-venezuela.html?adbsc=social_20180819_2494251&adbid=1031272092719665152&adbpl=tw&adbpr=22545453

Cruickshank, P. & Lister, T. (2011, Sep. 29). Analysis: Model planes as weapons of terror. *CNN.* Retrieved from http://security.blogs.cnn.com/2011/09/29/analysis-model-planes-as-weapons-of-terror/

Dronelli, V. (2017). 7 drones that can lift heavy weights [2017 Edition]. *Dronesglobe.* Retrieved from: http://www.dronesglobe.com/guide/heavy-lift-drones/

"Dutch police are training eagles to take out drones." (2016, Feb. 01). *Dutch News.* Retrieved from http://www.dutchnews.nl/news/archives/2016/02/dutch-police-training-eagles-to-take-out-drones/

FBI (2011). Massachusetts Man Charged with Plotting Attack on Pentagon and U.S. Capitol and Attempting to Provide Material Support to a Foreign Government. September 28, 2011. Retrieved from: https://archives.fbi.gov/archives/boston/press-releases/2011/massachusetts-man-charged-with-plotting-attack-on-pentagon- and-u.s.-capitol-and-attempting-to-provide-material-support-to-a-foreign-terrorist-organization/

How countries counter the drone threat (2018, Dec. 21). *BBC News.* Retrieved from: https://www.bbc.com/news/technology-46639099

Justin, F. (2019) Fastest Drones For Sale (Best Fast Drones 2019). *Dronethusiast.* Retrieved from: https://www.dronethusiast.com/author/icoleman/

Koetti, C. & Marcolini, B. (2018, Aug. 10). A Closer Look at the d\Drone Attack on Maduro in Venezuela. *N.Y. Times.* Retrieved from: https://www.nytimes.com/2018/08/10/world/americas/venezuela-video-analysis.html

Kesling, B. and Adnan, G. (2017, Feb. 26). Islamic State Drones Terrorize Iraqi Forces as Mosul Battle Rages. *Wall Street Journal*. Retrieved from: from https://www.wsj.com/articles/islamic-state-drones-terrorize-iraqi-forces-as-mosul-battle-rages-1488032643

Liberatore, S. (2015, Dec. 11). How do you catch a drone? With an even BIGGER drone and a giant net: Tokyo police reveal bizzare 'UAV catcher.' *Daily Mail.* Retrieved from http://www.dailymail.co.uk/sciencetech/article-3356746/How-catch-drone-BIGGER-drone-giant-net-Tokyo-police-reveal-bizarre-UAV-catcher.html

Mayko, M.P. (2014). "FBI: Drone-like toy planes in bomb plot." Connecticut Post, April 7, 2014. Retrieved from: http://www.ctpost.com/local/article/FBI-Drone-like-toy-planes-in-bomb-plot-5383658.php

Mueller, B. & Tsang, A. (2018, Dec. 21). Gatwick Airport Shut Down by 'Deliberate' Drone Incursions. *New York Times. Retrieved from: https://www.nytimes.com/2018/12/20/world/europe/gatwick-airport-drones.html*

O'Kane, S. (2019, Feb 1) Drones are already being confiscated near the Super Bowl. *The Verge*. Retrieved from: https://www.theverge.com/2019/2/1/18207081/super-bowl-2019-drones-atlanta-fbi

Ortiz, E. (2019, Jan 23). Newark airport drone disruption could be the way of the future. *NBC News.* Retrieved from: https://www.nbcnews.com/news/us-news/newark-airport-drone-disruption-could-be-way-future-n961761

Pavluk, J. & Cole, A. (2016, Feb. 23). Four Counter-Drone Technologies We Need Now. *Techcrunch.* Retrieved from http://techcrunch.com/2016/02/23/four-counter-drone-technologies-we-need-now/

Paterson, J. (2017, Feb. 16). Heliguy's guide to geofencing. Retrieved from: https://www.heliguy.com/blog/2017/02/16/heliguys-guide-to-geofencing/

Scotland Yard mulls deploying eagles against hostile drones in London skies. (2016, Feb. 8). Retrieved from https://www.rt.com/uk/331690-eagles-hostile-drones-london/

Skywall 100 Handheld Drone Capture System. (2018). Openworks Engineering Ltd.. Retrieved from: https://openworksengineering.com/skywall

Technology that Counters Drone Swarms. (2016). Lockheed Martin. Retrieved from https://www.lockheedmartin.com/en-us/news/features/2016/webt-laser-swarms-drones.html

Kenneth E. Gray, Jr. is a retired Special Agent of the Federal Bureau of Investigation (FBI) and a lecturer in the University of New Haven Henry C. Lee College of Criminal Justice and Forensic Sciences. While with the FBI, Mr. Gray worked Counter-terrorism, Foreign Counterintelligence, and cyber intrusion investigations.

Daniel P. Waterman is a 2016 graduate of University of New Haven. He is currently a University Police Officer with the New York State University Police. He can be reached at dwate2@unh.newhaven.edu.

Annual Meeting Information

ACJS 56th Annual Meeting
"Justice, Human Rights, and Activism"

March 26-30, 2019

Baltimore Marriott Waterfront Hotel

700 Aliceanna Street
Baltimore, MD 21202
410-385-3000

Pre-Registration is now closed.
Onsite registration is available at the Annual Meeting at the following rates:
ACJS Member: $180
Non-Member: $255
Student: $40
Senior (65 and over): $60
Spouse: $60

Additional annual meeting information can be found at:
https://cdn.ymaws.com/www.acjs.org/resource/resmgr/annualmeeting/acjs_2019_final_annual_meeti.pdf

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Member Announcements

Special Issue Call for Papers
Policing: An International Journal (formerly PIJPSM)

Special Issue Title:	Policing and Psychology
Guest Editor:	Dr. M.L. Dantzker Department of Criminal Justice University of Texas - RGV Edinburg, TX

Policing: An International Journal invites submissions for a special issue, Policing and Psychology edited by Dr. M. L. Dantzker. Since the Wickersham Commission (1931) the application of psychology to police recruitment has been well recognized. However, it's only been during the last 20 years that the important link between psychology and policing beyond police recruitment has been acknowledged. Today both practitioners and researchers recognize that psychology has much relevance to policing.

This special issue of *Policing: An International Journal* invites manuscripts that report on research on topics related to policing and psychology. Possible topics that may be empirically addressed include, but are not limited to: psych testing for pre-employment and fitness for duty, police personality, trauma and critical incidents, recognition of mental health issues/disorders among community members, handling individuals with mental health issues, and implicit biases and policing.

Authors interested in submitting a manuscript should email the guest editor by April 15, 2019 indicating both interest and topic.

Manuscripts should be previously unpublished and not simultaneously submitted elsewhere. Manuscripts should not exceed 7500 words in length. (The word limit is a strict guideline in order to allow for a number of high-quality manuscripts to be included in the special issue. This includes all text, references, and appendices.) Submissions will be accompanied by an abstract, author bio, and affiliation. All submissions will undergo a peer review process. Style and formatting guidelines for authors and additional information are available at: http://www.emeraldgrouppublishing.com/pijpsm.htm.

Submission Deadline: December 01, 2019. Please send all inquiries to guest editor:

Dr. M.L. Dantzker
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Annual Meeting Events of Interest
Friday evening (March 29):

- 5:00 – 6:30 Police Section General Business Meeting / Reception, in Dover C

Saturday morning (March 30):

- 8:00 – 9:15 Panel on "Revisiting Police Education," in Laurel C
- 11:00 – 12:15 Roundtable on "Where Does Evidence-Based Policing Fit in Police Training and Education?," in Laurel C

ACJS Lifetime Membership

Please remember that you still must pay the Police Section dues annually to remain a member of the Police Section. Membership is $37 per year and includes a subscription to *Police Quarterly*. Payment of dues is made to ACJS.

Call for Papers, Authors, Applicants

If you are working on a project and need authors for book chapters or encyclopedia entries, let us know. We'll include that call in *Police Forum* for free.

Or, if you are hosting a conference or seminar and need participants, let us know that too. We'll be happy to help spread the word for free.

Or, if you have a job opportunity—particularly of interest to those teaching or researching in areas related to policing—we'd love to help you announce that position. Send any announcements that you would like to have included in the next issue of *Police Forum* to acjspoliceforum@gmail.com

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Submission Guidelines for *Police Forum*

Format Criteria

The format criteria for all submissions are as follows: reasonable length (less than 30 pages), double-spaced, and in a font similar to 12 pt Times New Roman. All submissions should be in Word format. All charts, graphs, pictures, etc. must be one page or smaller and contained within standard margins. Please attach these at the end of the submission as appendices. Due to formatting limitations all appendices must be in a Word, Excel or similar format - PDF's cannot be used.

Feature Articles

Feature Articles can be quantitative or qualitative. Tables, figures, and charts should be kept to a minimum and should be inserted at the end of the document with an appropriate reference to placement location within the text. The page limits are flexible, however the editors reserve the right to edit excessively long manuscripts.

Practitioners Corner

Articles written from the perspective of persons currently or formerly working in the field, expressing personal observations or experiences concerning a particular area or issue. Page limits are flexible, however long articles may be edited for length.

Academic Pontification

Articles for this area should focus on making an argument, presenting a line of thought, or formulating a new conceptual idea in policing.

Point/Counterpoint

Authors are encouraged to work with another person to develop a point/ counterpoint piece. The initial argument should be between 2 and 5 pages. The initial argument should contain roughly 3 to 5 main points. Following exchange of articles between debating authors, a 1 to 3-page rejoinder/ rebuttal will be submitted.

Research Notes
Research notes should describe a work in progress, a thumbnail outline of a research project, a conceptual methodological piece, or any other article relating to research methods or research findings in policing.

Reviews
Book reviews on any work relating to policing. Reviews of Internet sites or subjects concerning policing on the Internet are also welcome.

Policing in the News
News items of interest to the police section are welcomed in any form.

Legal News in Policing
Reviews of court cases, legal issues, lawsuits, and legal liability in policing are welcomed submissions.

Letters to the Editor
Questions, comments or suggestions pertaining to a given Criminal Justice topic, article, or research.

This Date in History
Submissions on prior hot topics, research, or research methods in Criminal Justice from the past.

Good News
Submissions relating to professional and personal good news for our members - promotions, new jobs, marriages, etc.

How to Submit
Submissions may be made electronically by sending copy in a Word format to acjspoliceforum@gmail.com.

Disclaimer
The editor(s) of this publication reserve the right to edit any submissions for length, clarity, or other issues.

Academy of Criminal Justice Sciences

Police Section

Executive Board

http://www.acjs.org/page/PoliceSection

Membership: Join online at www.acjs.org

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