REPORT DOCUMENTATION PAGE

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*

4. TITLE AND SUBTITLE

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

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14. ABSTRACT

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INSTRUCTIONS FOR COMPLETING SF 298

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Final Report for Technical Proposal: Understanding the Structure and Dynamics of Disinformation in the Online Information Ecosystem

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ABSTRACT

This research advanced understandings of online disinformation and the alternative media ecosystem that catalyzes and shapes it spread. Using an interpretative, mixed-method approach to the study of "big" social data, we examined online disinformation and other information operations in two contexts: 1) within the conversations surrounding the conflict in Syria and 2) within the politicized discourse about #BlackLivesMatter in the U.S. In the first context, we found that the Russian-government media apparatus is integrated into the "alternative" media ecosystem that functioned to support Russia's political (and military) goals in Syria. We also noted that information operations connected to Russia (and other state and non-state actors) were intermingled with more "organic" online political activists—suggesting a strategy of targeting, infiltrating, and shaping online activism towards their strategic goals. In the second context, we again found that Russian information operations targeted political activist groups—on both the political "right" and "left" of the #BlackLivesMatter conversation in 2016—by impersonating Americans. Reflecting a possible strategy of amplifying discord, Russian agents enacted caricatures of American citizens and participated in the #BlackLivesMatter Twitter conversation, including through the sharing of incendiary content. Interestingly, though they diverged in their enacted stances on BlackLivesMatter, Russian "trolls" converged in attacking "mainstream" media and supporting the election of then-candidate Donald Trump—through direct support on the right, and by advocating for "never Hillary" positions on the left.

GOALS

Broadly, this research sought to advance our understanding of online disinformation and the alternative media ecosystem that catalyzes and shapes it spread. We aimed to reveal both the structure and dynamics of this "system" and to shed light on the content, tactics, and motivations behind the flow of information. Our initial goals were to:

1) To apply our methods of examining online misinformation (see Maddock et al., 2015) towards identifying multi-dimensional signatures of disinformation spreading online
2) To uncover the structure and tactics of the alternative media ecosystem that mediates disinformation—i.e. by mapping the social media communities and network of domains that create, host, remix, and share this content and revealing the linkages between social media accounts, communities, web domains, authors, etc.
3) To reveal common disinformation trajectories—i.e. analyzing and conceptualizing how information moves across these different structures and how the structures shape those trajectories.
4) To identify and distinguish between the ecosystem's emergent vs. orchestrated properties—i.e. to address whether this information is primarily spread by financial opportunists producing content to drive ad revenue, or by political actors orchestrating the spread of specific stories by seeding content on specific sites.

RESULTS

We conducted extended research into online disinformation and other information operations in two contexts: 1) within the conversations surrounding the ongoing conflict in Syria and 2) within the politicized discourse about #BlackLivesMatter in the U.S.

Information Operations and the Syrian Civil War: The Case of the "White Helmets"

In one line of research, we studied the persistent campaign targeting the "White Helmets" humanitarian response organization. Within this campaign, the White Helmets (WH) are accused of A) being a Western propaganda construct; B) working with or being terrorists; and C) being "crisis actors" who stage events such as chemical weapons attacks. This campaign intersected with information operations seeking to A) undermine investigations into the use of chemical weapons by Assad's Syrian government; and B) challenge and undermine the activities of the U.S., U.K., and other NATO partners in the region. These information operations are connected (within our data) to the Russian government-funded media apparatus, Syrian government officials and government-funded media, Iranian government-funded media, and other non-state political organizations in the region.

Our seed data for this investigation were approximately 1,000,000 tweets collected between May 2017 and May 2018. Our research examined the tweets themselves along with networks of accounts that posted (and reposted) these tweets. We also analyzed the URL links within the tweets, the articles those linked to, and the domains that hosted those articles. We then explored four separate (though related) aspects of this conversation.

1. The Structure of the Alternative Media Ecosystem

We first examined the structure of the alternative media ecosystem. We built a "domain network graph" that revealed the websites (or domains) that are most cited within the "White Helmets" conversations. Our graph grouped domains together using tweet-sharing patterns— domains are connected and grouped together when the same author posted tweets with

embedded links to both domains (e.g. one tweet linking to 21stCenturyWire and another linking to RT.com). This network graph revealed A) an alternative media ecosystem (similar to previous research on online disinformation) that generates and amplifies narratives criticizing the White Helmets; B) how Russian-government media were integrated into this alternative media ecosystem.
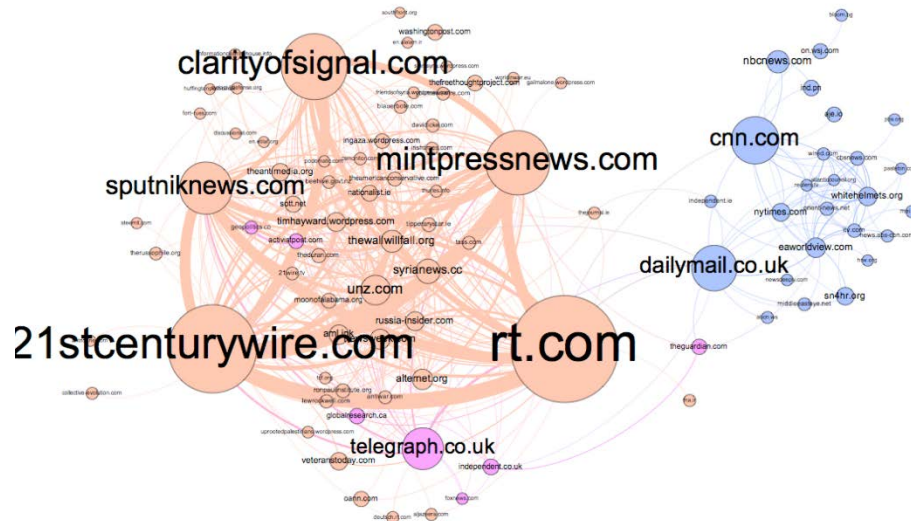

Figure 1. Domain Network Graph of "White Helmets" Twitter Conversation. In this graph, nodes are domains. Nodes are sized by the number of tweets linking to that domain. Edges are created when the same user shares tweets linking to both domains. Edges are sized by the number of different users who post tweets linking to both domains. Colors show "communities" of domains with similar edges. This image shows two distinct clusters of web domains, one (blue, right) that was largely supportive of the White Helmets and another (red, left) that was consistently critical of the White Helmets. The most active domains are shown here (though later analysis reveals other domains that were less visible initially due to link shortening).

2. Content-Sharing across Domains within the Alternative Media Ecosystem
Next, we explored content sharing across these domains. In previous work, we had noted that the same articles sometimes appeared across different domains in the ecosystem. To systematically assess this phenomenon, we calculated article similarity (using a TF-IDF metric) for every article linked to in our initial White Helmets dataset (May 2017 - Sept 2017). We then created a network graph demonstrating how content is shared across domains in the alternative media ecosystem. This analysis demonstrated widespread content sharing (copied-and-pasted articles) across seemingly ideologically diverse websites within the alternative media ecosystem—or "echo-system". It also showed how the Russian-government media apparatus was integrated into this echo-system.
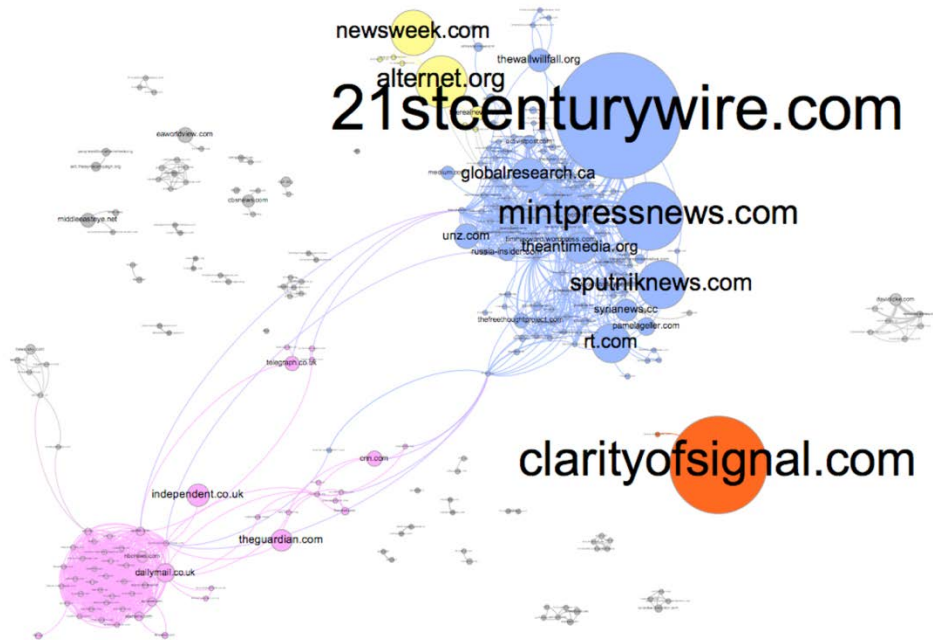
Figure 2. Content Sharing Patterns across Domains in the White Helmets Twitter Conversation
Figure 2 shows content sharing practices across the domains in the White Helmets conversation. Nodes are domains. Again, they are sized by the number of tweets. Edges represent cases where the same article appeared (with a high level of similarity) in both domains. Edge thickness represents the number of highly similar articles shared by the two domains. Colors represent structural "communities" (determined by the Louvain method). The pink cluster reflects sharing of a single AP article (reporting in a sympathetic tone on the murder of seven White Helmet volunteers) across many "mainstream" media domains. The blue cluster shows diverse and persistent sharing (multiple articles) across a heterogenous cluster of alternative media, clickbait, and government-funded websites. This content was highly critical of the White Helmets, reflecting a number of different narratives that function to discredit them and dampen sympathy for them and their cause.

Figure 3. Content Sharing Patterns within the Alternative Media Ecosystem. Figure 3 is a close up on the blue and yellow clusters from above. Here, accounts are colored by their degree (how many different domains that they share content with). This graph reveals how a network of seemingly ideologically diverse websites participate in content-sharing of the same or highly similar articles that spread anti-WH narratives that align with the goals of the Russian and Syrian governments.

Across this ecosystem—or "echo-system"—we see the same articles, dressed up in different wrappers. A close inspection of this graph reveals domains hosting websites for disaffected U.S. veterans, "uprooted Palestinians", anti-war "activists", anti-imperialist think tanks, explicitly anti-Semitic hate sites, alt-right "patriot" sites, and a multitude of sites dedicated to conspiracy theorizing on various topics. The structure and information-sharing practices described here have potentially interesting motivations and effects. On one hand, they function to bring ideologically distinct (and in some cases seemingly oppositional) domains together around common narratives and perspectives. This gives the appearance of a diverse set of people converging around the same ideas—i.e. a sense of false triangulation. It is also possible, and even likely, considering what we know about historical strategies and what we've seen in other cases like the BlackLivesMatter conversations in the US (described below), that these content sharing practices include information operations that intentionally micro-target specific communities with strategic narratives (through websites designed to speak to different audiences).

During the time period we examined, there was much higher volume—in terms of tweets and articles—among the networks of accounts and domains that sought to challenge and discredit the White Helmets. This activity was supported by an "alternative media echo-system" including a large number of diverse websites that fill their pages by re-posting content from other domains in the network. This ecosystem included a number of seemingly ideologically diverse websites—including sites like MintPressNews, VeteransToday, TruePatriot, JewWorldOrder—that repeatedly shared the same articles (often word for word). Russian government funded media outlets were integrated into this ecosystem, acting as a source for some content, and amplifying other content in multiple ways. This perspective provides insight into the mechanisms of information operations—and specifically Russian disinformation operations. It also demonstrates integration, but not necessarily coordination, between Russian-Government media and an array of alternative media websites.

We published these findings as a peer-reviewed conference paper (Starbird et al., 2018) here (http://faculty.washington.edu/kstarbi/Starbird-et-al-ICWSM-2018-Echosystem-final.pdf) and as a blog (https://medium.com/@katestarbird/content-sharing-within-the-alternative-media-echo-system-the-case-of-the-white-helmets-f34434325e77).

3. Information Operations within Online Activist Communities

In ongoing work examining tweet accounts (and the patterns of retweeting between those accounts), we are examining how the "information operations" around the White Helmets are integrated into online "activist" communities. This work conceptualizes the community of accounts that works to criticize the White Helmets as a form of online political activism that includes government media, government representatives, journalists, undercover "agents" of governments and non-state organizations, as well as sincere political activists. This work has implications for how we identify online information operations—including how we distinguish between information operations and sincere political activism.

The first manuscript from this aspect of the research (Wilson et al., 2018) has been accepted to the CSCW 2018 conference and will be published as a journal paper in the PACM.

4. The Role of Undermining and Bridging Narratives

We are also enumerating the many narratives that are used to challenge the White Helmets and conceptualizing these as reflecting (at least) two types of narratives: undermining narratives and bridging narratives. Undermining narratives are not meant to establish a common understanding of an event, but are instead designed to discredit, confuse, or otherwise undermine existing understandings. We see this in the conversations challenging the White Helmets in the immediate aftermath of chemical weapons attacks. These conversations function to confuse the situation—to deflect responsibility from the Syrian government and onto the White Helmets. The second type of narrative we see, bridging narratives, are designed to connect narratives about the White Helmets to other strategic narratives (anti-U.S., anti-NATO, anti-Western media). In this way, these conversations about the White Helmets seek to discredit them and, by connecting them to other groups or ideologies, to discredit those. Our

work on narratives is still in progress. We aim to submit something for publication in the coming months.

Russian Information Operations within #BlackLivesMatter Discourse

In a related line of research, we examined the activities of paid "trolls" from the Russian Internet Research Agency (RU-IRA) in the online discourse surrounding "Black Lives Matter" during 2016. We had previously collected a dataset of tweets that had terms related to shooting events and terms related to Black Lives Matter (including BlackLivesMatter, BlueLivesMatter, and AllLivesMatter). Through structural analysis, we found that conversation to be structured into two very distinct online communities—one left-leaning and supportive of BlackLivesMatter; the other right-learning and critical of the BlackLivesMatter movement. When Twitter released a list of known "troll" accounts from the RU-IRA (associated with Russian information operations), we cross-referenced that list with accounts that were participating in the BlackLivesMatter conversation. Significantly, we found that RU-IRA trolls were integrated into both 'sides' of that conversation. A first paper with these findings was published as a workshop paper in January 2018. We later conducted an extensive qualitative analysis of the activities of those accounts within that conversation to better understand how Russian information operations intersect with political and social divisions in the U.S. Interestingly, that analysis reveals that though they diverged in their enacted stances on BlackLivesMatter, RU-IRA "trolls" converged in attacking "mainstream" media and supporting the election of then-candidate Donald Trump—through direct support on the right, and by advocating for "never Hillary" positions on the left.
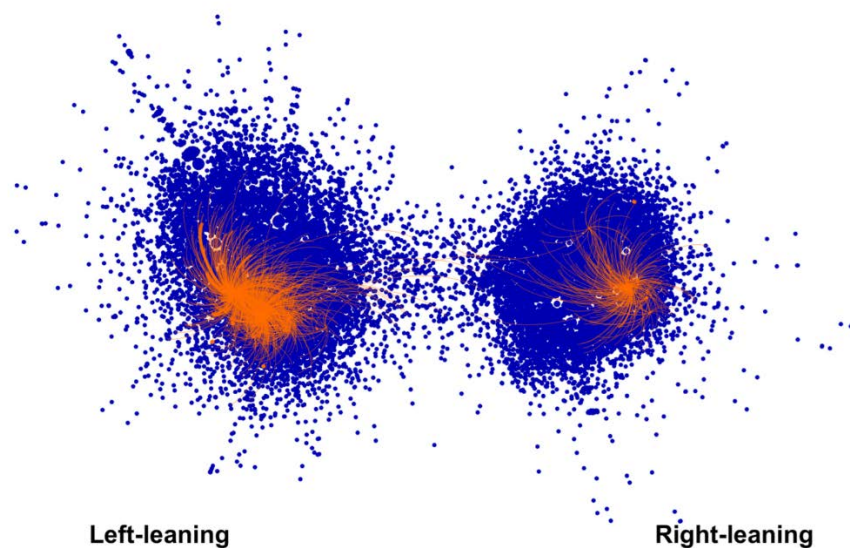

Left-leaning   **Right-leaning**

Figure 4. Retweet Network Graph for #BlackLivesMatter Twitter Conversations after Shooting Events in 2016. We collected tweets using the Twitter Streaming API, tracking on terms related to shooting events, from Jan 2016 to October 2016. We then scoped to tweets that also contained Black Lives Matter terms (BlackLivesMatter, BlueLivesMatter, AllLivesMatter). Nodes are Twitter accounts. Nodes are connected by edges (invisible here) that represent a retweet of one account by another. The structure of the graph uses a "ForceAtlas" functionality that pulls

together nodes that are connected and repels nodes that are not connected. The graph reveals a bipartite structure that reflects the divided nature of the conversation. Left-leaning, pro-BLM accounts are on the left. Right-leaning, anti-BLM accounts are on the right. We then cross-referenced accounts from the Russian Internet Research Agency (RU-IRA)—they are in orange and retweets of those accounts are the orange edges featured here. This graph demonstrates that RU-IRA accounts were active on both sides of the BLM conversation. In a few cases, they were highly retweeted and among the most influential voices in the conversation.

One first full-length paper from this research (Arif et al., 2018) was recently accepted for publication. We have also published two workshop papers related to this research (Stewart et al., 2018a; Stewart et al., 2018b).

This study strengthens the view of information operations as being integrated into—and in many cases difficult to disentangle and differentiate from—authentic online activism. This perspective complicates strategies by platform designers and policy makers alike to problematize and address the problem of disinformation and manipulation online.

RESEARCH PRODUCTS AND REFERENCES

This work has been disseminated through public talks, private conversations, research papers, workshops, poster presentations, and blogs.

We published three papers based on this research:

1. Tom Wilson, Kaitlyn Zhou, and Kate Starbird. (Forthcoming). Assembling Strategic Narratives: Information Operations as Collaborative Work within an Online Community. To Appear in *PACMHCI. 2, Computer-Supported Cooperative Work (CSCW 2018).*

2. Ahmer Arif, Leo G. Stewart, and Kate Starbird. (Forthcoming). Acting the Part: Examining Information Operations within #BlackLivesMatter Discourse. To Appear in *PACMHCI. 2, Computer-Supported Cooperative Work (CSCW 2018).*

3. Kate Starbird, Ahmer Arif, Tom Wilson, Katherine Van Koevering, Katya Yefimova, and Daniel Scarnecchia. (2018). Ecosystem or Echo-System? Exploring Content Sharing across Alternative Media Domains. In *Proceedings of 12th International AAAI Conference on Web and Social Media (ICWSM 2018*), Stanford, CA, (10 pages).

We have two workshop papers:

4. Leo G. Stewart, Ahmer Arif, and Kate Starbird. (2018). When Bad Actors Adhere to Group Norms: Extended Abstract. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI'18)*. ACM, New York, NY, USA, Article 4, 4 pages

5. Leo G. Stewart, Ahmer Arif, and Kate Starbird. (2018). Examining Trolls and Polarization in a Retweet Network. MIS2 Misinformation and Misbehavior Mining on the Web. Workshop held in conjunction with *WSDM 2018*. Los Angeles, CA. Feb 9, 2018.

We also wrote a public-facing blog:

> https://medium.com/@katestarbird/content-sharing-within-the-alternative-media-echo-system-the-case-of-the-white-helmets-f34434325e77

The PI has given numerous presentations derived in all or part from this research in academic and public venues:

2018 CRAW Conference at Snowbird. Invited Keynote Talk: Muddied Waters: Online Disinformation during Crisis Events. July 17, 2018. Snowbird, Utah.

Fake News and Misinformation: Mini Lecture Series, Office of the Provost, University of Washington. Invited Talk: Muddied Waters: Online Disinformation during Crisis Events. April 18, 2018. Seattle, WA.

College Park Scholars Speaking Series, University of Maryland. Invited Talk: Muddied Waters: Online Disinformation during Crisis Events. April 9, 2018. University of Maryland, Baltimore, MD.

Contentious Narratives Conference. Invited Talk: Contested Narratives in Conflict: Online Discourse about the "White Helmets" in Syria. April 2, 2018. Washington DC.

Carnegie Melon University. HCII Crowdsourcing Seminar. Invited Talk: Muddied Waters: Online Disinformation during Crisis Events. March 19, 2018. Carnegie Melon University. Pittsburg, PA.

Exploring Media Ecosystems Conference, MIT Media Labs. Invited Talk: Muddied Waters: Online Disinformation during Crisis Events. March 5, 2018. Cambridge, MA.

Harvard Kennedy School & Shorenstein Center on Media, Politics, and Public Policy. Fake News and Misinformation Series. Invited Talk: Muddied Waters: Online Disinformation during Crisis Events. March 1, 2018. Harvard University, Cambridge, MA.

Women's University Club. Invited Talk: Finding "Fake News" in Times of Crisis: Online Rumors, Conspiracy Theories, and Disinformation. February 21, 2018. Seattle, WA

Stanford Brown Institute for Media Innovation. Invited Talk: Muddied Waters: Online Rumors, Conspiracy Theories and Disinformation in the Context of Crisis Response. February 13, 2018. Stanford University. Stanford, CA.

Stanford Center for International Security and Cooperation. Invited talk: Muddied Waters: Online Rumors, Conspiracy Theories, and Disinformation in the Context of Crisis Events. January 29, 2018. Stanford University. Stanford, CA.

Santa Clara Ethics Center and the High Tech Law Institute, IT, Ethics, and Law Series. Invited talk: Online Rumors, Conspiracy Theories, and Disinformation: Informatics and Civil Discourse. January 26, 2018. Santa Clara University. Santa Clara, CA.

Epistemology for the Real World: Navigating in an Archipelago of Alt-Epistemology and Alt-Truth Conference. Invited Talk: Muddied Waters: Online Rumors, Conspiracy Theories and Disinformation in the Context of Crisis Response. January 19, 2018. University of Washington. Seattle, WA.

Stanford Center on Democracy, Development, and the Rule of Law (CDDRL). Seminar. Online Disinformation during Crisis Events. November 16, 2017. Stanford University. Stanford, CA.

Michigan Interactive and Social Computing (MISC) Talk: Muddied Waters: Online Rumors, Conspiracy Theories and Disinformation in the Context of Crisis Response, October 24, 2017. University of Michigan.

College of Engineering Lecture Series, University of Washington. Finding 'Fake News' in Times of Crisis: Online Rumors, Conspiracy Theories, and Disinformation. October 26, 2017. Seattle, WA.

Redmond Library. Public Talk. In a Crisis: Online Rumors, Conspiracy Theories, and "Fake News". October 9, 2017. Redmond, Washington.

Bainbridge Public Library. Series on Fake News: The News Media's Latest Challenge. Talk: Finding 'Fake News' in Times of Crisis: Online Rumors, Conspiracy Theories, and Disinformation. September 30, 2017. Bainbridge, WA

Swissnex San Francisco. Crisis Code: Humanitarian Protection in the Digital Age. Panel on Humanitarian Threats in the Age of Cyberwar. Online Rumors, Conspiracy Theories and Disinformation in the Context of Crisis Response. September 27, 2017. (Remote presentation). San Francisco, CA.

REPORT OF INVENTIONS AND SUBCONTRACTS

(Pursuant to "Patent Rights" Contract Clause) (See Instructions on back)

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Seattle WA 98195-9472

c. CONTRACT NUMBER
N00014-17-1-2980

d. AWARD DATE *(YYYYMMDD)*
20170701

2.a. NAME OF GOVERNMENT PRIME CONTRACTOR
Same as 1a

b. ADDRESS *(Include ZIP Code)*
Same as 1b

c. CONTRACT NUMBER
N00014-17-1-2980

d. AWARD DATE *(YYYYMMDD)*
20170701

3. TYPE OF REPORT *(X one)*
a. INTERIM
b. FINAL [X]

4. REPORTING PERIOD *(YYYYMMDD)*
a. FROM 20170701
b. TO 20180131

SECTION I - SUBJECT INVENTIONS

5. "SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR/SUBCONTRACTOR *(If "None," so state)*

NAME(S) OF INVENTOR(S) (Last, First, Middle Initial) a.	TITLE OF INVENTION(S) b.	DISCLOSURE NUMBER, PATENT APPLICATION SERIAL NUMBER OR PATENT NUMBER c.	ELECTION TO FILE PATENT APPLICATIONS (X) d.				CONFIRMATORY INSTRUMENT OR ASSIGNMENT FORWARDED TO CONTRACTING OFFICER (X) e.	
			(1) UNITED STATES		(2) FOREIGN		(a) YES	(b) NO
			(a) YES	(b) NO	(a) YES	(b) NO		
	None							

f. EMPLOYER OF INVENTOR(S) NOT EMPLOYED BY CONTRACTOR/SUBCONTRACTOR

(1) (a) NAME OF INVENTOR *(Last, First, Middle Initial)*

(b) NAME OF EMPLOYER

(c) ADDRESS OF EMPLOYER *(Include ZIP Code)*

(2) (a) NAME OF INVENTOR *(Last, First, Middle Initial)*

(b) NAME OF EMPLOYER

(c) ADDRESS OF EMPLOYER *(Include ZIP Code)*

g. ELECTED FOREIGN COUNTRIES IN WHICH A PATENT APPLICATION WILL BE FILED

(1) TITLE OF INVENTION

(2) FOREIGN COUNTRIES OF PATENT APPLICATION

SECTION II - SUBCONTRACTS *(Containing a "Patent Rights" clause)*

6. SUBCONTRACTS AWARDED BY CONTRACTOR/SUBCONTRACTOR *(If "None," so state)*

NAME OF SUBCONTRACTOR(S) a.	ADDRESS (Include ZIP Code) b.	SUBCONTRACT NUMBER(S) c.	FAR "PATENT RIGHTS" d.		DESCRIPTION OF WORK TO BE PERFORMED UNDER SUBCONTRACT(S) e.	SUBCONTRACT DATES (YYYYMMDD) f.	
			(1) CLAUSE NUMBER	(2) DATE (YYYYMM)		(1) AWARD	(2) ESTIMATED COMPLETION

SECTION III - CERTIFICATION

7. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR *(Not required if: (X as appropriate))* SMALL BUSINESS or   [X] NONPROFIT ORGANIZATION

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a. NAME OF AUTHORIZED CONTRACTOR/SUBCONTRACTOR OFFICIAL *(Last, First, Middle Initial)*
Adelia Yee

b. TITLE
Central Operations Manager

c. SIGNATURE

d. DATE SIGNED
August 17, 2018

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