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‘How “Alone” are Lone-Actors?

**Exploring the Ideological, Signaling, and
Support Networks of Lone-Actor Terrorists’**

David C. Hofmann, Assistant Professor of Sociology, University of New
Brunswick

dhofmann@unb.ca

(506) 458-7437



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For more information, contact the Director of the Network, Lorne Dawson, Department of Sociology and Legal Studies, University of Waterloo (ldawson@uwaterloo.ca) or Elizabeth Ford, Project Manager of TSAS.



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Executive Summary

The threat of lone-actor terrorism poses a unique challenge to security practitioners tasked with detecting, identifying, and preventing acts of ideologically and politically-motivated violence. Conventional knowledge and early academic work on lone-actor terrorism has popularized the concept that these individuals radicalize, operate, plan, and execute terrorist plots in relative anonymity, with little connection to formal or more organized terrorist groups and networks. However, the growing scholarship in this area has begun to challenge the notion of the “loneliness” of lone-actors, and recent empirical research (e.g., Hamm and Spaij 2017; Gill 2015; Joosse 2015) has identified the crucial role that social relations, socio-political environments, and group dynamics play in the radicalization and operation of lone-actor terrorists. Put simply, the empirical evidence suggests that the motivations, methods, and ideologies of lone-actor terrorists are influenced by their larger socio-political environments and by their interactions and relationships with *other people*.

While there is growing consensus among terrorism scholars that questions the level at which lone-actor terrorists are socially and operationally isolated from others as they progress towards their first act of terrorist violence, there remains much that is not known about the extent and types of social, communication, and support relationships which they create and maintain during this formative period. With this lacuna in knowledge in mind, the current research employs social network analysis to examine patterns of social, ideological, communication, and support ties formed over a 24 month period prior to the commission of the first act of terrorist violence by two case studies of lone-actor terrorists: Timothy McVeigh, and Michael Zehaf-Bibeau. Extensive relational data were gathered from open-sourced documents on both case studies, and was then used to code relational matrices for each lone-actor’s full, ideological, signaling, and support networks. These matrices were then used to conduct sociometric tests to analyze relational patterns at the network, group, and individual (ego) levels.

While the findings of this study are tempered by the fact that it is difficult to generalize research results from a pair of case studies, the research results offer empirical support to the current literature that questions the extent of the “loneliness” of lone-actors by demonstrating that both case studies were actively engaged with and were part of larger ideological, operational, and communication networks that played a role in their radicalization towards violence, and/or the planning and operational stages prior to committing an act of terrorist violence. Perhaps more importantly, the current study provides four new potential insights into the social dynamics of lone-actor terrorists that were uniquely obtainable through the use of social network analytical methods:



- (1) The radicalization, planning, and operational stages of lone-actors are tied to and influenced by a mixture of *multiple* small-group and person-to-person social dynamics, depending on the nature of interaction (i.e., ideological, signaling, or support).
- (2) Information about terrorist plots tended to be shared the most with friends and co-workers of lone-actors. When shared, information tended to be transmitted from person-to-person, and with some few exceptions, tended not to be discussed in small groups.
- (3) The examined lone-actors relied on roughly a fifth to a fourth of their overall network for some form of material or non-material support meant to aid in the planning and execution of their terrorist plot. In both cases, the lone-actors tended to seek help from single individuals, rather than from groups or clusters of supporters.
- (4) Acquaintances of both lone-actors emerged as the most well-connected and important contributors to ideological discussions, and family members tended to play a diminished or lesser role in both lone-actors' ideological networks.

While the findings from the current research are still too preliminary to provide concrete and actionable insight to inform sound counter-terrorism policy related to lone-actor terrorism, several provisional recommendations are offered that, if substantiated with future research, may prove to be useful to security practitioners tasked with detecting, identifying, and preventing acts of lone-actor terrorism:

- (1) Lone-actors do not radicalize, plan, or operate in complete social isolation. This means that with sufficient additional research, it is likely that effective detection and interdiction strategies can be developed to combat instances of lone-actor terrorism.
- (2) Lone-actors are connected to, and are influenced by, small-group and person-to-person dynamics, which offers security practitioners several points of interdiction. Effective counter-terrorism strategies need to take into account the nature, type, and strength of the relationships that lone-actors form in order to exploit structural weaknesses within their networks. At this early stage, the research results suggest that acquaintances tend to be the most important to lone-actors during the radicalization process and when they seek material and non-



material support, and that friends and co-workers tend to disseminate information about the lone-actor's plot to other network actors.

- (3) Analysis of the signaling behaviours of the examined lone-actors suggests a certain laxity in operational security which can be exploited by security practitioners who monitor certain types of terrorist "chatter" among radical milieus known to produce, justify, or inspire acts of lone-actor terrorism.



1.0 - Introduction

Over the last fifteen years there has been an increase in violent politically-motivated incidents committed by “lone-actor” or “lone-wolf” terrorists: individuals who act independently from established terrorist organizations (Eby 2012; Gill 2015; Spaaij, 2010). In response to mounting concern among American and Canadian policy-makers, security practitioners, and police (Chermak et. al., 2010; Kerley 2010; Public Safety Canada 2016), there have been concerted efforts among terrorism scholars to understand the motives and methods of lone-actor terrorists in order to help combat this growing security threat. As a result, a small but growing body of case study research has emerged, focusing on various behavioral, operational, and social aspects of lone-actor terrorism (e.g., Andre and Harris-Hogan 2013; Berntzen and Sandberg 2014; Gartenstein-Ross 2015; Springer 2009), and researchers have discovered a number of important insights into the motivations and antecedent behaviors (see, Borum, 2013; Capellan, 2015; Gill et. al. 2014; Gill 2015; Pitcavage 2015), target selection (see, Ackerman and Pinson, 2014; Becker, 2014; Spaaij and Hamm 2015a), and pathways of radicalization towards violence (see, Hamm and Spaaij 2017; McCauley and Moskalenko 2014; Springer 2009) of lone-actor terrorists. While there have been some significant advances in our knowledge on lone-actor terrorism, scholars note that the current research is still in its infancy and suffers from many of the same theoretical, methodological, and empirical shortfalls that plague terrorism studies in general (see, Dawson 2014, pp. 66-70; Gill 2015, pp. 15-17; Schuurman and Eijkman 2013; Spaaij 2010; Spaaij and Hamm 2015b, p. 167).

Parsing out and discovering the various social processes and dynamics that drive lone-actor terrorists towards violent action has not been a straightforward or easy task. As noted in a recent report on lone-actor terrorism “...there is no hierarchical organization to disrupt, no large network to infiltrate, no group literature to monitor, and few public statements to interpret or background chatter to analyze for patterns”



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(Deloughery et. al., 2013, p. 2). The implication is that the solitary nature of lone-actor terrorism presents unique and difficult challenges for security agencies, policy-practitioners, and scholars tasked with detecting, identifying, and preventing acts of lone-actor terrorism. However, the notion of the solitary lone-actor who radicalizes towards violence and plans their attack(s) without any form of outside influence or support is being increasingly questioned by terrorism scholars. As Spaaij and Hamm (2015b, p. 170) argue:

[The concept of] lone-wolf terrorist attacks occurring “in the absence of collaboration with other individuals or groups” does not mean that lone-wolves are truly alone in their cause, or that they operate in a social of political vacuum. Put differently, lone-wolf terrorism must be placed within the broader context of the individual’s personal history, social relations, and political or religious struggles. A degree of external social influence is often employed during the terrorist attack cycle, notably at the level of ideological formation and (online and/or offline) communication with outsiders, including engagement with extremist materials or “terrorist PR.”

Many of the core assertions in the above statement have been examined by several notable empirical studies. Employing a mixture of database analysis and qualitative case studies to examine patterns and motivations of lone-actors, Spaaij (2012, p. 54) argues that “lone-wolf terrorists are more often than not strongly influenced (if only tacitly or vicariously) by wider communities that provide ideologies which cultivate a sustained, alternate sense of morality capable of justifying the destruction of life and property that terrorism entails.” Building upon this finding, Hamm and Spaaij (2017) compiled a database of two-hundred cases of American lone-actor terrorist incidents and conducted a number of complimentary ethnographic studies. Their findings stress the importance of social interaction (particularly on the Internet) in the radicalization towards violence of lone-actor terrorists, and found that lone-actor terrorists tend to broadcast their intentions to a wider supportive community or audience prior to committing an act of terrorist violence (see also, Feldman 2013, pp, 277-278). These



arguments are reinforced by Joosse's (2015) case study of Wiebo Ludwig, who is best known for the bombing of the EnCana pipeline in 2008-2009, where he demonstrates how individual lone-actors tap into the rhetoric and ideology of larger sympathetic communities to provide themselves and their struggle with meaning and focus. Finally, Gill et. al. (2014, pp. 429-431) highlight a number of striking findings in their quantitative analysis of the antecedent behaviour of 119 cases of lone-actor terrorists: one out of six lone-actors directly sought some form of legitimization from religious, political, social, or civic leadership; one third of lone-actors were involved at some time in a form of radical (but non-violent) socio-political activism; one third of cases tried to recruit others to their cause; close to 60% of lone-actors shared "specific information about the lone actor's research, planning, and/or preparation prior to the event itself" with other individuals (also known as 'signaling'), and; more than half of the examined lone-actors linked their actions with some form of wider group or movement (see also, Gill 2015). These findings have been further strengthened with a recent study of 55 lone actor terrorists by Schuurman et. al. (2017), who found that 62% of their sample had contacts with larger radical circles, 78% of their sample were encouraged by external supporters, and that 58% of their sample engaged in some sort of signaling behaviour by informing others of some aspect of their plot to commit an act of terrorist violence. Put simply, the current empirical scholarship on lone-actor terrorism argues that their motivations, methods, and ideologies are influenced by their larger socio-political environments and by their interactions and relationships with *other people*.

While there is growing consensus among terrorism scholars that questions the "loneliness" of lone-actors (see, Gartenstein-Ross and Barr 2016) there remains much that we do not know about the extent and type of social and support relationships that lone-actors create during the formative period leading up to their first act of terrorist violence. To date, the scholarly and empirical literature has yet to explicitly explore the structure, nature, and implications of the ideological, communicative, and support ties



formed by lone-actors. As a result, we have been overlooking potentially important structural insights into how lone-actors engage with and consume ideological material, how they share information about the planning and operational stages of their plots with others, and how they leverage or use existing ties to obtain material and ideological support for their planned attack(s). A deeper knowledge of these social dynamics may help scholars better understand *why* and *how* lone-actors radicalize towards violence, and organize their resources prior to the commission of an act of terrorist violence. With this lacuna in knowledge in mind, the goals of this research are threefold:

- (1) To further empirically test the claim in the current scholarly literature that lone-actor terrorists are influenced by their larger social, support, and ideological environments and networks;
- (2) To begin empirically exploring the extent to which lone-actor terrorists engage in “signaling” behavior by communicating their interest, preparation, and/or planning to other individuals prior to committing their first act of terrorist violence, and;
- (3) To begin exploring the nature and extent of the ideological and support ties formed by lone-actor terrorists during the time period in which they progressively radicalize towards violence and begin operational planning for their first act of terrorist violence.

In order to address these goals, this research uses social network analysis to examine the patterns and nature of social, ideological, communication (signaling), and support ties formed over a 24 month period prior to the commission of the first act of terrorist violence by two high profile lone-actors: (1) Timothy McVeigh, known for the 1995 Oklahoma City Bombing that killed 168 people, and (2) Michael Zehaf-Bibeau, known



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for the October 2014 Parliament Hill attack where he murdered Corporal Nathan Cirillo as he guarded the Canadian National War Memorial in Ottawa. For the purposes of this research, lone-actor terrorism is defined as an act of ideological or politically-motivated violence that is planned and executed by a single individual without *direct* support or communication from or with a wider, more established terrorist organization or network. It is important to note that this definition is not universal, and other research (e.g., Gill et. al. 2014; Simon 2014; Teich 2013) uses broader criteria to define lone-actor terrorism to include dyads or triads of “isolated” actors.¹

This report begins with a discussion of the methods used during analysis, the criteria for case study selection, and the procedures used for the collection and coding of relational data. Brief backgrounds of the two lone-actors selected for study are then provided, followed by a presentation of the results of analysis. The report then concludes with an overview of how the research findings contribute to our knowledge about the motives, methods, and behaviors of lone-actor terrorists, a consideration of study limitations and avenues for future research into the relational ties of lone-actor terrorists, and concludes with a discussion of how the findings may help inform policy decisions for strategic stakeholders and security partners.

2.0 – Methods and Data Collection

2.1 – Social Network Analysis

As stated above, the goals of this study are to empirically examine different aspects of the ideological, signaling, and support ties formed by lone-actor terrorists as they progress towards the commission of their first act of terrorist violence. Social network analysis is therefore ideally suited for exploring these types of relationships, since the

¹ For a more complete discussion of definitional issues surrounding lone-actor terrorism, please consult Spaaij and Hamm (2015b).



focus of the research is upon the nature of the social and strategic ties formed by lone-actor terrorists. Social network analysis consists of a collection of techniques meant to explore the structure and patterns of social relations among individuals and social groups (see, Scott 2017). Rather than focusing exclusively on attribute data (sex, age, socioeconomic status, and so on) or on qualitative data taken from written documents or face-to-face interviews, social network analysis is primarily interested in the *relations* or *ties* between actors that make up their larger interpersonal networks. Once the extent and nature of these relations are observed and coded, researchers can conduct a number of sociometric tests that reveal insights into structural dynamics and characteristics of the examined network(s), and how individual actors (also known as “nodes”) fit within and influence their overall network(s). The type of networks and sociometric measurements within this study are called “egocentric,” since the analysis focuses upon the social ties formed around a single central actor (i.e., the lone-actor).

Terrorism scholars have previously used social network analysis to examine topics such as leadership transition (Wu et. al. 2014), online propaganda and social media activity (Klausen et. al. 2012; Van Den Ende 2016), and the social, structural, and operational dynamics of terrorist cells (Azad and Gupta 2011; Krebs 2002; Pedazhur and Perliger 2006). However, at the time of writing, this study is the first of its kind to employ social network analysis to empirically examine various aspects of several different types of networks formed by lone-actor terrorists.

2.2 – Challenges of Dark Networks

The type of social networks analyzed in this study are known as “dark” networks, which consist of collections of interconnected actors who actively attempt to occlude the nature and extent of their relations and activities from outside scrutiny. Examples of dark networks include drug-trafficking organizations, terrorist cells, and secret societies. Dark networks present at least three major conceptual and empirical



challenges for social scientists (see, Cunningham et. al. 2016, pp. xviii-xix). The first challenge is the dynamic nature of dark networks. Since lone-actors are not static social beings, the extent and nature of their social and support ties can change rapidly over time. This is admittedly a weakness of the current study that needs to be addressed in future research (see, section 5.2). The second challenge is the incomplete nature of the data used to construct the analyzed networks. Since the ideological and planning stages leading towards an act of terrorist violence requires some level of secrecy from outside scrutiny, obtaining data for the complete network that is devoid of any gaps or holes is a near impossibility barring unerring cooperation from the actual lone-actor terrorist themselves. Despite this limitation, the consensus among network analysts is that important findings and insights can still be gleaned from the known portions of dark networks (Gerdes 2015; Krebs 2002). Lastly, the third challenge presented by dark networks involves the fuzziness of the network boundary, which is an artificially imposed inclusion/exclusion criteria meant to make the coded network analytically manageable and meaningful.² For the purposes of this research, a boundary of 2 steps away from the lone-actor (e.g., lone-actor terrorist > adjacent actor > individual connected only to adjacent actor) was chosen since it is unlikely that any actors beyond that point had any sort of meaningful influence or interaction with the lone-actor.

2.3 – Identification of Case Studies and Data Collection

After a working definition for lone-actor terrorism was established, a pool of potential case studies of lone-actors was compiled from a survey of two existing terrorism databases: The Global Terrorism Database (START 2016), and the Canadian Incident Database (TSAS 2015). Once the preliminary cases were selected, each lone-actor was

² For example, an ego-centric network whose boundary is '2' will only include actors within the network that no more than two steps away from 'ego' (i.e., they are at least connected to another actor directly connected to the central actor).



evaluated for inclusion/exclusion based primarily upon the availability of sufficient quality relational data on their ideological, support, communication, and operational networks. From the initial pool of case studies, five lone-actors were originally selected for analysis:

1. Timothy McVeigh;
2. Michael Zehaf-Bibeau;
3. Andreas Breivik;
4. Theodore Kaczynski; and
5. Justin Bourque.

Relational, attribute, and qualitative data for each of the above case studies were collected from available open-source data (e.g., Lexis-Nexis, Factiva, FindLaw, Canlii, autobiographies, biographies, court documents, scholarly articles and books) and systematically recorded into profiles that focused on understanding multiple dimensions of the nature, extent, and types of networks formed by each case study. Efforts were made to obtain data on each case from many different types of sources (e.g., news media, court documents, biographies, and so on), but this was not possible for every case.

At the time of the writing of this report, coding for the McVeigh and Zehaf-Bibeau networks are complete, and the remainder are ongoing. As a result, only the findings from the McVeigh and Zehaf-Bibeau networks are included in the analysis. Data on McVeigh's networks were drawn primarily from biographies (e.g., Gumbel and Charles 2012; Hamm 1997; Hammer and Paul 2004; Jones and Israel 1998; Michel and Herbeck 2001), court documents, and news media accounts found using the Lexis-Nexis and Factiva databases. Zehaf-Bibeau was killed by security personnel when he stormed the Canadian Parliament building, therefore there were no subsequent court cases to provide certain details of the events preceding the attack. Since the attack happened relatively recently, there are no available biographies on Zehaf-Bibeau, and scholarly



studies are scarce. Therefore, the data on Zehaf-Bibeau's networks were taken almost exclusively from journalistic accounts and news media found using the Lexis-Nexis and Factiva databases. As a result, the gaps in data on Zehaf-Bibeau's networks, particularly those dealing with the interactions and relationships he formed through online/virtual communication, are fairly significant.

2.4 – Examined Networks (Full, Ideology, Signaling, Support)

In order to explore and compare various types of relational ties formed by lone-actors in the 24 months prior to their first act of terrorist violence, a total of four different networks were coded for each case study: (1) full, (2) ideology, (3) signaling, and (4) support. Descriptions for each network are provided below:

- Full network: consists of the actors that make up the lone-actor's wider social circle of friends, acquaintances, co-workers, and family members. The full network was coded to serve as a control/contrast for the other three networks, particularly to highlight the differences in who the lone-actor discussed ideological material with, with whom they shared information about their planned attack, and who they relied upon or used for material or non-material support in executing their attack.
- Ideology network: consists of the actors within the lone-actor's social circle where some form of radical or extremist discussion took place that was directly related to the primary ideological worldview (Christian Identity, fundamental Islam, radical environmentalism, and so on) held by the lone-actor. The ideological ties that make up the larger network include both violent and non-violent conversations between two or more actors, and is meant to shed light upon the different individuals and subgroups/cliques with whom the lone-actor



engaged in some form of ideological discussion during the period where they progressively radicalized towards violence.

- Signaling network: consists of the actors with whom some form of information about the lone-actor's research, planning, or execution of an act of terrorist violence was shared. This network is meant to empirically explore the extent of signaling behavior of lone-actors, and to discern any patterns among individuals and subgroups regarding the sharing of information related to the lone-actor's planning/operational stages.
- Support network: consists of the actors that provided some form of *direct* material or non-material support related to the research, planning, or execution of the lone-actor's planned attack. This support may be intentional (e.g., providing materials or training in regards to bomb making) or unintentional (e.g., providing money or lodging to the lone-actor which is then used towards the commission of an act of terrorist violence without the knowledge of the benefactor).

2.5 – Coding Guidelines

Once sufficient data were gathered for all the case studies, two researchers (the PI and one RA) coded binary adjacency matrices³ for each lone-actor's full, ideology, signaling, and support network. Basic attribute data (age, gender, relationship to lone-actor) were also coded for each actor. Coding was done separately, and once complete, the PI and RA met to go over discrepancies. Differences in coding were resolved through

³ A binary adjacency matrix involves coding for the presence or absence of a tie (coded as “0” for absence, and “1” for present) between all identified actors within a particular network.



discussion and consulting the original source data. The following criteria were used to determine the presence or absence of a relational tie for each of the coded networks:

- Full network: is there evidence of some form of repeated and/or sustained social interaction and/or relationship between actors during the 24 month period prior to their first act of terrorist violence? Incidental or passing contact was coded as the absence of a relational tie.
- Ideology network: is there evidence of person-to-person (either face-to-face or virtual) discussion of radical or extremist views related to the lone-actor's primary ideological worldview that *does not* necessarily overtly advocate for or involve the escalation towards violent action?
- Signaling network: is there evidence of purposeful or unintentional signaling of the lone-actor's intention to research, plan, or execute an act of terrorist violence? The litmus test for this criteria involved a basic "reasonability" test: a tie was coded as present if the coders found it reasonable that an objective third party would be alarmed enough to call the police if the information was shared with them.
- Support network: is there evidence of *direct* support that either intentionally or unintentionally aided in the planning, commission, or execution of an act of terrorist violence (e.g., provision or facilitation of the acquisition of land/storage, money, training, information, weapons, safe houses, moral/legal/spiritual guidance or justification, physical material, and so on).

The full and ideology networks were coded as undirected, meaning that the presence of a relational tie involves reciprocity between both actors (e.g., an ideological conversation involves a back and forth discussion between both parties). The signaling



and support networks were coded as directed, meaning that the observed relationship may have been reciprocal or one-way (e.g., information was shared from one actor to another without any information going the other way). Whether or not a network is directed or undirected can affect the types of sociometric tests that can be used, and how certain types of measurements are understood.

In addition to these criteria, data triangulation protocols were employed to help mitigate validity issues that may arise during coding processes where there is an overreliance on secondary and open-source data. In order to be coded as present, a relational tie must have been mentioned in at least two or more different data sources (e.g., in both a news report and in a court document) that did not directly reference or draw information from one another. Relational ties that were only mentioned in a single data source were not included in the final coded matrices.

3.0 - Case Studies

3.1 - Timothy McVeigh

Timothy McVeigh is known for planning and executing the Oklahoma City Bombing on April 19th, 1995, where he detonated a homemade fertilizer bomb contained in a rented Ryder truck parked outside the Alfred P. Murrah federal government building. The resultant blast killed 168 individuals and injured over 600 others. Among the dead were nineteen children who were present in the building's daycare center. The aftermath and public backlash surrounding the Oklahoma City Bombing is often credited with a decline in the growth of far-right militia and anti-government movements during the late 1990s (Crothers 2003).

McVeigh's motivations for planning and committing the bombing centered mainly around his anti-government worldview which was exacerbated by the lethal government interventions over arms violations at Ruby Ridge in 1992, and at Waco in



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1993 (see, Levitas 2002; Wright 1995). McVeigh's ideology was shaped by far-right theories that centered upon fears of a hostile government out to disarm citizens prior to a forceful takeover, and similar far-right conspiratorial worldviews. He was present and active among protestors during the government siege at Waco, and was a regular in the gun show circuit where he sold far-right literature, survival gear, and weaponry (see, Hamm 1997). McVeigh began actively planning his attack after the disastrous April 1993 ending of the government siege of the Branch Davidians at Waco, Texas, where 76 people burned to death during an FBI assault on the compound. Based primarily in Kingman, Arizona, McVeigh began collecting and testing the materials for an ammonium nitrate fertilizer bomb with the help of Terry Nicols and Michael Fortier. Two years to the day after the end of the Waco siege, McVeigh planted and detonated the homemade truck bomb outside the Murrah Building. He was arrested shortly after the bombing, and was executed by lethal injection on June 11th, 2001.

3.2 - Michael Zehaf-Bibeau

Michael Zehaf-Bibeau is known for the shooting murder of Corporal Nathan Cirillo on October 22nd, 2014 at the Canadian National War Memorial in Ottawa, and subsequently storming the Parliament building, where he was fatally shot by security staff. Zehaf-Bibeau recorded a short video of himself prior to executing his planned attack where he expressed his motives, citing the Canadian military's involvement in Afghanistan and the Middle East, justifying his actions as retaliation, and asking God to curse his enemies.

Zehaf-Bibeau's father is a Libyan-Canadian, and his mother is a French-Canadian employee of the Canadian Immigration and Refugee board. He converted to Islam in 2004, and moved to Western Canada around 2007 to earn a living as a laborer. During this period, Zehaf-Bibeau engaged in petty crime such as drug possession and robbery.



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Psychiatric evaluations prior to a trial in 2011 found him mentally fit to stand trial. Zehaf-Bibeau attended mosques in the Burnaby B.C. area around 2011-2012, but alienated congregation members with his erratic behavior. Prior to committing the attack, he expressed a desire to travel overseas to Libya to ostensibly pursue Islamic studies, but was likely motivated to participate in the Syrian civil war. He traveled east to Ottawa in early October 2013, where he frequented homeless shelters. During this time, Zehaf-Bibeau applied for Canadian and Libyan passports. The Libyan government denied him a passport, and the Canadian background check process was delayed but in progress when he committed the attack. The RCMP commissioner credits Zehaf-Bibeau's denial of a Canadian and Libyan passport as the central issue that drove him to commit the attack on Parliament.

4.0 - Results

The discussion below is organized into three sections, each of which corresponds to a particular level of analysis. It begins at the network-level which examines the overall structure and the patterns of relations across each lone-actor's full, ideological, signaling, and support network. The discussion then proceeds with a group-level analysis that explores the connectivity and importance of certain subgroups found within each of the lone-actors' networks. Lastly, the results of the ego-level analysis provide insight into how each individual lone-actor fit within their respective networks.

4.1 - Network-level characteristics

The measurements for network-level properties (see, tables 1 and 2) reveal interesting structural insights into McVeigh and Zehaf-Bibeau's full, ideology, signaling, and support networks. Not surprisingly, the full networks are the largest for both lone-actors, with 62 actors within McVeigh's network, and 26 actors within Zehaf-Bibeau's



network (see, figures 1 and 5). The results for the average degree centrality⁴ scores indicate that the typical individual within McVeigh and Zehaf-Bibeau’s full networks was connected to an average of approximately 5 other actors (4.839 and 5.462, respectively). In terms of network cohesion, the density⁵ and global clustering coefficient⁶ scores for McVeigh’s full network indicate an overall diffuse network structure (density: 0.079), however, with a high-level of local clustering (GCC: 0.777). Zehaf-Bibeau’s full network is somewhat denser than McVeigh’s (density: 0.218) and has slightly higher levels of local clustering (GCC: 0.877). This suggests that while both lone-actors’ full networks were relatively uncohesive, they each contained a number of small pockets of tightly-knit individuals that were well-connected to one another.

Table 1
Network-Level Characteristics across McVeigh’s Network Types

LWT	Network Type	Size	Avg. Degree	Density	Global Clustering Coefficient
McVeigh	Full	62	4.839	0.079	0.777
	Ideology	32	3.875	0.125	0.799
	Signaling	24	1.417	0.062	0.418
	Support	15	1.467	0.105	0.514

Table 2
Network-Level Characteristics across Zehaf-Bibeau’s Network Types

LWT	Network Type	Size	Avg. Degree	Density	Global Clustering Coefficient
Zehaf-Bibeau	Full	26	5.462	0.218	0.877
	Ideology	10	3.000	0.333	0.833
	Signaling	5	1.000	0.250	0.000
	Support	5	1.200	0.300	0.389

⁴ Average degree centrality indicates the average number of direct ties that a typical node within a network has to other actors within the same network.

⁵ Density is a network cohesion measurement that provides a score between 0 and 1. It is calculated by identifying the number of actual ties divided by the number of possible ties within the network. A score of 0 indicates that no actors within the network are connected to each other, while a score of 1 indicates that all actors within the network are directly connected to one another.

⁶ The global clustering coefficient is an overall indication of the degree of local clustering within a network, and represents a network’s tendency to have tightly-knit groups.



Using their full networks as comparisons, the size of McVeigh and Zehaf-Bibeau's ideology networks (see, figures 2 and 6) are smaller by almost half the number of actors for McVeigh (32) and somewhat more than half the number of actors for Zehaf-Bibeau (10). The average degree scores for both lone-actors also dipped somewhat. Individuals within McVeigh's ideology network were connected to an average of approximately 4 other actors (avg. degree: 3.875), while individuals within Zehaf-Bibeau's ideology network were connected to an average of 3 other actors. Density scores reveal that McVeigh and Zehaf-Bibeau's ideological networks are somewhat more cohesive than their full networks (0.125 and 0.333, respectively), and the global clustering coefficients only changed minimally (0.799, and 0.833, respectively). The results suggest that both lone-actors discussed non-violent and violent ideological material related to their particular worldview with fairly significant portions of their full social network (McVeigh: 51.6%; Zehaf-Bibeau: 38.4%), and that ideological discussions within these networks tended to take place in relatively small and tightly-knit groups of three to four individuals.

Unsurprisingly, McVeigh and Zehaf-Bibeau's signaling networks (see, figures 3 and 7) are smaller than their full and ideological networks (24 and 5, respectively). The average degree scores (McVeigh: 1.417; Zehaf-Bibeau: 1.000) are also significantly lower, indicating that on average, actors within both lone-actors' signaling networks shared information or knowledge about the research, planning, or execution stages of the plots with approximately one other individual. The density score (0.062) and the global clustering coefficient (0.418) for McVeigh's signaling network reveal that it is the least cohesive and has the lowest amount of tightly-knit



Figure 1
Sociogram of McVeigh's Full Network

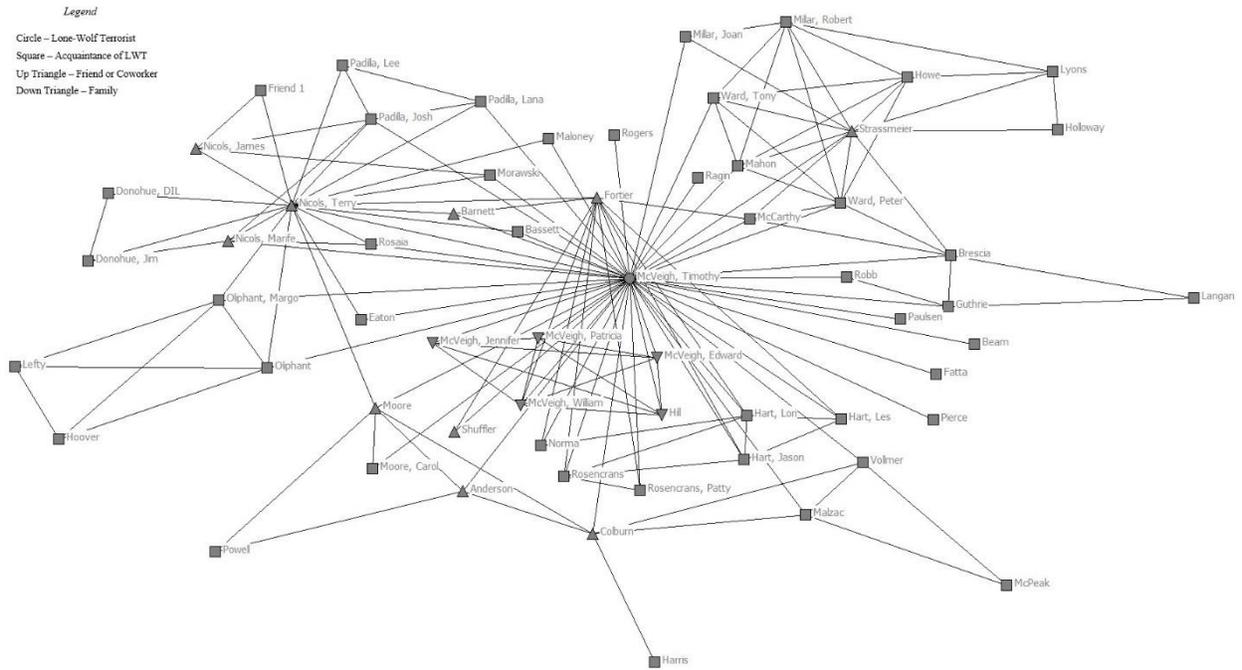
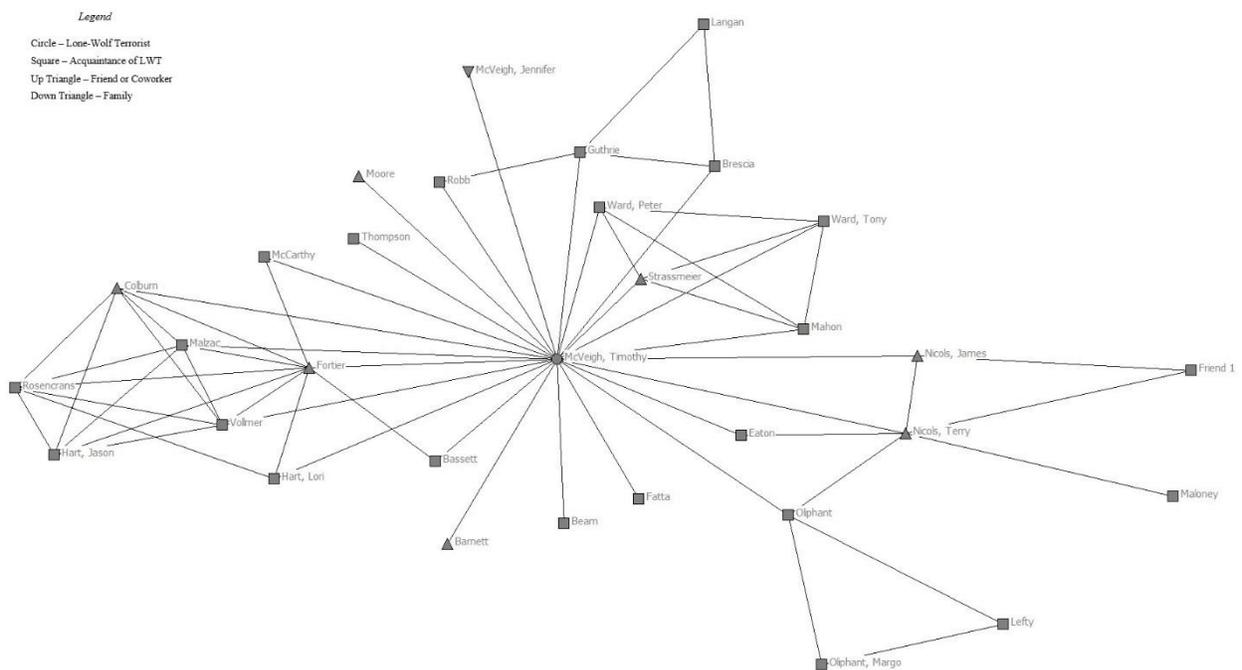


Figure 2
Sociogram of McVeigh's Ideology Network





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Figure 3
Sociogram of McVeigh's Signaling Network

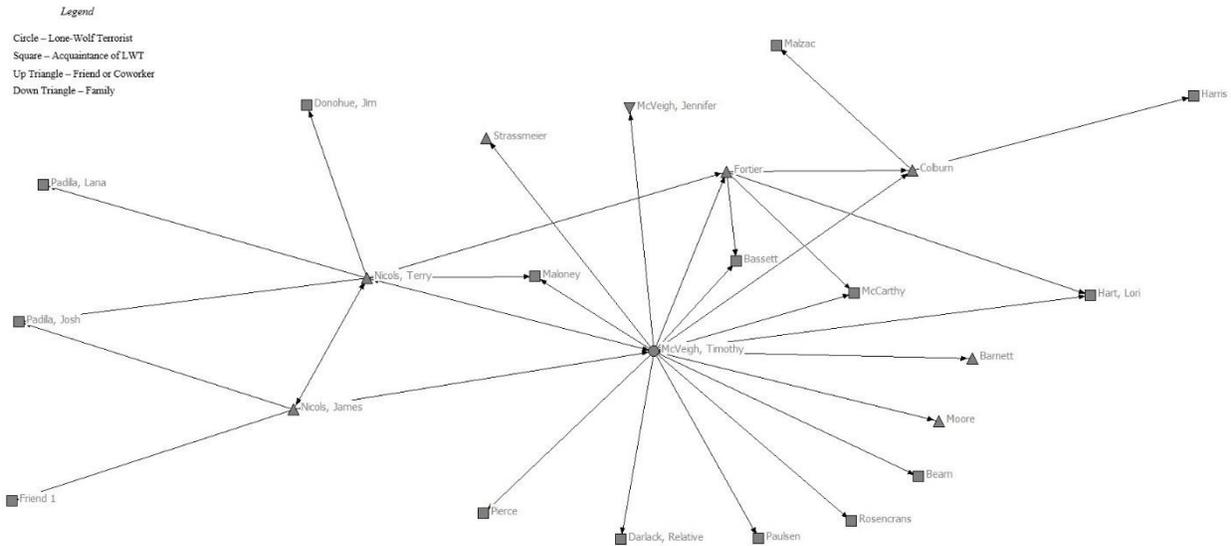


Figure 4
Sociogram of McVeigh's Support Network

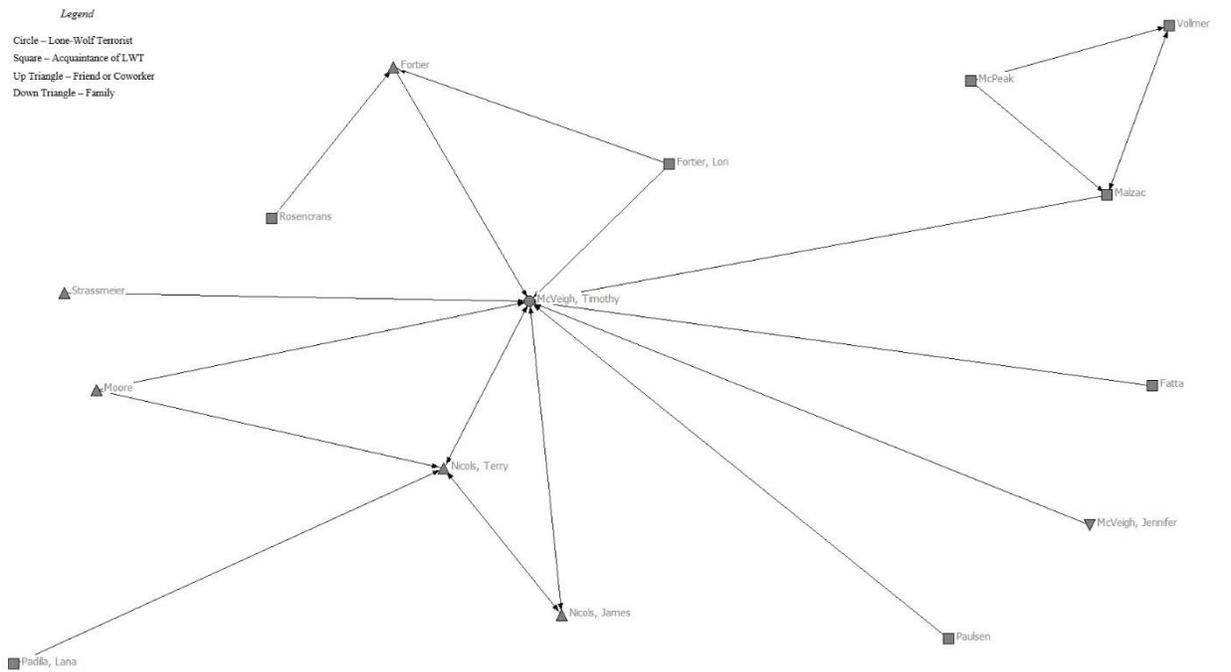




Figure 5
Sociogram of Zehaf-Bibeau's Full Network

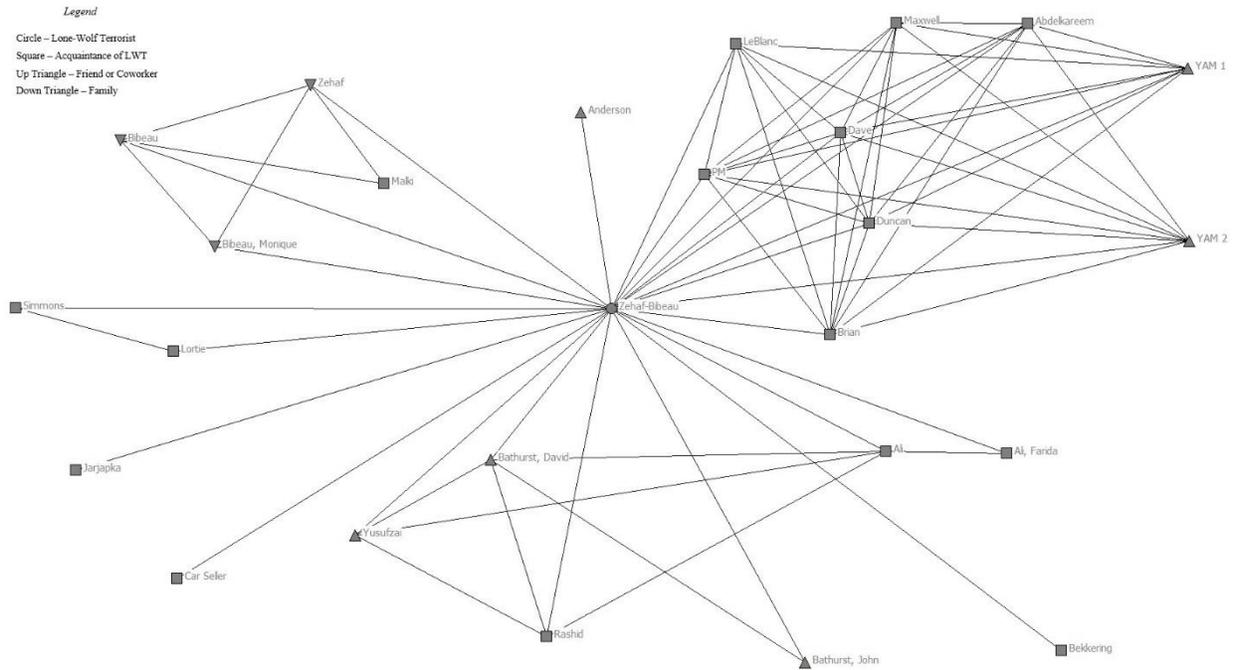


Figure 6
Sociogram of Zehaf-Bibeau's Ideology Network

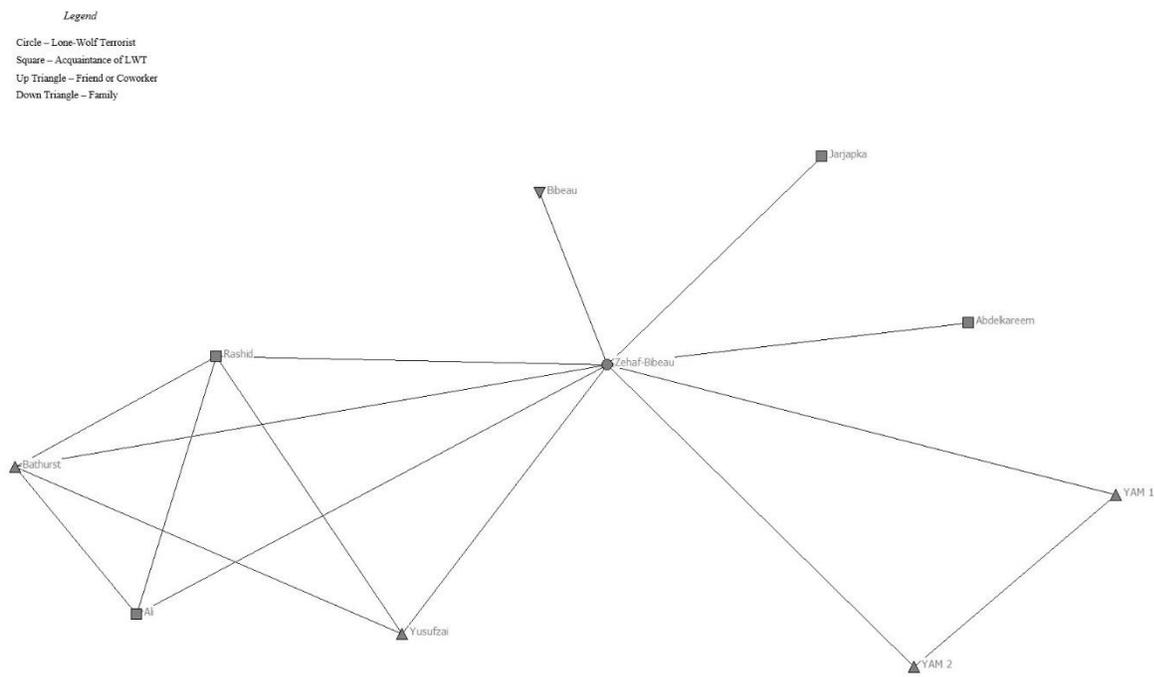


Figure 7
Sociogram of Zehaf-Bibeau's Signaling Network

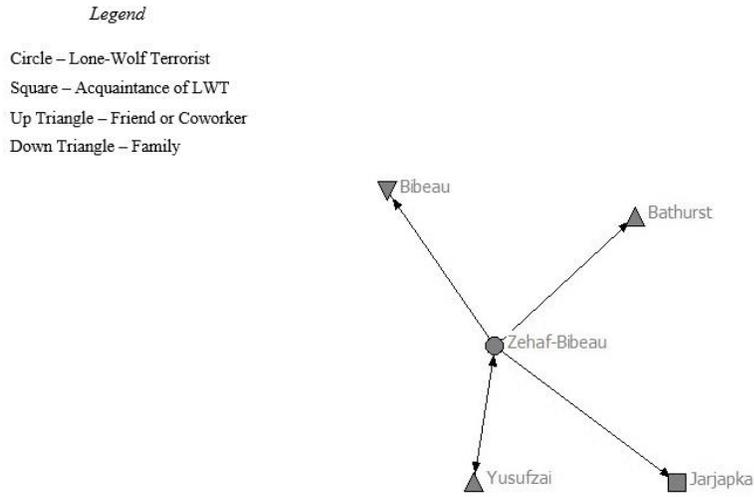
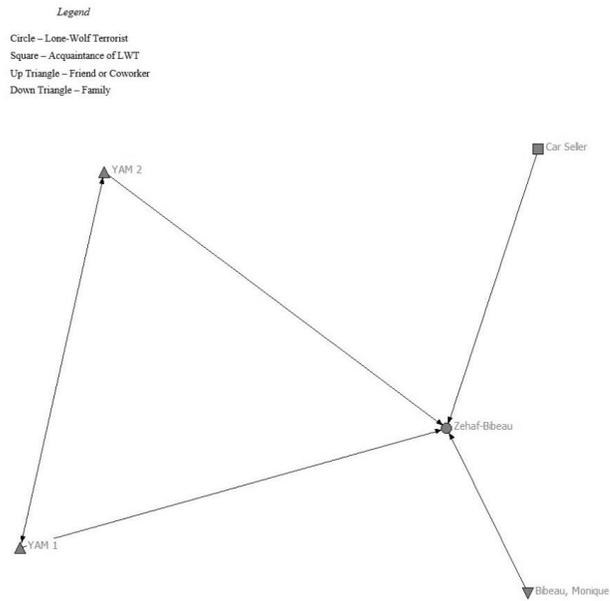


Figure 8
Sociogram of Zehaf-Bibeau's Support Network





groups of among all of his examined networks. The density score (0.250) for Zehaf-Bibeau's signaling network reveals that it is somewhat more cohesive than his full network, and somewhat more diffuse than his ideology network, and contains no tightly-knit clusters of actors (GCC: 0.000).⁷ The results suggest that 38.7% of McVeigh's and 19.2% of Zehaf-Bibeau's full networks were privy to some aspect(s) or information regarding their plots, that related information was passed fairly linearly from individual-to-individual, and for the most part, tended not to be discussed or shared amongst small groups within the network (with some few exceptions in McVeigh's case).

Lastly, the network-level characteristics of McVeigh's support network (see, figure 4) reveal that they, for the most part, closely resemble the network-level characteristics of his signaling network. The resultant sociometric measurements for McVeigh's support network show that: it is the smallest in size (15); that on average actors are directly connected to approximately one other individual within the network (avg. degree: 1.467); it is slightly more cohesive (density: 0.105) when compared his full and signaling networks, but less cohesive than his ideological network; and that it has a somewhat higher tendency to have tightly-knit groups when compared with his signaling network, but a somewhat lower tendency when compared with his full and ideology networks (GCC: 0.514). The network-level characteristics of Zehaf-Bibeau's support network (see, figure 8) also closely resemble those of his signaling network: it is identical in size (5), and has relatively similar average degree (1.200) and density (0.300) scores. The global clustering coefficient (0.389) for Zehaf-Bibeau's support network is lower than those in his full and ideological networks, but is higher when compared to his signaling network. These results suggest that McVeigh (24.2%) and Zehaf-Bibeau (19.2%) relied on roughly a fifth to a quarter of their full networks to provide them with

⁷ The composition of Zehaf-Bibeau's signaling network (see, figure 7) is known as a "star network," which is characterized by a single actor that is a central "hub" that bridges to all the other actors within the network.



some form of direct support that aided in the planning, commission, or execution of their terrorist plot, and that they tended to leverage single individuals for support rather than relying on small groups or clusters of supporters.

4.2 – *Group-level characteristics*

Basic attribute data on the nature of each actor's relationship with the lone-actor terrorist (acquaintances; friend/co-worker; family)⁸ were coded for all of McVeigh and Zehaf-Bibeau's networks. These categories were then used to explore sociometric characteristics of these subgroup categories across all four different types of examined networks (see, tables 3 and 4). Acquaintances are the largest subgroup across all four of McVeigh's examined networks (between 9 and 46 actors), followed by friends/co-workers (between 4 and 10 actors), and finally by family members (between 1 and 5 actors). For Zehaf-Bibeau's networks, acquaintances are the most numerous subgroup in his full network (16 actors), followed by friends/co-workers (6 actors), and then family members (3 actors). Acquaintances and friends/co-workers within Zehaf-Bibeau's ideological network are the largest subgroup (4 actors per category), followed by family members (1 actor). Lastly, Zehaf-Bibeau's signaling and support networks have the same number of friends/co-workers across each network type (2 actors per network), which is more numerous than the number of identified acquaintances and family members (1 actor per network).

Normalized degree centrality scores⁹ for each of the relational categories across McVeigh's four networks provide additional structural insight for each subgroup. In

⁸ Acquaintances are defined as actors who had occasional (at most several interactions over the period of several months) social interaction with the lone-actor. Friends/co-workers are defined as actors who had regular (on average, at least four or five interactions over a month) social interaction with the lone-actor. Lastly, family members are defined as actors who were related to the lone-actor by blood or marriage.

⁹ Normalized degree centrality scores provide a value between 0 and 1 that reflects the proportion of the network that is directly connected (adjacent) to a particular node or subgroup. In the case of group centrality, normalized degree scores indicate the percentage of the network that are directly connected to members who belong to the group in question. For directed networks, normalized OutDegree scores are the proportion of the network where a tie is directed outwards from a member of the subgroup to a node who is not part of the subgroup, and normalized

Table 3
Group Centrality Scores (Relationship with LWT) across McVeigh's Network Types

LWT	Network Type	Relationship with LWT	# of actors	nDegree	nOutDegree	nInDegree
McVeigh	Full	Acquaintance	46	0.500	-	-
		Friend/Co-worker	10	0.673	-	-
		Family	5	0.054	-	-
	Ideology	Acquaintance	24	0.750	-	-
		Friend/Co-worker	6	0.577	-	-
		Family	1	0.031	-	-
	Signaling	Acquaintance	15	-	0.000	0.556
		Friend/Co-worker	7	-	0.647	0.059
		Family	1	-	0.000	0.043
	Support	Acquaintance	9	-	0.500	0.000
		Friend/Co-worker	4	-	0.091	0.455
		Family	1	-	0.071	0.000

McVeigh's full network, friends and co-workers are the most well-connected category (directly connected to 67.3% of the network), despite being significantly less numerous than the number of acquaintances. This is followed by acquaintances (directly connected to 50.0% of the network), and then by members of McVeigh's family (directly connected to 5.4% of the network). Within McVeigh's ideological network, acquaintances are the most central subgroup (directly connected to 75.0% of the network), followed by friends and co-workers (directly connected to 57.7% of the network), and then by family members (directly connected to 3.1% of the network). This suggests that ideological conversations related to McVeigh's worldview were more prevalent among his acquaintances than among his friends, despite the fact that McVeigh's friends and co-workers were the most socially-connected individuals within his full network. For McVeigh's directed networks, normalized OutDegree scores for the signaling network reveal that McVeigh's friends and co-workers shared knowledge about the research, planning, and execution stages of his plot with 64.7% of the network, while acquaintances and family members did not share any information

InDegree scores are the proportion of the network where a tie is directed towards a member of the subgroup from a node outside of the subgroup.



pertaining to the plot with other members of the network. Normalized InDegree scores for McVeigh's signaling network reveal that information about McVeigh's plot was shared the most with acquaintances (55.6% were privy to information about the plot), followed by friends and co-workers (5.9% were privy to information about the plot), and then family members (4.3% were privy to information about the plot). This suggests that a very small number of McVeigh's friends and co-workers shared information about his plot with a disproportionately high number of McVeigh's acquaintances. Lastly, normalized OutDegree scores for McVeigh's support network reveal that acquaintances offered direct support to the highest number of individuals within the network (directly connected to 50.0% of the network), followed by friends and co-workers (directly connected to 9.1% of the network), and finally by family members (directly connected to 7.1% of the network). Normalized InDegree scores for the support network show that, aside from McVeigh himself (see, section 4.3), friends and co-workers who were planning concurrent or supportive terrorist activities and plots received the most support (directly connected to 45.5% of the network).

Table 4
Group Centrality Scores (Relationship with LWT) across Zehaf-Bibeau's Network Types

LWT	Network Type	Relationship with LWT	# of actors	nDegree	nOutDegree	nInDegree
Zehaf-Bibeau	Full	Acquaintance	16	0.700	-	-
		Friend/Co-worker	6	0.500	-	-
		Family	3	0.087	-	-
	Ideology	Acquaintance	4	0.500	-	-
		Friend/Co-worker	4	0.500	-	-
		Family	1	0.111	-	-
	Signaling	Acquaintance	1	-	0.000	0.250
		Friend/Co-worker	2	-	0.333	0.333
		Family	1	-	0.000	0.250
	Support	Acquaintance	1	-	0.250	0.000
		Friend/Co-worker	2	-	0.333	0.000
		Family	1	-	0.250	0.000



Normalized degree centrality scores for Zehaf-Bibeau's full network reveals that his acquaintances are the most socially-connected actors (directly connected to 70.0% of the network), following by friends and co-workers (directly connected to 50.0% of the network), and then by family members (directly connected to 8.7% of the network). Within Zehaf-Bibeau's ideology network, acquaintances and friends/co-workers are equally central (both categories directly connected to 50.0% of the network), followed by family members (directly connected to 11.1 % of the network). This suggests that acquaintances, friends, and co-workers were equally important to the discussion of ideological material within Zehaf-Bibeau's network. Within his directed networks, normalized OutDegree scores for Zehaf-Bibeau's signaling network reveal that friends and co-workers shared knowledge about the research, planning, and execution stages of his plot with 33.3% of the network, while acquaintances and family members did not share any information about the plot with any other network actors. Normalized InDegree scores for the signaling network show that information about Zehaf-Bibeau's plot was shared the most with friends and co-workers (directly connected to 33.3% of the network), followed by acquaintances and family members (both categories directly connected to 25.0% of the network). This suggests that the most information about Zehaf-Bibeau's plot was shared with and passed on by his friends and co-workers. Lastly, normalized OutDegree scores for Zehaf-Bibeau's support network show that friends and co-workers offered direct support to the highest number of individuals within the network (directly connected to 33.3% of the network), followed by acquaintances and family (both groups directly connected to 25.0% of the network). Normalized OutDegree scores for the support network show that no direct support was offered by any subgroups to other network actors, aside to Zehaf-Bibeau himself.



4.3 – Ego-level characteristics

As the respective “egos” of the four different types of examined networks in this study, degree centrality¹⁰ scores were calculated individually for McVeigh and Zehaf-Bibeau in order to further explore the extent of the ties which they formed during the 24 months prior to the commission of their acts of terrorist violence (see, tables 5 and 6). For McVeigh’s undirected networks, the degree centrality scores reveal that he was directly connected 46 other actors, which consists of 74.1% of his full network (nDegree: 0.741). In regards to the ideological network, McVeigh was directly connected to 24 other actors, which consists of 75.0% of the network (nDegree: 0.750). These findings are unsurprising, given that the network boundary was set at 2 steps away from the lone-actor, and that coding for an egocentric network is purposefully conducted with the “ego” as the central hub for the entire network. What the results do suggest, however, is that McVeigh was not at the absolute center of the ideological discussions conducted amongst his network. Even with the skewed importance given to McVeigh during the coding process, one out of four of the actors within his ideology network were involved in radical or extremist discussions without being directly connected to him. Furthermore, the “dark” nature of McVeigh’s networks (see, section 2.1) means that there is a high likelihood that there are large gaps and holes in the analyzed data, suggesting that the extent of ideological networks in which McVeigh participated were likely even larger than those coded for this study.

For McVeigh’s directed networks, degree centrality measurements for his signaling network reveal that he shared information related to research, planning, or executing an act of terrorism to 17 other actors (OutDegree: 17), which consists of 70.8%

¹⁰ Degree centrality is the number of adjacent ties of a particular node within a network (i.e., the number of direct connections an actor has with other actors). For directed networks, InDegree is the number of ties directed from other actors towards a particular node, while OutDegree is the number of ties directed outwards from a particular node to other actors. Normalized degree centrality is the proportion of the network which is directly adjacent to a particular node



of the overall signaling network (nOutDeg: 0.708). McVeigh was also informed about concurrent or supportive plots by 2 actors within his signaling network (InDegree: 2), which consists of 8.3% of the overall network (nInDeg: 0.083). In terms of his support network, McVeigh offered direct support in the planning, commission, or execution of a supportive or tangentially-related act of terrorist violence to 2 individuals (OutDegree: 2) which consists of 13.3% of the overall network, and was provided with support from 10 individuals (InDegree: 10) which consists of 66.6% of the network. When using McVeigh’s full network as a contrast, results indicates that roughly a quarter (27.42%) of his full network had some form of knowledge about his plans and intentions to commit an act of terrorist violence, and that 16.13% of his full network were leveraged or used to provide him with some form of direct support for his bomb plot. Given the gravity and nature of McVeigh’s plot, a fairly significant number of individuals had some form of prior knowledge and forewarning of McVeigh’s intentions to commit an act of terrorist violence.

Table 5
Degree Centrality for McVeigh across Network Types

Ego	Network Type	Size	Degree	nDegree	OutDegree	nOutDeg	InDegree	nInDeg
McVeigh	Full	62	46	0.741	-	-	-	-
	Ideology	32	24	0.750	-	-	-	-
	Signaling	24	-	-	17	0.708	2	0.083
	Support	15	-	-	2	0.133	10	0.666

Table 6
Degree Centrality for Zehaf-Bibeau across Network Types

Ego	Network Type	Size	Degree	nDegree	OutDegree	nOutDeg	InDegree	nInDeg
Zehaf-Bibeau	Full	26	24	0.923	-	-	-	-
	Ideology	10	9	0.900	-	-	-	-
	Signaling	5	-	-	4	0.800	1	0.200
	Support	5	-	-	0	0.000	4	0.800



The ego-level characteristics across Zehaf-Bibeau's networks reveal less information and insight when compared to McVeigh's findings. This is largely due to the fact that the holes in the data within Zehaf-Bibeau's networks are significantly larger than McVeigh's. As a result, the combination of gaps within Zehaf-Bibeau's networks and the coding process for egocentric networks likely overinflates Zehaf-Bibeau's direct connections within his full (degree: 24; directly connected to 92.3% of the network), ideological (degree: 9; directly connected to 90% of the network), signaling (OutDegree: 4, InDegree: 1; 80% of the network privy to some knowledge of the attack, 20% of the network informed Zehaf-Bibeau about some aspect of the attack), and support (OutDegree: 0, InDegree: 4; 80% of the network offering direct support to Zehaf-Bibeau) networks. Regardless of the limited findings, they suggest that much like McVeigh, fairly significant portions of Zehaf-Bibeau's social connections had some form of prior knowledge about his intentions to commit an act of terrorist violence.

5.0 - Discussion and Conclusion

5.1 - Summary of Findings

It is impossible to draw generalizable conclusions from the analysis of a pair of case studies, and much more empirical research of a similar nature to the present study is required in order to confirm, deny, or add to the various research results that are discussed below. However, at this early stage, at least six preliminary findings can be drawn from the research results outlined in section 4.0 that can potentially help inform future research examining the extent, nature, and types of relational ties formed by lone-actors prior to the commission of their first act of terrorist violence. The first two findings address the study's research goals aimed at empirically testing previous assertions about the behaviours made by lone-actor terrorists and the nature of the influence(s) that their social connections have upon them:



- (1) Both lone-actors engaged with fairly significant portions of their social and strategic networks in regards to their ideological (McVeigh: 51.6%; Zehaf-Bibeau: 38.4%), signaling (McVeigh: 38.7%; Zehaf-Bibeau: 19.2%), and support (McVeigh: 24.2%; Zehaf-Bibeau: 19.2%) activities. This provides additional empirical support for the body of research that questions the extent of the “loneliness” of lone-actors (see, Gill et. al. 2014; Gill 2015; Hamm and Spaaij 2017; Joosse 2015; Schuurman et. al. 2017; Spaaij 2012; Spaaij and Hamm 2015b). In both cases, McVeigh and Zehaf-Bibeau were part of ideological, operational, and communicative networks whose actors had some form of knowledge or role in contributing to the lone wolves’ radicalization towards violence, or operational/planning stages of their attacks.

- (2) Both lone-actors engaged in signaling behaviours with fairly significant portions of their full social network (McVeigh 38.7%; Zehaf-Bibeau: 19.2%) during the 24 months prior to committing their first act of terrorism. This finding reinforces previous empirical research that suggest lone-actors tend to engage in surprisingly widespread signaling behaviours by sharing details of their plans with others during the formative stages of their plots (Hamm and Spaaij 2017; Gill et. al. 2014; Schuurman et. al. 2017).

If substantiated and strengthened with future empirical research, the remaining four findings may provide new insights into the social dynamics within the networks of lone-actor terrorists:

- (3) Despite low-to-moderate levels of cohesion across all four examined networks, both lone-actors were connected with, and relied upon, small clusters of relatively tightly-knit individuals with whom they discussed ideological concepts, signaled their intent to commit an act of terrorist violence, and



leveraged for material and non-material support. This suggests that the radicalization, planning, and operational stages of lone-actors are tied to and influenced by a mixture of *multiple* small-group and person-to-person social dynamics, depending on the nature of interaction (i.e., ideological, signaling, or support). Furthermore, this highlights the complex and multiplex nature of the types of relations that lone-actors form prior to committing an act of terrorist violence: *who* and *how* the lone-actor connected with others across their various networks was determined strategically by the type of interaction sought by the lone-actor.

- (4) The network-level analysis of both of the lone wolves' signaling networks shows that information about each terrorist plot tended to be shared from person-to-person, and with some few exceptions, tended not to be discussed in small groups. Furthermore, aside from the lone-actors themselves, their friends and coworkers tended to be the group that engaged most in signaling behaviours by passing on information about the lone-actors' plots to other network actors.
- (5) Both lone-actors relied on roughly a fifth to a fourth of their overall network for some form of material or non-material support meant to aid in the planning and execution of their terrorist plot. McVeigh revealed a tendency to rely on acquaintances for support, while Zehaf-Bibeau tended to rely on friends and coworkers. In both cases, the lone-actors tended to seek help from single individuals, rather than from groups or clusters of supporters.
- (6) Acquaintances of both lone-actors emerged as the most well-connected and important contributors to ideological discussions. While friends and co-workers played an equal role in Zehaf-Bibeau's ideological network, they were less important for McVeigh's network. Finally, family members tended to play a



diminished or lesser role in both lone-actors' ideological networks. At the ego-level of analysis, the relative importance of the lone-actors themselves are undoubtedly inflated by the fact that the analyzed networks are ego-centric and focus upon the lone wolves, however, findings suggest that both lone-actors were actively engaged in larger radical milieus that shared, created, and disseminated ideological concepts and worldviews that very likely had a significant impact upon their radicalization towards violence.

5.2 – Study Limitations and Suggestions for Future Research

There are several limitations that need to be taken into consideration when interpreting the above research findings. First, study findings are hampered by a common deficiency that plagues much of the current terrorism scholarship, namely, the overreliance on secondary source data (Dawson 2014, pp. 67-68; Dolnik 2013, pp. 3-4; Schuurman and Eijkman 2013; Spaaij and Hamm, 2015b, p. 173). While the barriers to access for quality primary source data are significant, overcoming these hurdles is a necessity if we are to gain a holistic understanding of the structural, relational, and social dynamics of the networks of lone-actor terrorists. This can potentially be overcome by gaining access to personal journals, biographies, video statements, or correspondence written by lone-actors, or by corresponding with friends and family members of lone-actors (see, Spaaij and Hamm 2015, pp. 173-175). However, these sources of data are not always available, and in the cases where they are, might not be readily accessible to researchers. Regardless, efforts can and should be made to obtain as much quality primary data as possible in future research focused upon the networks of lone-actors.

Recent empirical research on lone-actor terrorism places an emphasis on the important role that the Internet plays in ideological discussions, the radicalization process, operational planning, and signaling behaviours of lone-actor terrorists (e.g., Spaaij and Hamm 2017). The current research is limited in the sense that McVeigh was



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active prior to the widespread use of the Internet, and that the researchers could not obtain reliable data on Zehaf-Bibeau's online interactions and activity. As a result, the current findings do not take into account the role that the Internet played across McVeigh and Zehaf-Bibeau's various networks. This is a fairly significant issue when trying to extend or generalize trends taken from the research findings to contemporary cases of lone-actor terrorism, and is something that needs to be explicitly examined and addressed in future research that explores the nature and extent of online and virtual communications that lone-actors establish prior to committing an act of terrorist violence.

As discussed in the section on the challenges of dark networks, lone-actors are not static social beings, and the extent and nature of their social and support ties can change rapidly over time. The current study takes a cross-sectional approach when examining the 24 months prior to the commission of an act of terrorist violence. While a cross-sectional approach does offer interesting findings at this early stage of inquiry, a more nuanced understanding of the social, relational, and operational dynamics of lone-actor terrorists will require future research that gathers and analyzes longitudinal changes across the various networks formed by lone-actors prior to their first act of terrorist violence.

To date, scholars interested in terrorist radicalization have yet to overcome the problem of the explanatory gap in order to properly explain "why only a few individuals, from among the many subject to the same conditions, become terrorists" (Dawson 2014, p. 66). Much of the literature on lone-actor terrorism continues to struggle with the explanatory gap problem, where, aside from several studies that examine antecedent factors and descriptive statistics of lone-actor terrorists (e.g., Borum, 2013; Capellan, 2015; Gill et. al. 2014; Gill 2015; Pitcavage 2015), little is known about how and why certain individuals chose to embark on a path towards lone-actor terrorist violence. While the current study offers some interesting hints that have the



potential to narrow the explanatory gap in the case of lone-actor terrorists, much more research is required before any meaningful progress is achieved. More importantly, it demonstrates how an understanding of relational dynamics within and across the networks formed by lone-actors can complement and enhance what large-N quantitative research and case studies of lone-actors have already identified as crucial components in the process of radicalizing towards violence.

Lastly, future research on the relational dynamics of lone-actor terrorism will benefit greatly from comparative analyses that employ control groups. Sufficient nuanced comparative analyses of the similarities and differences across the ideological networks of non-violent radical milieus with a sample of lone-actor terrorists may help researchers identify important structural and relational variations and trends that can help us understand some of the factors that drive lone-actors towards terrorist violence.

5.3 – Policy Recommendations

Proceeding under the assumption that lone-actor terrorism is a solitary, hard-to-detect, and harder-to-interdict phenomenon is self-defeating. Recent empirical research, including this study, suggests that the moniker of “lone-actor” is a misnomer, in the sense that most do not radicalize, plan, and execute their plans in social, ideological, or operational isolation. Given the preliminary nature of the current study, this is perhaps the most concrete finding that can inform security policy focused upon combatting lone-actor terrorism. It suggests that with additional scholarly research into the relational dynamics and social networks of lone-actors, generalizable information and trends about the exact nature, extent, and patterns of relations that lone-actors form prior to committing an act of terrorist violence are likely to provide valuable information for security practitioners tasked with detecting, identifying, and preventing acts of lone-actor terrorism.



Tempered by generalizability issues and the study limitations discussed in section 5.2, research findings from the current study also offer several insights that can serve as stepping stones for future policies aimed at combatting lone-actor terrorism, as well as starting points for further inquiry into the nature and extent of the social connections formed by lone-actors. To begin, research findings reveal that the radicalization, planning, and operational stages of lone-actors are tied to and influenced by a mixture of small-group and person-to-person social dynamics, depending on the nature of interaction (i.e., ideological, signaling, or support). This suggests that there are multiple points of interdiction for security agencies interested in gathering intelligence or assessing the potential risk for violence on individuals suspected of planning or committing an act of terrorism. As highlighted by the examined case studies, lone-actors form complex relationships with other people, and do so with diverse purposes and intents. This means that effective detection and interdiction strategies will need to take into account the nature, type, and strength of the various relationships that lone-actors form when discerning the most effective way to gather intelligence, determine the risk for violence, and disrupt operations. At this early stage, it is impossible to pinpoint with any accuracy who or where security practitioners should target within the networks of lone-actors in order to achieve maximum efficacy for their efforts. However, research results provide some preliminary insight into structural weaknesses within the networks of lone-actors which may be exploited to gather intelligence on, or even disrupt, the activities of suspected lone-actors. Given their importance to the case studies' ideological networks, the lone-actor's acquaintances appear to play the most important role within their networks during their early radicalization stage, and are likely to provide the most illuminating and useful intelligence. If the lone-actor has progressed towards the research and planning stages of their plot, friends and coworkers emerge as the logical starting point for any intelligence gathering and interdiction strategies, given their tendency to pass along information about the lone-



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actors' plots to other members of the network. Lastly, if the lone-actor has moved towards the terminal stages of operational planning, interdiction efforts should likely shift back towards acquaintances, since the research results suggest that the examined lone-actors tended to leverage them the most for material and non-material support.

Lastly, paying close attention to certain types of "chatter" among radical milieus known to produce, justify, or inspire acts of lone-actor terrorism may provide sufficient early warning to prevent acts of violence. As supported by the current study's research results and other empirical research (Gill et. al. 2014; Schuurman et. al. 2017), lone-actor terrorists tend to be fairly lax in regards to operational security, particularly when it comes to sharing information about the research, planning, and operational stages of their plots. As demonstrated in McVeigh's signaling network, information about the planned act of violence can spread beyond those actors in which the lone-actor personally confided. This suggests that there are likely to be multiple opportunities for security practitioners to pick up and identify potential threats within a given network.

5.4 - Conclusion

The threat of lone-actor terrorism remains a persistent and unique challenge for security agencies tasked with detecting, identifying, and preventing acts of ideologically and politically-motivated violence. The purpose of this study is not only to further empirically test the growing consensus among terrorism scholars that lone-actor terrorists are not nearly as "alone" as previously conceived, but also to do so using a previously unused approach that employed social network analysis to examine the structural, nature, and patterns of relations that lone-actors may form prior to committing an act of terrorist violence. Hopefully, this study provides a foundation that can help inform future research, that, when paired with the wider quantitative and qualitative empirical literature on lone-actor terrorism, will contribute to identifying certain generalizable social-structural and relational trends useful to Canadian security



agencies tasked with identifying and preventing acts of lone-actor terrorism. Much more research needs to be conducted before this can be accomplished, but as the findings from the current study suggests, a better understanding of the relational dynamics of lone-actor terrorism has the potential to provide crucial insight into how and why they radicalize towards violence, how they plan and execute their plots, and how they might be prevented from realizing their goals.



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