FRAGMENTATION IN EMERGENCY RESPONSE OPERATIONS: A CURSE OR A BLESSING?

A case study into the Brussels Bombing and Manchester Arena Bombing

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Abstract

By conducting a comparative case study into how officers in command coped with fragmentation in the emergency response operation during coordination after the Brussels Bombings (2016) and the Manchester Arena Bombing (2017), this research aimed to provide more clarity about the phenomenon of fragmentation in relation to coordination practices by officers in command in the fast-paced environment of emergency management. While the majority of studies consider fragmentation to be a deficiency of coordination which undermines integrative coordination practices, and therefore effective coordination of the emergency response operation, this research found support for a less well known perspective to coordination: the fragmentation perspective to coordination. This research demonstrated that officers in command coped with the problems arising as a result of fragmentation by using the virtues of fragmentation. By conducting cross boundary interventions and through the breaking of protocol, novel and creative solutions to the situation at hand were created. Although these actions undermined integration, they simultaneously allowed for adaptation, thereby contributing to effective coordination. For this reason, recognition that fragmentation can be used as an alternative way of coordination in case achieving integration is not possible is an important step in ensuring that crisis management is practiced effectively. This does not mean that integrative coordination should be disregarded. However, in case of sudden onset crises, researchers should switch away their attention from researching ways to avoid and reduce effects of fragmentation. Instead the focus should be on researching how and when fragmentation can ensure effective coordination as this will increase the officers in command resilience to adequately cope with these type of crises. This is necessary because fragmentation is inevitable in a fast-paced environment.

Preface

Presented to you is the thesis: Fragmention in Emergency Response Operations: A Curse Or A Blessing? This thesis was written as the final step to complete the Master Programme, Crisis and Security Management. Throughout this process I have had the pleasure and honor of working with my supervisor Dr. J.J. Wolbers, whose expertise lies in fast-response organizing during coordination, sensemaking and decision making in crisis management. I would like to thank him for his substantive feedback, quick responses to any questions received and the interesting discussions we had. His assistance and guidance, and importantly his enthusiasm about this topic helped me to get the best out of myself to create this work. Moreover, I would like to thank my friends and family, who assisted me when times were rough and when I needed some time for relaxation. I am very proud to present this research and hope you will enjoy the ride I take you on.

Kind regards,
Florianne Kortmann

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Chapter 1: Introduction

When on 29 June, 2014, the official spokesman of the Islamic State declared the establishment of the Islamic Caliphate in Syria and Iraq, the threat of Jihadist terrorism striking Europe increased significantly ('Isis Spokesman Declares', 2014). The increase of Jihadist inspired terrorist attacks began with the shooting at the satirical magazine Charlie Hebdo in Paris, only two months after the declaration of the Caliphate. Hereafter, Europe was confronted with various large scale terrorist attacks such as in Paris (2015), Brussels/Zaventem (2016), Nice (2016), Berlin (2016), various attacks in London (2017), Stockholm (2017) and Strasbourg (2018) (Europol, 2018). These terrorist attacks resulted in many casualties, injured people, and torn down infrastructures.

A terrorist attack can be regarded as a sudden-onset crisis, which is a crisis that suddenly and unexpectedly arises, often with a large impact. Unlike a creeping crisis or a slow-unfolding crisis, there are no warning signals or cues to be noticed; the crisis literally catches society by surprise (Fonio & Boersma, 2017). To illustrate, a sudden-onset crisis such as a terrorist attack could consist of a suicide bomber igniting his suicide vest in a building. Suddenly, and without warning, society is confronted with a large amount of injured and fatalities, risk of collapse and additional ambiguity and uncertainty about what just occurred, and what is to come next. To mitigate the consequences of these type of crises, a swift emergency response operation is required (Faraj & Xiao, 2006) and an important role is therefore attributed to the crisis management of emergency response organizations (Drabek, 1985).

In the case of a terrorist attack, various emergency response organizations are involved, because security needs to be ensured (police and military organization), evacuations may be necessary (fire organization) and treatment of the injured is required (medical organization). Because various emergency services are involved, ambiguity and uncertainty increases (Comfort & Kapucu, 2006). Therefore, an important role is attributed to coordination of the emergency response operation. Coordination ensures that through input regulation and interaction articulation a collective performance is achieved (Faraj & Xiao, 2006; Okhuysen & Bechky, 2009). Indeed, a common strategy and approach is necessary to ensure an effective emergency response operation (Bigley & Roberts, 2001).

However, coordination of the emergency response operation in case of a sudden-onset crisis such as a terrorist attack may prove difficult and pose a coordination challenge, because the emergency response organizations are confronted with highly volatile environments

characterized by dynamisms and discontinuous change (Moynihan, 2008; Bigley & Roberts, 2001; Comfort & Kapucu, 2006). For this reason, it may be difficult to synchronize the different actions conducted by the emergency response organizations because of the extreme settings in which the first emergency responders operate (Bigley & Roberts, 2001). To illustrate, Hirsch et al. (2015) found that in the case of the terrorist attacks in Paris (Bataclan), the emergency response organizations faced time pressure, opposing interests and a variety of demands from different stakeholders. Formal structures broke down in unexpected ways which caused the situation to quickly become ambiguous and uncertain. The *''discontinuity and ambiguity make it difficult to predict which organizations will engage in which part of the response operations, and what tasks, people, and expertise are needed at different times''* (Wolbers, Boersma & Groenewegen, 2018, p. 1522). Consequently, in responding to a terrorist attack, coordinators are inevitably confronted with fragmentation: a breakdown of collaborative action and collective sensemaking in the emergency response operation (Wolbers et al., 2018).

This raises the question how first responders should cope with fragmentation during coordination of the emergency response operation. Within crisis management literature, the dominant view is that coordinators should attempt to reduce the effects of fragmentation. This is because the traditional view of coordination is based on the notion of integration of different areas of work under a central agreement to ensure a collective performance (Okhuysen & Bechky, 2009; Argote, 1982; Heath & Staudenmayer, 2000). Focused on integration, fragmentation is considered to be a deficiency of coordination, as it results in differentiation which affects integrative coordination practices, and its effects must therefore be reduced at all costs (Wolbers et al., 2018).

On the other hand, organizational resilience literature implies that the effects of fragmentation should not be reduced. Instead, the authors of this literature argue that fragmentation can foster creativity, improvisation and adaptation during coordination practices which contributes to resilience (Comfort, Boin & Demchak, 2010; Williams, Gruber, Sutcliffe, Shepherd & Zhao, 2017; Mendonca & Wallace, 2004; Rerup, 2001; Kendra & Wachtendorf, 2003). Resilience can be understood as the capability to effectively cope with and adapt to unexpected crises (Comfort et al., 2010). Moreover, Comfort et al. (2010) argue that fragmentation must be encouraged if it enhances coordination, flexibility, improvisation and endurance. Wolbers et al. (2018) also suggest that fragmentation could be used as an alternative way of coordination and thereby increase effectiveness of coordination of the crisis management operation.

The above discussion indicates that for scientists, fragmentation is still an unresolved problem in crisis management. On the one hand, scientists consider fragmentation to be negative, noting that its effects should be reduced. On the other hand, scientists note that fragmentation could be used to improve the effectiveness of the coordination of the crisis management operation. As such, a lack of scientific consensus is present with regard to how first responders should cope with fragmentation during coordination of the emergency response operation to a sudden-onset crisis. For this reason, more clarification and research into this topic is required. The aim of this thesis is to contribute to this knowledge gap by conducting a multiple case study with comparative element into the coordination of the emergency response operation after the Brussels Bombings that occurred on 22 March, 2016, and the Manchester Arena Bombing that occurred on 22 May, 2017 (Dearden, 2016; Coyle, 2017). Specifically, this thesis will attempt to answer the following question: *How did officers in command cope with fragmentation during the coordination practice of the emergency response operation of the Brussels Bombings in 2016, compared to the Manchester Arena Bombing in 2017?*

The selected cases form a unique comparison because both cases show similar instances of fragmentation. That is, in the case of the Brussels Bombings, the fire department was under the impression that not enough ambulances were present on scene and requested more ambulances, while the medical department and the emergency center stated enough ambulances were present and refused to send more ambulances. In the case of the Manchester Bombings, the fire department was under the impression that it was not safe to deploy to the Manchester Arena scene, because they assumed this was an ongoing marauding terrorist attack, resulting in them arriving more than two hours after the attack, whereas the ambulance services and police services deployed to the scene immediately. Both cases indicate that different cognitive frames and different interpretations of the situation were present with regard to what action was required and what was going on, which indicates a breakdown of collective sensemaking. Moreover, in both cases the end result was a breakdown of collaborative action. Comparing these cases enables the researcher to study how fragmentation occurred, what effect this had on coordination processes and to compare how officers coped with fragmentation, thereby enabling the researcher to answer the research question. Moreover, because these cases are similar in type of incident (terrorist attack), method of execution (suicide bombing), and environmental context (circumstances of ambiguity and uncertainty) this allows for a comparison under similar circumstances.

Having said that, this research is both scientifically and socially relevant. The empirical findings and processes that will be identified will not only provide more clarity on the role of fragmentation in relation to coordination practices, and thereby contribute to the identified scientific knowledge gap, but the findings will also contribute to crisis managers being able to better alleviate the effects of the crisis, because once a better understanding of fragmentation is reached, scientists will be able to provide practitioners with more accurate advice on how to cope with fragmentation. Practitioners need to be provided with clarity with regard to how to cope with fragmentation during coordination, as a failure to understand the role of fragmentation in relation to coordination may undermine the effectiveness of coordination practices. This is something all practitioners are attempting to avoid, especially when coordinating the emergency response operation to a sudden-onset crisis such as a terrorist attack, where making mistakes can risk the lives of the injured.

Chapter 2: Theoretical Framework

2.1 Introduction

Crises exist in various forms and sizes. When a crisis arises, this threatens basic structures or fundamental values and norms of a social system. Consequently, a crisis response is required to reduce the potential impact of the crisis and to bring the crisis to an end (Rosenthal, Boin & Comfort, 2001). Because a terrorist attack is a sudden-onset crisis, there are no warning signals or cues to be noticed: the crisis literally catches society by surprise (Fonio & Boersma, 2017). In these type of crises, time pressure to make decisions, uncertainty and ambiguity are instantly present, and first responders and crisis managers must quickly respond and decide what action to take to reduce the crisis impact (Faraj & Xiao, 2006). An important role is therefore designated to crisis management of the emergency response operation (Drabek, 1985).

Crisis management can be defined as the actions taken *''... to reduce harm inflicted upon society by the crisis and endeavor to regain control and order after a crisis''* (Bundy, Pfarrer, Short & Coombs, 2017). Comfort (2007) notes that crisis management revolves around cognition, communication, coordination and control. She states that these four factors imply an interdependent, evolving process of organizational management. Through cognition, emerging risk is noticed which triggers a response to this risk. As cognition is triggered, the subsequent processes of coordination, communication and control are activated. Comfort notes that communication enables the creation of (shared) meaning amongst and in organizations. Shared meaning creation is crucial in crisis management, because it enables a common understanding of the goals and missions of the organization, thereby allowing the organization to respond with the correct resources and to align actions, so as to achieve the common goal and operating picture (Comfort, 2007). To reach a common operational picture, information is required (Wolbers & Boersma, 2013). Still, it is it is not only information sharing that is important, but the way in which that information is interpreted. The way meaning is given to information eventually determines the action path taken as sense is made of the situation. This indicates that sensemaking is also an important part of crisis management and coordination (Wolbers & Boersma, 2013). Moreover, coordination allows for the coupling and integration of organizations' human and tangible resources to reach a common goal (Comfort, 2007). Lastly, control enables the organization to restore the situation to a pre-emergency state. Control is maintained through knowledge sharing, expertise skills and adjustment to the situation at hand (Comfort, 2007). Taking into account the processes of

cognition, communication, sensemaking, coordination and control, crisis management can be seen as *''a complex, adaptive system that adjusts and adapts its performance to best fit the demands of an ever-changing physical, engineered, and social environment''* (Comfort, 2007, p. 195).

This theoretical framework will further clarify the concepts of coordination and sensemaking. While control and communication are equally crucial aspects of crisis management, it could be argued that these concepts are incorporated in coordination and sensemaking, as coordination cannot be practiced without communication with other actors and sensemaking cannot be seen in isolation from communication and information and knowledge sharing, which is an important part of control. Consequently, by further elaborating on coordination and sensemaking, the concepts of control and communication are essentially integrated and will not be discussed separately. Having said that, the theoretical framework will address the challenges to the practice of coordination and sensemaking under circumstances of uncertainty and high pressure and discuss and link the concepts to coping with fragmentation in emergency response operations to sudden-onset crises.

2.2 Coordination

Defining coordination

Coordination is a key aspect of crisis management that is studied in detail in organization and management studies (Wolbers et al., 2018). This thesis uses Faraj & Xiao's (2006, p. 1157) definition of coordination which defines coordination as a *''temporally unfolding and contextualized process of input regulation and interaction articulation to realize a collective performance.''* This definition is chosen because this thesis focuses on coordination of the emergency response operation by officers in command in response to a terrorist attack which can be considered a sudden-onset crisis. Sudden-onset crises require a fast-response and in a fast-response emergency operation, officers in command are confronted with highly volatile environments characterized by dynamisms and discontinuous change, resulting in uncertainty, and ambiguity (Faraj & Xiao, 2006). In these environments *''coordination is more about dealing with the ''situation'' than about formal organizational arrangements''* (Faraj & Xiao, 2006, p. 1157).). Indeed, officers in command are more likely to be driven by practicalities such as recognizing emergent situations, recognizing unpredictability of evolving action and new task demands (Faraj & Xiao, 2006).

Although through the creation of predetermined roles, regulations and formal structures, an organization can design the coordination process and assist actors to successfully complete and align work to achieve a common objective, the *''... portrayal of processes and structures as formal elements planned by organizations rather than as ongoing work activities that emerge in response to coordination challenges''* is problematic (Okhuysen & Bechky, 2009, p. 468). Kellogg, Orlikowski and Yates (2006) study found for example, that interdependencies change over time and are redefined as the coordination process unfolds. Similarly, Gkeredakis (2014, p. 1475) observed that *''vital coordination work is accomplished when actors interact with one another to address interdependence on an unfolding trajectory of collective action.''* Indeed, Jarzabkowski, Lê & Feldman (2012, p. 909) note that *''even relatively structured coordinating mechanisms are continuously produced as they coordinate activity and expectations.''* Consequently, coordination must be considered a dynamic social process that is constantly evolving and redeveloping itself, and that is always in flux (Jarzabkowski et al., 2012; Okhuysen & Bechky, 2009; Kellogg et al., 2006).

Because coordination is an emergent process, this thesis uses a practice approach to study coordination. A practical approach enables explaining *''social phenomena in a processual way without losing touch with the mundane nature of everyday life and the concrete and material nature of the activities''* (Nicolini, 2013, p. 9). This approach is particularly fruitful when studying coordination during sudden onset extreme events, as coordination and coping with fragmentation occur in a highly contextualized and interdisciplinary environment from which coordination and fragmentation practices emerge and are reevaluated based on the organizational context (Orlikowski 2000; Faraj & Xiao, 2006). The practice approach enables the researcher to answer the question how, what, why and with what consequences coordination and coping with fragmentation happens, which is important as coordination and coping constantly reinvents itself (Korica, Nicolini & Johnson, 2017; Gkeredakis, 2014; Jarzabkowski, et al., 2012).

Having defined coordination, Okhuysen & Bechky (2009) note that coordination is based on three integrative conditions: accountability, predictability, and common understanding. Through the creation of accountability, responsibilities of the organizations are aligned and made visible. This ensures that coordination is enacted either by a formal authority or through the coordination of autonomous parties which are responsible for their own actions. Predictability is related to familiarity of actors to how elements and timing of other tasks are executed. They are predictable for example, because procedures are present or

because of formal workflows in protocols. Lastly, common understanding is required for integration as through a shared interpretation of the situation at hand, individuals will know what their role is within the task that needs to be performed. The authors note however, that a common understanding can only be accomplished if participants share information and knowledge of the task, goals and objectives. Communication and information sharing (control) are thus a crucial aspect of coordination.

Coordination under circumstances of high pressure and uncertainty

As noted in the introduction, coordination under circumstances of high pressure and uncertainty may prove difficult, as fragmentation may arise. Faraj & Xiao (2006) conducted a study into how a medical trauma center – a fast response organization - coordinated the emergency response operation under circumstances of high pressure and uncertainty. They found two type of coordination practices to cope with these circumstances: expertise coordination practices (design) for routine situations, and dialogic coordination practices for non-routine situations (emergent).

The expertise coordination practices are focused on managing knowledge and skill interdependencies during a habitual routine trajectory in a fast-response emergency environment (Faraj & Xiao, 2006). Examples of expertise coordination practices to ensure a smooth operation under high pressure and uncertainty involve reliance on protocol, communities of practice, knowledge sharing, plug-and-play teaming (Faraj & Xiao, 2006), role switching (Bigley & Roberts, 2001), and bricolage (Bechky & Okhuysen, 2011). These practices enable coordination because shared task knowledge, common expectations of workflow and structured role systems are present in a single organization which contribute to coordination (Bechky & Okhuysen, 2011). As such, they are essentially integrative and aim to reduce or avoid any fragmentating effect.

However, these social cognitive skills to counter circumstances resulting in fragmentation may not be sufficient in case more than one organization is involved, for example in the case of a terrorist attack. Comfort & Kapucu (2006) note here that in the direct aftermath of an unexpected and extreme event, a fast-response situation arises in which various different emergency response organizations must collaborate and align their actions instantly. Because the context in which the emergency responders operate is no longer a single organizational setting, the described social cognitive resources to reduce differentiation as a result of ambiguity and high pressure may not be present (Comfort & Kapacu, 2006). It is in these cases that one is more likely to observe fragmentation in the emergency response

operation, as the various emergency response operations face time pressure, opposing interests, a variety of demands from different stakeholders which makes it very difficult to predict who will take part in the response operation, what tasks they will conduct and which expertise and people are required at different times (Hirsch et al., 2015; Wolbers et al., 2018). Formal structures may break down in unexpected ways which causes the situation to increasingly become ambiguous and uncertain. Consequently, the expertise coordination practices therefore may be not be fully optimal, which results in coordinators being confronted with differentiation despite coordinators best efforts to reduce or avoid this.

Faraj & Xiao (2006) also identify dialogic coordination practices. They note that in case the habitual action trajectory of the organization does not go as planned, because treatment may not work or in case one is confronted with unexpected developments, dialogic coordination practices are required, because a new and unexpected event or realization challenges existing models and structures. A non-routine situation emerges and additional action must be taken to resolve the problem. Faraj & Xiao (2006, p. 1164) note that *''a dialogic coordination practice differs from more general expertise coordination processes in that it is highly situated in the specifics of the unfolding event, is urgent and high staked, and occurs at the boundary between communities of practice.''* Examples of dialogic coordination practices are cross boundary intervention, protocol breaking, joint sensemaking and epistemic contestation (Faraj & Xiao, 2006).

The authors note that firstly, cross boundary intervention may be required in case the safety of the patient is compromised by the actions of a team member. It is related to on the spot decision making or interference. Secondly, protocol breaking can occur in case following or sticking to the protocol slows down the treatment. This latter practice can be risky because it essentially disregards pre-determined procedures and upsets work plans, roles and expectations thereby undermining integration. Yet, it sometimes may be necessary to break protocol to ensure a crucial intervention which is required to reach a more suitable outcome Thirdly, sensemaking may assist in the process. This can be achieved by discussing the situation at hand with the team to gain new insights so as to adapt the course of action because the original pathway is not working (Faraj & Xiao, 2006). However, this may result in epistemic contestation. Epistemic contestation arises because different specializations come together and because predesigned structures of division of roles and responsibilities become blurred, as the situation requires adaptation in which different rules, expertise and responsibilities apply. Consequently, differences in opinion arise as the discussion occurs at the boundaries of practice. With stakes that are high and facing an ambiguous and uncertain

situation, this may result in conflict-laden discussions. Yet, the epistemic differences will eventually be controlled by the coordinator, and put aside for the common good (Kellogg et al., 2006; Faraj & Xiao, 2006). As such, coping with circumstances of high pressure and uncertainty in the emergency response may be achieved by applying these dialogic or emergent practices.

However, as already briefly touched upon, while dialogic (emergent) practices may contribute to workable solutions and adjustment to the situation at hand when facing circumstances of high pressure and uncertainty, these coordination practices do not necessarily aim for integration. Indeed, there is a tension present because the emergent practices can undermine pre-determined procedures and upset work plans, roles and expectations and thereby undermine integration. Bechky (2003), Bechky (2006), and Brown, Colville & Pye (2015) also argue that these emergent practices could trigger a process in which various actors are involved, and with various responsibilities arising, the interpretation and perspective of people differ, thereby creating misunderstanding and equivocality. This misunderstanding and equivocality may result in miscommunication and disruption of the coordination practice and thus undermine workable solutions and integration processes (Cornelissen, Mantere & Vaara, 2014). Indeed, differentiation could arise through coping by using emergent practices such as those named by Faraj & Xiao (2006).

Wolbers et. al (2018) for example, conducted a study in which the authors found that the dialogic practice of working around procedures was practiced by officers in command as creative solutions were invented and tactics were changed. Although this enabled ad-hoc adaptations, this also caused more difficulty to oversee the situation. Therefore, tasks were delegated but this created separate pockets of control and thus reinstated the functional boundary which in itself created more uncertainty. This uncertainty caused the need for demarcating expertise, as a result of which a multiplicity of interpretations arose. As such, the authors noted that the officers in command aimed for integration, their coordination practices caused differentiation. Nonetheless, Wolbers et al. (2018, p. 1536) noted that this contributed to workable solutions in extreme settings, as *''by engaging in these practices, officers treated ambiguity and discontinuity as a given, and as a valuable means of devising novel articulations and distributed actions.''* Consequently, Wolbers et al. (2018) proposed a fragmentation perspective to coordination which provides an alternative to the integrative perspective to coordination in case achieving integration may be difficult.

In a similar vein, Comfort, Boin & Demchak (2010), Williams, Gruber, Sutcliffe, Shepherd & Zao (2017), Mendonca & Wallace (2004), Rerup (2001), Kendra & Wachtendorf

(2003) note that fragmentation and emergent practices may contribute to resilience if it fosters creativity, improvisation and adaptation. Resilience can be understood as the capability to effectively cope and adapt to unexpected crises (Comfort, Boin & Demchak, 2010). Understood this way, the effectiveness of the coordination of the response operation depends on the extent to which people are able to enhance coordination through flexibility, improvisation and endurance which are all factors that contribute to resilience (Comfort, Boin & Demchak, 2010). By encouraging first responders to use fragmentation, this can spur creativity, (Mendonca & Wallace, 2004) improvisation, (Rerup, 2001) and on the spot decision making (Kendra & Wachtendorf, 2003). Therefore, this may contribute to workable solutions in extreme settings and improve coordination processes (Wolbers et al., 2018).

2.3 Sensemaking

Defining sensemaking

Weick (1995) states that sensemaking is a critical organizational activity. He defines sensemaking as a process of social construction in which contradictory cues disturb the ongoing process of thinking after which the person must ask himself what these cues mean so as to be able to rationalize the next steps. Simply put, a sensemaking process is triggered when persons are confronted with novel, unexpected, ambiguous events (cues) which challenge the person's expectation and understanding about reality, resulting in confusion (Meyer, 1982; Robinson & Morrisson, 2000). Upon being faced with this disruption, people will ask themselves what is going on and how to proceed (Maitlis & Christianson, 2014). By confronting the disruption, or by attempting to seek an explanation, information is extracted and interpreted from the environment which enables the person to make sense of what occurred (Weick, 1995; Maitlis & Christianson, 2014).

This illustrates that sensemaking is underpinned by the concept of enactment. That is, *''the idea that people generate the environment through their actions and through their attempts to make sense of these actions''* (Maitlis & Sonenshein, 2010, p. 553). They confront the disrupting cue that they are attempting to understand (Weick, 1995; Weick 2005). Indeed, as Weick (1988, p. 635) notes sensemaking is based on the idea that ''*… reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs… Sensemaking emphasizes that people try to make things rationally accountable to themselves and others.*''

Weick, Sutcliffe & Obtsveld (2005, p. 409) also note that *''to make sense of the disruption, people look first for reasons that will enable them to resume the interrupted*

activity and stay in action.'' That is, one turns to formal structures and authorities such as institutional frameworks, procedures, expectations and traditions that can assist in the process of making sense of the situation. Once meaning is constructed and a rational account of what is going on has been created, action can be taken (Maitlis & Christianson, 2014).

Joint sensemaking under circumstances of high pressure and uncertainty

In a turbulent and high-stake environment that arises after a crisis, sensemaking processes are crucial to ensure collaborative action (Maitlis & Sonenshein, 2010; Weick, 1988). Joint sensemaking ensures that the team can reach a common understanding of the situation at hand, which enables coordinators to make informed decisions, and enables them to reach an effective team performance (Boin, Kuipers & Overdijk, 2013). To obtain a common understanding, Wolbers & Boersma (2013) found that not only information is important, but also the way meaning is given to that information, as this guides the operation of the emergency responders. Therefore, the way the officers in command jointly make sense (or interpret) the situation during crises and whether they all do so similarly is key in reaching effective coordinated action and collaboration processes. Sensemaking is thus an important process that facilitates coordination.

Having said that, Weick (1988; 1995) identified three triggers which are required for (joint) sensemaking. Firstly, commitment to a common frame is required. During coordination, a common frame is created step-by-step as the event evolves, as various cues are connected to the frame. The way a cue is linked to the frame determines the behavioral consequences and action path taken, as it helps individuals create an account of what is going on (Maitlis and Sonenshein, 2010). Indeed, only if members and officers in command of an organization have a commitment to the common frame, the individuals know what their expectations and tasks are, and as such the commitment to this common frame creates an understanding which provides direction, purpose and an action trajectory (Cornelissen et al., 2014). Secondly, identity is crucial for joint sensemaking, in which a sense of shared identity will influence how collective meaning is created (Weick, 1995). Lastly, expectations influence the process of sensemaking. That is, expectations of oneself, or expectations the public holds about a certain organization or person creates a process in which these expectations are connected with cues and create meanings. (Joint) Sensemaking is crucial to reach a common operational picture, but it needs to be effectively performed.

Indeed, while (joint) sensemaking assists individuals in understanding and predicting behavior of others, thereby facilitating coordinated collective action as organizations commit

themselves to a common frame, this very same commitment to a common frame that enables coordination, can also undermine coordination as it is a double-edged sword (Cornelissen et al., 2014). Maitlis and Sonenshein (2010, p. 562) observe here that commitment *''on the one hand, … creates meaning and purpose and enables coordinated activity, and may thus facilitate sensemaking under pressure. On the other hand, such staunch commitment to a particular set of meanings creates substantial blind spots that impede adaptation.''* That is, commitment to a certain frame that is too strong may impede the ability of officers in command and their team to see important contradictory cues. This is also what happened in the Stockwell shooting, where commitment to a frame combined with the tendency to seek confirmatory cues and thereby neglect disconformity evidence, caused the fatal death of Jean Charles de Menezes (Cornelissen et al., 2014).

Barton & Sutcliffe (2009, p. 1331) also found in their study of wildlife fire management that a too strong commitment to a frame can result in the building up of dysfunctional momentum which they define as *''when individuals or teams continue to engage in a course of failing action.''* According to this study, dysfunctional momentum will build up if sensemaking is not periodically interrupted and reevaluated. Only through the voice of concern by team members and by actively seeking contradictory cues by officers in command, the buildup of dysfunctional momentum can be prevented. This will cause an interruption which enables the team to update their sensemaking. Yet, Rudolph and Repenning (2002) noted that sensemaking can also break down by multiple small interruptions. This may have to do with the fact that voicing concern may cause epistemic contestation in which opinions differ too much and thereby impedes efficiency of sensemaking and people not reaching an agreement (Faraj & Xiao, 2006).

Moreover, Christianson (2019) raises concern about the fact that most researchers assume that updating occurs under all circumstances. She notes that this may not always be the case, especially not during unexpected and fast unfolding events. She conducted a study in which she zoomed in on how emergency department staff managed the same unexpected event (a broken piece of equipment). This trajectory approach to sensemaking and updating *''focuses on sensemaking that occurs between individuals, as people jointly construct meaning and engage in coordinated action''* (Christianson, 2019, p. 49)**.** It considers both cognition and action, thereby enabling an examination of the interplay between interpretation and actual courses taken as common sense is made. That is, the author argues that even though a cue may be noticed by a team, this does not necessarily mean that this results in a change of action. This distinction is important, because a failure of updating can also be

present if cognitive frames have been revised, but this has not led to adjustment of the teams trajectory of action (Christianson, 2019). Christianson (2019) found that effective teams monitor and interpret new cues rapidly and take action. Less effective teams *''fail to monitor and confirm cues with others, overlook or misinterpret cues, and delay investigating cues and developing plausible explanations, they also delay testing explanations, often being sidetracked by patient care tasks''* (Christianson, 2019, p. 45).

In short, using the insights of both Christianson (2019) and Barton & Sutcliffe (2009) failure to update can result in the building up of dysfunctional momentum, because cognitive frames are not revised, or because cognitive frames are revised, but this does not result in the adjustment of action taken. Not surprisingly then, Maitlis & Sonenshein (2010, p. 565-566) argue that *''where commitment, identity, and expectations get us into deep trouble is when we have the false belief that our sensemaking is finished and that we have arrived at the answer.''*

Having said that, sensemaking and updating during the emergency operation to a sudden-onset crisis may prove difficult, because the emergency responders are facing an ambiguous environment in which a lack of communication, and *''lack of clarity, high complexity, or a paradox makes multiple, rather than single dichotomous explanations plausible''* (Martin, 1992, p. 134). This causes interpretive indeterminacy or epistemic differences in which ‘*'individuals draw on different knowledge bases to develop different understandings about what is happening and what should be done to prevent crisis''* (Maitlis & Sonenshein, 2010, p. 557). This process is fueled by the fact that a variable disjunction of information may be present, in which various agencies receive different information at different stages due to the complex situation of a crisis, and where resources are not sufficient to reach collective sensemaking amongst organizations (Maitlis & Sonenshein, 2010). A first implication is that this causes action ambiguity, in which it is unclear what action to take, what the consequences are of these actions and what action is called for (Martin, 1992). Different interpretations and sensemaking processes may result in different action paths taken, and therefore may undermine collaborative action and the collective performance of emergency response organizations during terrorist attacks (Wolbers et al., 2018). Moreover, the breakdown of sensemaking can consist of parties not updating their frames, because important signals are missed or neglected as a result of group think (Cornelissen et al., 2014). It may also consist of a failure to update despite having changed the cognitive frame, due to the high pressure under which the emergency responders work (Christianson, 2019). Lastly, the accommodation of contradictory cues, or normalization of extraordinary events could be

the result of organizational cultures, systems or routines that enhance blind spots (Levinthal & Rerup, 2006). In short, if sensemaking and updating by the officer in command and its team does not occur effectively during crises, this affects coordinated collaborative action and collective performance and thus the crisis management operation.

The above literature indicates that during emergency response operations under high uncertainty and pressure, ambiguity and uncertainty, reaching inter-organizational coordination may prove difficult as emergency responders are confronted with fragmentation. Interorganizational coordination and collaborative action may nonetheless be achieved by applying expertise and dialogic coordination practices which are focused on reducing these differentiating effects. However, during a sudden-onset crisis such as a terrorist attack, applying expertise coordination practices may not always be possible because various organizations are involved and because of the additional ambiguity and uncertainty of the situation. Consequently, an important role is attributed to dialogic coordination practices as traditional structures and pre designed methods are challenged and disturbed. Dialogic coordination practices may enable adjustment to the situation at hand which enables a new action trajectory that is more suitable for the situation. However, there is a chance that dialogic coordination practices itself result in or enforce fragmentation. As such, coping with circumstances of ambiguity, discontinuity, high pressure and fragmentation can be achieved either by attempting to reduce the effects of fragmentation, or by using fragmentation in which coordination has a differentiating effect to reach a workable solution.

Chapter 3: Methodology

3.1 Research design

In this study I set out to learn how officers in command coped with fragmentation during coordination of the emergency response operation in the aftermath of the Brussels and Manchester Bombing(s). Officers in command are responsible for coordination of their respective discipline during the emergency response operation. Moreover, officers in command must collaborate and communicate with the commanders of the other disciplines to ensure a swift emergency response operation and to ensure interorganizational coordination. Consequently, by focusing on coordination practices of officers in command in response to fragmentation the researcher could explain coping practices *''in a processual way without losing touch with the mundane nature of everyday life and the concrete and material nature of the activities''* (Nicolini, 2013, p. 9) and thereby enable the practice approach. As mentioned earlier, this approach was fruitful because coping occurred in a highly contextualized and interdisciplinary environment from which coordination and fragmentation practices emerged and were reevaluated based on the organizational context (Orlikowski 2000; Faraj & Xiao, 2006). The disciplines that were studied were the fire, police and medical department.

To reveal the coordination and coping processes with regard to fragmentation by officers in command, an inductive, qualitative multiple case study with comparative element was conducted, using a grounded theory approach. A case study approach enabled the researcher to study the phenomenon in its original context, while allowing for a holistic, in-depth investigation of the phenomenon (Zainal, 2007). The grounded theory approach was fruitful, because it enabled the researcher to capture the dynamic coordination activities and coping mechanisms of the officers in command, and the interdependencies between these activities, the environment and the other teams. This was achieved by transforming large chunks of data into more general patterns which could be used to reveal processes, as codes were assigned to the data after which they were grouped into categories and linked to each other (Langley, 1999). To identify the coordination and coping processes with regard to fragmentation, the researcher moved back and forth between theory and the phenomenon observed, as will become clear in the data analysis section (Alvesson & Kärreman, 2007).

3.2 Case selection and justification

The cases that were selected were the Brussels Bombings, which occurred on 22 March 2016, and the Manchester Arena Bombing, which occurred on 22 May 2017. These cases were similar in type of incident (terrorist attack), method of execution (suicide bombing), and environmental context (circumstances of chaos, uncertainty, ambiguity, discontinuity, high pressure, various emergency services involved). Moreover, both cases showed similar instances of fragmentation. That is, in the case of the Brussels Bombings, the fire department was under the impression that not enough ambulances were present on scene and requested more ambulances, while the medical department and the emergency center stated enough ambulances were present and refused to send more ambulances. In the case of the Manchester Bombings, the fire department was under the impression that it was not safe to deploy to the Manchester Arena scene, because they assumed this was an ongoing marauding terrorist attack, resulting in them arriving more than two hours after the attack, whereas the ambulance services and police services deployed to the scene immediately. Both cases initially indicated that different interpretations of the situation were present with regard to what action was required and what was going on, which indicated a breakdown of collective sensemaking. Moreover, in both cases the end result was a breakdown of collaborative action. Therefore, these cases allowed for a unique comparative case study, because it enabled the researcher to compare how fragmentation occurred, what effect this had on coordination processes and how officers coped with fragmentation, thereby enabling the researcher to answer the research question. Lastly, valuable lessons could be drawn from these cases as the answer to the research question provided the researcher with insights with regard to the role of fragmentation in relation to coordination.

3.3 Data collection

The qualitative data presented in this thesis was collected from news feeds, incident reports and public governmental inquiries into the emergency response operation of the selected cases. Moreover, in the case of the Brussels Bombings, transcripts of interviews with commanders in charge on that day, as part of the governmental inquiry into the emergency response operation were used. Similarly, in the case of the Manchester Bombing, an exclusive interview with the Chief Fire Officer was publicly available on Youtube, as well as a documentary in which first responders told their stories. These interviews were used because as Yin (2003) notes, interviews can be considered one of the most important resources in case study research. Crucially, the interviews complemented the publicly available governmental inquiries and other relevant secondary sources, as they included first hand experiences of coordination practices and actions taken during the emergency response operation by officers in command holding a relevant role. Moreover, the organizational and social context required to capture and understand the coordination activities and coping mechanisms of officers in command could be included, thereby capturing the interdependencies between the coordination activities and the environment. Lastly, the interviews allowed for validation of the collected information from alternative secondary sources, thereby improving academic soundness and contributing to scientific rigor of this thesis.

While the body of knowledge used was appropriate for analyzing the phenomenon studied, it had some limitations. In the case of the Brussels Bombings, the interviews were conducted by a parliamentary commission. For this reason, the answers of the commanders may have been biased. Although the commanders answered under oath of truth, this still does exclude the fact that possibly different answers would have been provided in case a non-political figure would have asked these questions. However, it was not possible to conduct these interviews myself, because it turned out to be very difficult to reach and obtain direct access to the involved actors. Consequently, the researcher was forced to rely upon documentaries, reports and other secondary sources. Moreover, in the case of the Manchester Bombing, not as many interviews were available. Nonetheless, the online interview with the Chief Fire Officer, the documentary and the Kerslake Report ensured that the information from other secondary sources could also be verified, as these sources provided the researcher with interviews, or in the case of the latter report, with a document that was based on a large amount of interviews and sources.

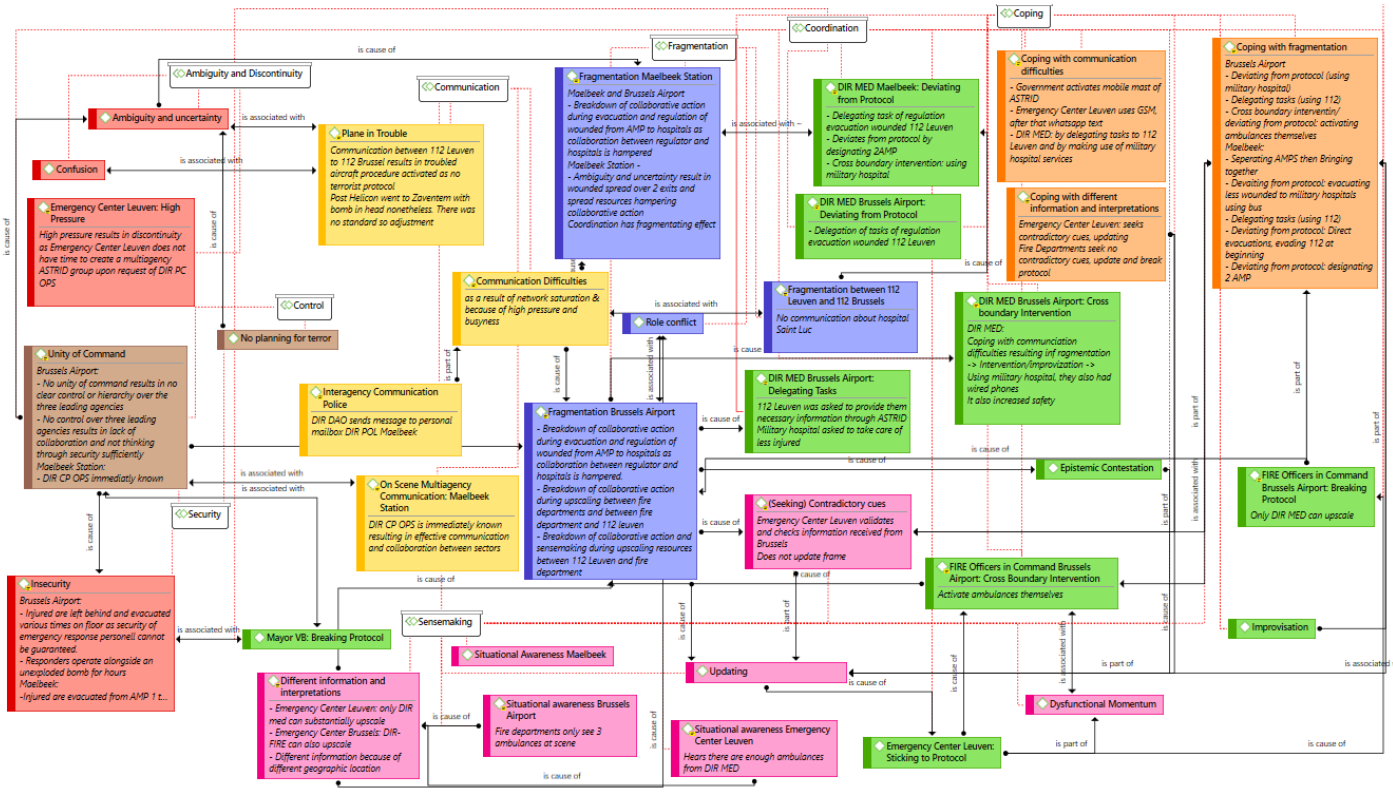
3.4 Data analysis

Understanding how officers in command coped with fragmentation in the emergency response operation during coordination practices also required identification of the processes that caused fragmentation in the emergency response operation. This is because fragmentation is not a one-way street; It cannot only be caused by circumstances of ambiguity, uncertainty and discontinuity, but it can also be a result of the coordination practices of officers in command when coping with fragmentation. Therefore, the aim was not to identify clear-causal chain reactions. Instead, understanding the role of fragmentation in relation to the coordination process of the emergency response operation required an understanding of the various underlying patterns and processes that operated in this context (Langley, 1999). For this reason, a process tracing approach was required. A process approach *"tend(s) to see the world in terms of people, situations, events, and the processes that connect these; explanation is based on an analysis of how some situations and events influence others"* (Maxwell, 2013, p. 29, p.3).

To capture these processes and to analyze the data, a combination of temporal bracketing, grounded theory and visual mapping was used. Firstly, a timeline was made which included the key coordinated actions. Hereafter, moments of potential fragmentation were identified after which grounded theory was used to zoom in on these fragmentation moments. Grounded theory enabled the researcher to gradually construct a system of categories that described the phenomena observed (Langley, 1999). To assist in this process, the Qualitative Data Analysis & Research Software ATLAS.ti was used. ATLAS.ti enabled the researcher to assign descriptive codes to fragmenting events related to coordination and coping with fragmentation by officers in command, as well as to assign codes to context related events and interactions between the various disciplines. This was done in two phases. Firstly, open coding was conducted in which the data was broken down into codes which were assigned to quotations in the data. This enabled the researcher to identify main themes and to understand coordinated actions in relation to the context. Examples of codes used were contextual codes, describing the context in which coordination was practiced (e.g. ambiguity, uncertainty, insecurity, and unity of command structures) and codes related to coordination and sensemaking activities itself, describing the behavior of commanders (e.g. getting an overview, delegating tasks, sticking to protocol, deviating from protocol, updating frame et. cetera).

In the second phase, axial coding was performed in which the codes assigned to the quotations were grouped under a common category (or ‘concept’) taken from the theoretical framework. The categories used were ambiguity and discontinuity, communication, control, coordination, coping, fragmentation, security and sensemaking. While coding, comments were attached to the codes, allowing for the thought process to be tracked. Moreover, two memos were created per case in which comments and ideas with regard to relationships of causes and coping with fragmentation were noted. This enabled the researcher to reveal theoretical relationships and contrasts between the codes.

After grouping the codes in common category, the data was then visually mapped using the ATLAS.ti network function. This visualization tool enabled the researcher to visualize findings and interpretations in a digital mind map, which enabled the simultaneous representation of a large number of dimensions. The mind map was then used to show parallel processes (Langley, 1999). Below, in table 1, an example is shown of the codes (in colors), categories (in white), comments attached to the codes, and the relationships drawn between



them in case of the Brussels Bombings case.

Table 1.

Even after having focused on coordination practices in relation to fragmentation by officers in command taking into account context, the visual representation was still overwhelming. For this reason, the final step was zooming in and out of the data. This was done by opening relevant categories as a separate network which enabled the researcher to get a better overview of the relationships between the codes, enabling critical assessment and comparison with other relationships and improving the relationships. Moreover, by zooming in on the codes, quotations could be shown in detail, contributing to further explorations of relationships between specific codes, while allowing the researcher to refresh memory. Below, in table 2, an example is portrayed of zooming in on the code ambiguity and uncertainty. The picture shows the related codes, including quotations.

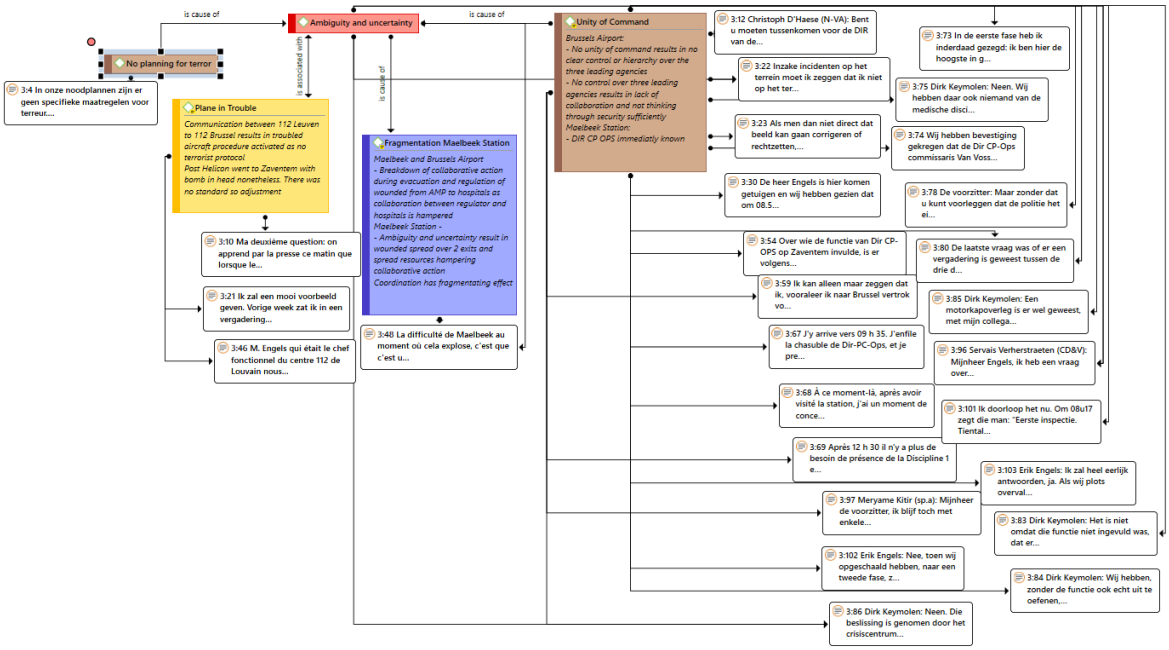


Table 2.

Zooming in on the codes was particularly important when comparing coping mechanisms in both cases. That is, it enabled the researcher to draw similarities and differences by comparing these two structures with each other. The results of this comparison were eventually portrayed in a table which can be found in the findings section. As such it could be argued that detailed analysis was undertaken which allowed the researcher to develop a good understanding of the matter at hand, as the researcher interacted with the data both inductively and deductively, making it an iterative process in which the researcher uncovered and systematically analyzed the phenomenon.

3.5 Reliability and validity

Hammersley (1992) notes that research is reliable if it can be repeated by other researchers and when it produces consistent results. In order to enable other researchers to conduct similar procedures, they must have access to similar research methods. Yin (2003) states for example, that the reliability of research improves if the research methods are operationalized as much as possible. Considering the fact that transcripts of the interviews and other documents that were used for data collection are publicly available, other researchers are provided with the means to replicate this research. Replication may be undermined because of the method of process tracing however, as it may be difficult to undergo the exact same process (Langley, 1999). However, the researcher has attempted to explain as well as possible the steps undertaken during data analysis and in the data analysis section which enables other researchers to undergo a similar process.

Internal validity, i.e., the extent to which the research measures what it intends to measure (Yin, 2003) was hampered, because this case study studies coping with fragmentation by officers in command during coordination of the emergency response operation in two different countries, making it difficult to rule out extraneous variables, (i.e., societal context). Nonetheless, internal validity was increased through a case selection that provided a context in which coordination was practiced in a similar context and similar fragmentation moments. Moreover, construct validity was achieved through the use of different data sources (transcripts of interviews, governmental inquiries, reports, news feeds, documentaries). Lastly, considering the fact that the method of analysis chosen was process tracing, the analysis is high in accuracy, as the research stayed close to original data through its method of grounded theory (Langley, 1999).

Chapter 4: Findings

Requesting more ambulances after a bomb explosion and facing refusal by an organization that is not present on scene, and an arrival of a key emergency response organization on scene two hours after the explosion are key examples of fragmentation. How could this happen? And more importantly, how did officers in command cope with this?

In this chapter, the findings of these questions will be presented. To structure this chapter, the findings with regard to the Brussels and Manchester Bombing will be discussed in separate sections. Each section will first portray a chronological factual overview of the relevant coordination actions conducted by commanders, while the overview also attempts to sketch a context. A more enhanced overview of the coordinated actions can be found in the timelines in Appendix A (Brussels Bombing) and Appendix B (Manchester Bombing). Hereafter, an analysis of the data follows in which the moment of fragmentation is pinpointed, including the initial causes leading up to it. The analysis then zooms in how commanders coped with fragmentation during coordination of the emergency response operation after which a sub conclusion is presented. Lastly, a comparison between the cases is portrayed.

For readers, who are not familiar with the organization of emergency management during disasters or terrorist attacks in the respective countries, an overview of the applicable protocols and procedures is provided in Appendix C (Belgium) and D (United Kingdom), although key elements will be discussed throughout this chapter.

4.1 Brussels Bombings: 22 March, 2016

4.1.1. Factual Overview

The event

On Tuesday 22 March 2016, at 07:58, two subsequent bomb explosions struck the departure hall of the main terminal of Brussels Airport, Zaventem. At 09:11, another bomb explosion ignited inside a metro that was entering Maelbeek Metro Station, Brussels. In total, 35 people died, and 340 others were injured (Torfs, 2019). Figure 1 and 2 below, indicate the location of both attacks.

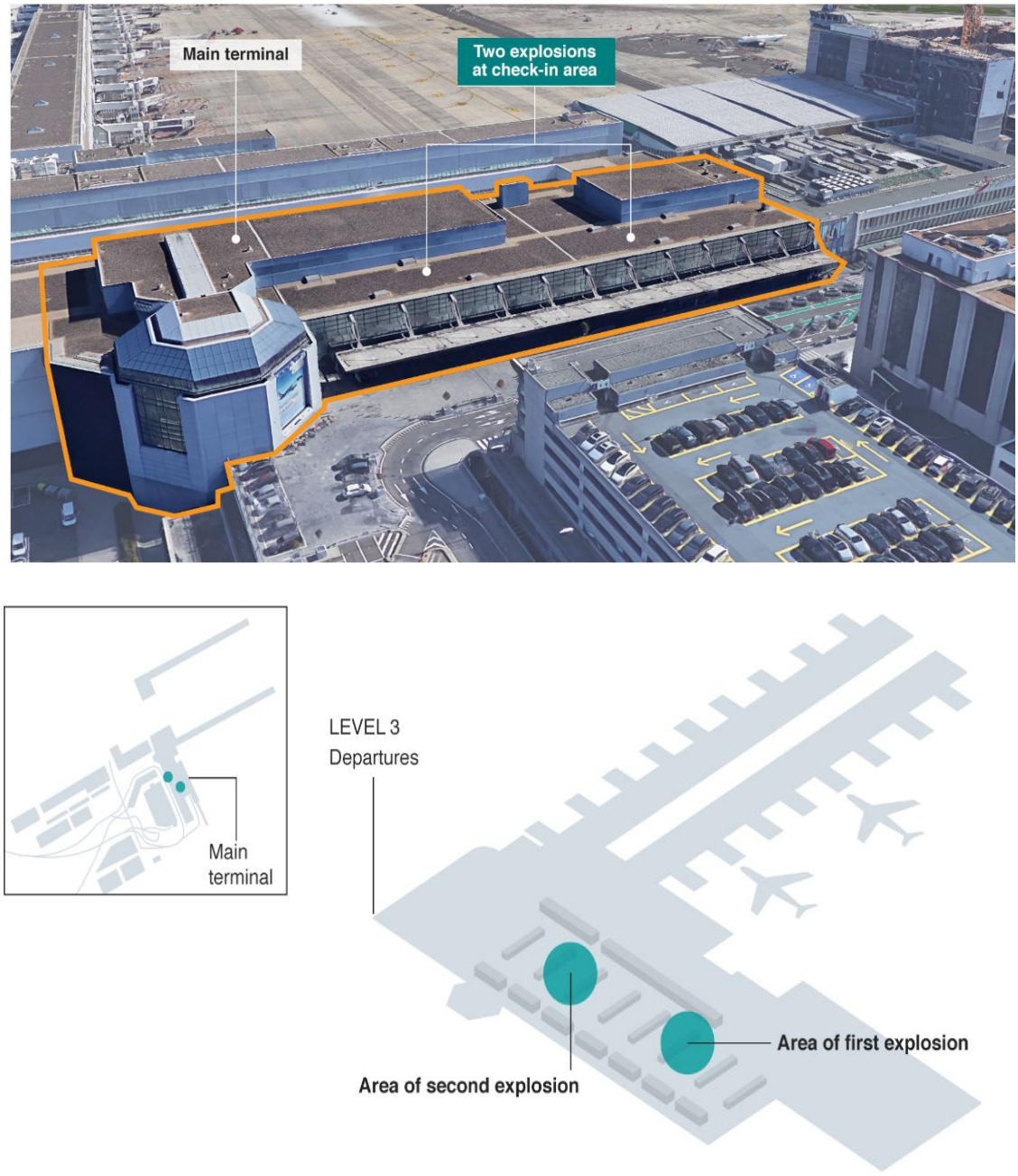


Figure 1. Location of the explosions, Brussels Airport

Figure 2. Location of the explosion, Maelbeek Station

A chronological overview of the emergency response operation

The emergency center of the province of Flemish-Brabant (hereafter: Emergency Center Leuven) was first informed of a bomb explosion at 07:59. Upon notification, Emergency Center Leuven alarmed the Fire Department of the Regional-Flemish-Brabant West (Hereafter: Regional Fire Department), Brussels Capital Service for Fire Fighting and Emergency Medical Assistance (hereafter: Brussels Fire Department), and the Director Medical Care of the Military Hospital Neder-Over-Heembeek (hereafter: medical director) of the incident. Moreover, the governor and federal health inspector were informed. Hereafter, Emergency Center Leuven activated a first wave of five ambulances and three MUGs (mobile urgency groups) which were sent to the scene (Engels, parliamentary interrogations, 2016).

While various actors were being informed, on scene responding began. At 08:02, the on duty airport police commander arrived at the departure hall. Being the first on scene, with his team following after shortly, they reassured the injured and attended to them (Devos, parliamentary interrogations, 2016). The fire department of the Northern Barracks of Brussels Airport arrived three minutes after, and upon noticing a chaotic scene consisting of many injured people and risk of collapse, the Brussels Airport fire commander ordered immediate evacuation of the injured out of the departure hall (Baert, parliamentary interrogations, 2016).

Because the ceiling had fallen down on the floor, and because of blood on the floor, evacuation was hampered as walking was difficult (Devos, parliamentary interrogations, 2016). Tourniquets were used to stop the bleeding of the injured and because the personal EHBO kits of military were not sufficient, belts were used and luggage was searched for useful materials to stop the bleeding (Porieau, 2016). Meanwhile, the military commander located at Brussels Airport had sent out his units to the departure hall where their priority became ensuring security of civilians and first responders. By then, they had already negated the threat of an ongoing firearms attack and were aware this was a bomb explosion. However, information was scarce and the emergency services were not sure if a second explosion or firearms attack could be expected (Porieu, 2016).

At 08:09 the airport was closed and evacuation began. Additionally, the medical intervention plan was declared by the governor (DeVijver, parliamentary interrogations 2016). At 08:12, the first medical urgent care (hereafter: MUG) doctor arrived, who took on the position of medical commander until the arrival of the predesignated medical commander (Labruyère & Engels, parliamentary interrogations, 2016). At 08:14, post Zaventem of the Regional Fire Department had arrived in the departure hall. The post Zaventem commander took over command from the Brussels Airport fire commander after having been briefed about the amount of injured and deceased (Baert, parliamentary interrogations, 2016). The post Zaventem commander then notified Emergency Center Leuven of a major incident, after which they assisted the Brussels Airport fire and aviation teams with evacuation to the kiss and ride zone, just outside of the departure hall. Shortly after, Emergency Center Leuven activated an additional five ambulances of the Red Cross (Keymolen, parliamentary interrogations, 2016). Simultaneously, the police commander requested the special explosive teams services (hereafter: DOVO) to the scene (Devos, parliamentary interrogations, 2016).

At 08:16, three MUG and ten ambulances were present at Brussels Airport (De Witte, 2016). At 08:17, the MUG doctor provided Emergency Center Leuven with a medical situational update and requested an additional five ambulances and a MUG team (Labruyère & Engels, parliamentary interrogations, 2016). Hereafter, the MUG doctor began casualty treatment, resulting in him not providing Emergency Center Leuven with further updates (Du Bus de Warnaffe, parliamentary interrogations, 2016). At 08:20, post Zaventem requested to its dispatch that Emergency Center Leuven sent all available ambulances of the region. This request was denied by Emergency Center Leuven, because requesting additional ambulances was the competence of the medical commander. At 08:24, the commander of post Zaventem therefore activated four ambulances himself (‘Hulpdiensten Brussel na’, 2016). In addition,

two ambulances of Zaventem left spontaneously without waiting for approval of the fire commander or Emergency Center Leuven (Keymolen, parliamentary interrogations, 2016).

Simultaneously, at 08:20, the Brussels fire commander who was on his way to Brussels Airport had been informed of at least thirty wounded. He requested five ambulances to his own dispatch between 08:27 and 08:31 (Du bus de Warnaffe, parliamentary interrogations, 2016). Moreover, at 08:26, the designated adjunct fire commander called Emergency Center Leuven and requested at least thirty ambulances to be present. He was informed that only the medical commanders could upscale (Keymolen, parliamentary interrogations, 2016). At 08:27, the maximum medical intervention plan was activated. Important to note however is that at this point, the maximum-medical intervention plan was not officially installed in the organizations yet, and Emergency Center Leuven had to rely upon their own interpretation of the plan[1] (Engels, parliamentary interrogations, 2016).

Meanwhile, the predesignated adjunct medical commander had arrived at 08:30. Upon arrival on scene at the scene, he was confronted with a chaotic scene. Injured civilians walked through each other and were laying on the floor outside of the departure hall (Hubo, 2017). Between 08:35-08:40, the Brussels fire commander requested a second wave of five ambulances to his own dispatch, noticing not enough ambulances present (Du Bus de Warnaffe, parliamentary interrogations, 2016). At 08:36, the designated fire commander arrived who saw a discussion between the Brussels fire commander and his adjunct fire commander, because the former was under the impression the blockage came from the adjunct fire commander, after which he separated the two commanders so they could focus on their tasks. To the designated fire commander it was unclear what the role and function of the Brussels Fire Department was, as there was no communication between them (Keymolen, parliamentary interrogations, 2016).

Hereafter, he assumed the field commander position (DIR CP OPS). The field commander ensures that interorganizational coordination occurs and is in charge of creating the central operational command post. However, after notifying the zone commander of Regional Fire Department of his position, the field commander was informed that because this was a terror related incident, the field commander position had to be taken by a senior officer of the Police Department. As a result, the field commander quickly after assumed the fire commander position instead. Nonetheless, he attempted to unofficially organize meetings between him, the police commander and medical commander, but these attempts stranded

[1] For a thorough explanation of the Medical Intervention Plan and MAXIMUM-Medical Intervention Plan, see appendix C.

(Keymolen, parliamentary interrogations, 2016).

At 08:40, the designated medical commander had arrived, who then informed Emergency Center Leuven that there were enough ambulances present. He designated the fire brigade of Brussels Airport (CCOT) as the advanced medical post (Mergny, parliamentary interrogations, 2016). At 08:42, Emergency Center Leuven and Emergency Center Brussels decided to locate ambulances at the flyover zone (Engels, parliamentary interrogations, 2016). At 08:43, the Brussels fire commander was informed by its dispatch that Emergency Center Leuven refused to send the activated Brussels ambulances on site, after which dispatching proposed to send the first wave to Melsbroek, located North of Brussels Airport. However, the Brussels fire commander instead ordered his dispatch to send ambulances immediately to the advanced medical post. He then called Emergency Center Leuven at 08:45, providing them with a situational report in which he noted a major explosion, a war zone scenario and many victims, including amputees and polytraumatized persons as a result of shrapnel wounds. He again requested more ambulances, but was informed sufficient means were present (Du Bus de Warnaffe, parliamentary interrogations, 2016). At 08:50, the departure hall was evacuated (De Witte, parliamentary interrogations, 2016) and shortly after DOVO arrived. DOVO conducted a quick sweep to see if any people were alive inside. At this point, no bombs were found. Hereafter, a consultation followed between fire, medical, DOVO and airport police crews on how to proceed. Last sweeps were conducted to find potential injured (Devos, parliamentary interrogations, 2016). Finally, at 08:55, the Brussels fire commander arrived at the advanced medical post to search for the medical commander. The medical commander then informed him that more ambulances were indeed required, after which with approval of the medical commander, three radio messages were sent to request the second wave of five ambulances of Brussel to deploy to the scene (Du Bus de Warnaffe, parliamentary interrogations, 2016). At 08:56, the military captain received a situational update that two suicide attacks had occurred, that the departure hall had been evacuated, the perimeter had been installed and wounded were being taken care of (Schotte, parliamentary interrogations, 2016). At 09:00, sufficient medical ambulances and means were present (Mergny, parliamentary interrogations, 2016). Throughout this process, at 08:45, 09:02, 09;17, 08:30, and 09:55 mandatory evacuations of emergency responders occurred as a result of false bomb alarms, bomb cars warnings and alarms. However, it would not be until 13:37, that Emergency Center Leuven was informed of a suspicious package inside the departure hall and it was only at 14;15 when the emergency response organizations dismantled the bomb (Engels, parliamentary interrogations, 2016).

At 09:11, another bomb explosion ignited inside a metro that was entering Maelbeek Metro Station, Brussels. Hereafter, the present railway police together with the Brussels Intercommunal Transport Company (hereafter: STIB-MIVB) activated the BLACK-OUT plan for the metro at 09:12, shutting down all metro traffic and enabling self-evacuation of the walking wounded, light injured and non-injured (DeCuyper, parliamentary interrogations, 2016). Meanwhile, Emergency Center Leuven and Emergency Center Brussels agreed to designate all hospitals in Brussels to the victims of the Maelbeek Station attack at 09:14, including Saint Luc, which was the nearest hospital to Brussels Airport (Labruyère & Engels, parliamentary interrogations, 2016).

Meanwhile, at 09:20, the Brussels fire commander present at Brussels Airport left Brussels Airport to assume the field commander position at Maelbeek Station, where he arrived at 09:35 (Labruyère, parliamentary interrogations, 2016). The designated medical commander was confronted with a situation in which two different exits of Maelbeek Station based on two different levels resulted in patients and injured beings spread across two locations. Therefore, after consultation with the field commander, he designated two advanced medical posts: the Irish Pub on the corner of Joseph II street and Steenstreet at the lower exit of the station, and Wetstraat, at height of the exit of the station (Vermylen, parliamentary interrogations, 2016). The latter advanced medical post was later moved to Hotel Thon, after a thorough safety sweep of the hotel (DeCuyper, parliamentary interrogations, 2016). Figure 3 portrays the locations of the advanced medical posts.

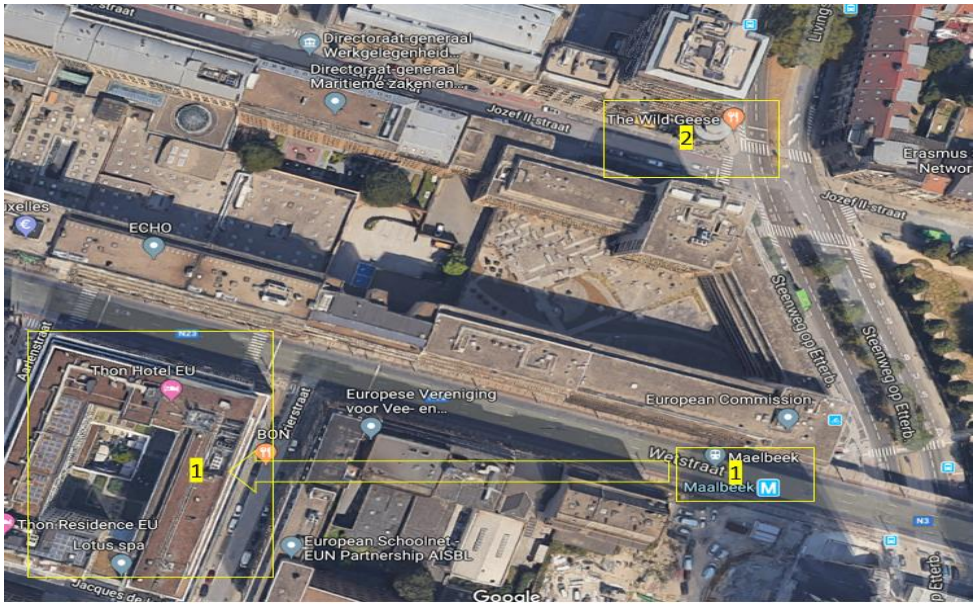


Figure 3. Location of advanced medical posts Maelbeek Station

Between 09:24 and 09:45, fire department relief was organized in which the fire department entered Maelbeek Station to search and rescue the severely injured who could not self-evacuate (Du Bus de Warnaffe, parliamentary interrogations, 2016). Once outside, the paramedics took over and provided first aid and forwarded the wounded to the two advanced medical posts (Labruyère, parliamentary interrogations, 2016). Meanwhile, at 09:27, the entire underground network of Brussels was shut down (Engels, parliamentary interrogations, 2016). At 09:32, the police finished a safety sweeping of Maelbeek Station. Meanwhile, the Brussels fire commander provided the field commander with a situational update and the station was closed (Labruyère, parliamentary interrogations, 2016). The field commander also consulted with the police commander about validation of the perimeters which were extended. DOVO arrived at 09:54 after which safety sweepings near the European District were conducted. DOVO neutralized various suspicious packages, including a suspicious package inside Maelbeek Metro station at 10:25, but these turned out to be false alarms (DeCuyper, parliamentary interrogations, 2016). Moreover, police was confronted with false alarms at 09:27, 09:38, 09:42, 09:48 at Maelbeek Station (DeCuyper, parliamentary interrogations, 2016). Similarly, at Brussels Airport, at 08:45, 09:02, 09;17, 08:30, and 09:55 mandatory evacuations of emergency responders occurred as a result of false bomb alarms, bomb cars warnings and alarms (Engels, parliamentary interrogations, 2016).

At 09:26, network saturation problems arose, resulting in mobile phone use difficulties. Additionally, the ASTRID[2] network became saturated at 09:28 (Leroy, parliamentary interrogations, 2016). Therefore, the medical commanders of both Brussels Airport and Maelbeek Station were confronted with the inability to call with hospitals to ask for their capacity. The medical commander requested Emergency Center Leuven to inform them of capacity of the hospitals (Mergny, parliamentary interrogations, 2016). Moreover, the medical commander at Maelbeek Station delegated the task of regulation of evacuation of injured to Emergency Center Brussels (Vermylen, parliamentary interrogations, 2016). Emergency Center Brussels had fixed lines that enabled them to call hospitals and inform them of the type of injuries, so as to be able to adequately refer them to hospitals.

Moreover, both advanced medical posts were confronted with overcapacity. Therefore, the medical commander transported the walking wounded to the military hospital, who had activated their mass casualty plan at 09:19. Moreover, the walking wounded were transported away from a dangerous scene (Mergny, parliamentary interrogations, 2016). The Maelbeek

[2] ASTRID stands for All-round Semi-cellular Trunking Radio communication system with Integration Dispatching and is used to enhance interorganizational communication.

medical commander faced similar issues, but evacuated the severely injured at Etterbeek advanced medical post directly to the hospitals, without informing Emergency Center Brussels. After the most injured were evacuated, the remaining light wounded were transferred to the advanced medical post in hotel Thon, using a STIB-MIVB bus (Du Bus de Warnaffe, 2016, parliamentary interrogations; Vermylen, parliamentary interrogations, 2016). From here, the less injured were dropped off at various hospitals using a bus (Labruyere,, parliamentary interrogations, 2016). The medical commander also sent injured to the military hospital to increase capacity on scene (Vermylen, parliamentary interrogations, 2016).

At 10:04, the designated fire commander at Brussels Airport received confirmation that Police Commissioner van Vossaelaer was the new field commander (Keymolen, parliamentary interrogations, 2016). At 11:04 the Brussels Airport medical commander stated that he needed more capacity, resulting in relocation of the advanced medical post from the fire brigade (1) to Parking 2 (2) (see below).

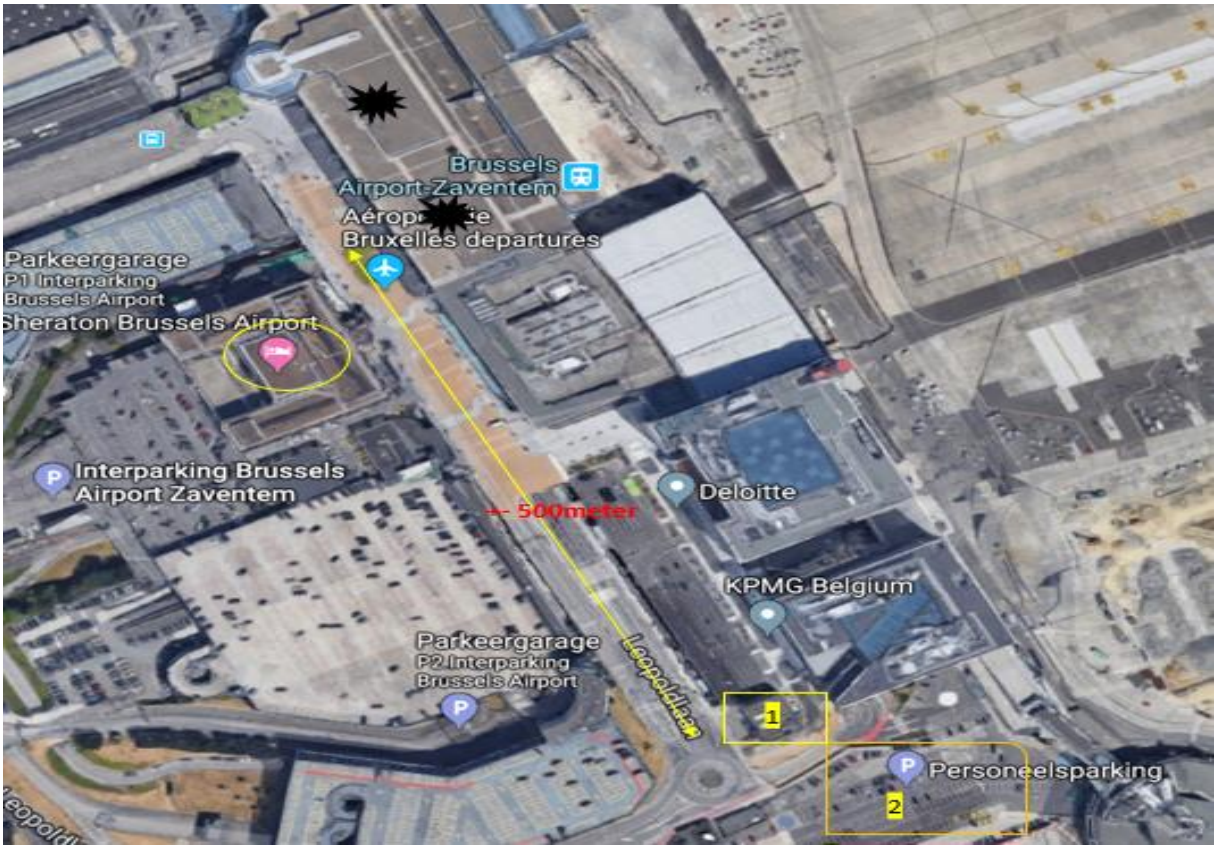


Figure 4. Location of advanced medical posts Brussels Airport

However, at 13:21, another relocation occurred from Parking 27 to a place further away from the scene, after emergency services were notified of a third bomb (De Witte, parliamentary interrogations, 2016). In this case, injured were left behind on the floor of the parking lot (DeVijver, parliamentary interrogations, 2016). At 14:15 the emergency response

organizations dismantled the bomb and it turned out that emergency services had been operating next to an unexploded bomb for hours. At 14:40, all injured at Brussels Airport and Maelbeek station were evacuated to the hospitals and criminal investigation began (Engels, parliamentary interrogations, 2016).

4.1.2. Analysis

4.1.2.1 Identifying fragmentation in the emergency response organization

1. Absence of a visible field commander and central command post

In Belgium five disciplines are concerned with disaster response operations. Within each discipline, operational coordination lies with the designated director (commander). In case multidisciplinary coordination is required, a central operational post (CP-OPS) is created represented by the five directors from the different disciplines. The field commander (DIR CP OPS) is in charge of interorganizational coordination and in charge of creating the central operational command post. This position is exercised by the most senior fire officer present at the place of intervention. However, it may be practiced by a commander of another discipline, in case that discipline is deemed more suitable (Federale Overheidsdienst Binnenlandse zaken, n.d.). Figure 5 below portrays this hierarchical structure.

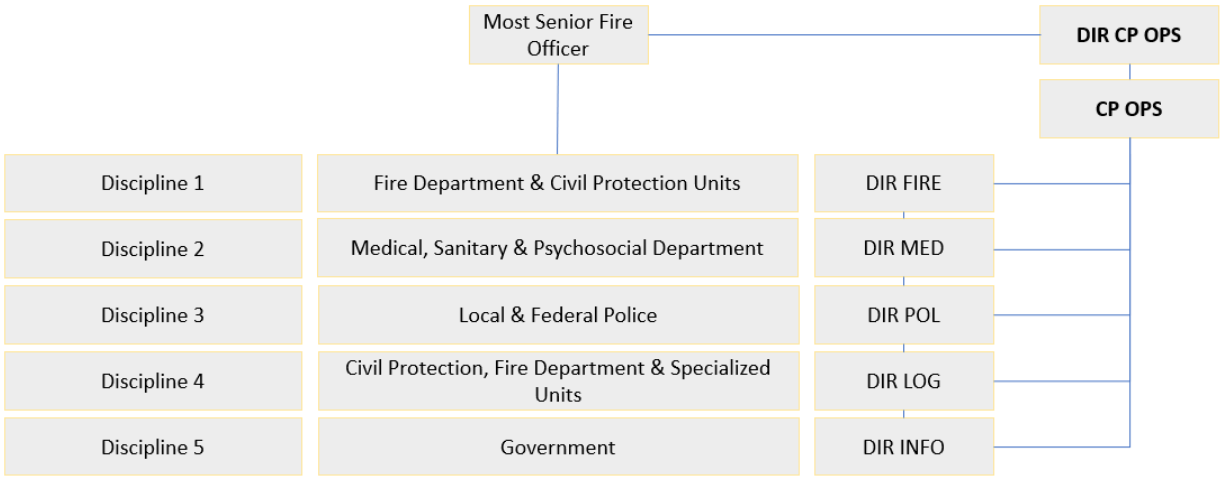


Figure 5. Coordination structure Belgium

The factual overview illustrated that the field commander position at Brussels Airport was assumed at 08:36. However, the position of field commander was shortly after delegated to the police department, because the zone commander considered the police department to be more suitable to assume this position, because this was a terror related incident. Consequently, the initial field commander assumed the fire commander position instead. Still,

it was not until 10:04 that confirmation reached the designated fire commander that Police Commissioner van Vosselaere was the new field commander. Therefore, it was unknown to the on scene commanders who was the field commander until 10:04, and even after 10:04 there was no visible officer that ensured that interorganizational coordination between the disciplines from the moment the field commander resigned from this position. In hindsight, the designated fire commander stated: *''I have never seen this person on scene, even though we were informed that our central post would be created at Sheraton hotel''* (Keymolen, parliamentary interrogations, 2016, p. 529). Meanwhile, the head of urgent medical aid noted: *''I only realized in hindsight that there was no CP OPS''* (Van der Auwera, parliamentary interrogations, 2016, p. 292). As such planned formal structures designed to ensure interorganizational communication and collaboration broke down as a result of a coordination decision. Consequently, commanders were effectively out of the loop of each other's actions and this affected collective sensemaking and collaboration processes as it increased ambiguity and uncertainty on scene, in particular when requesting ambulances as will become clear later.

Contrarily, in Maelbeek, the field commander position was immediately assumed upon arrival of the field commander at 09:35 and clearly communicated with the relevant disciplines. There, the field commander ensured that the was the visible connection between the three disciplines while he also used his position to reduce clarity in case of doubt. To illustrate, the medical commander came to the field commander and discussed the problem of the advanced medical post after which they decided together to create two advanced medical posts. Moreover, the perimeter was extended, after discussion with the police commander. Lastly, Maelbeek station was closed after discussion between the Brussels fire commander and the field commander to ensure security. The field commander was therefore constantly in the loop of everything and could answer any questions the individual commanders had, thereby avoiding ambiguity and uncertainty and ensuring effective coordination of the emergency response operation.

2. Different frames: Requesting ambulances at Brussels Airport

As the factual overview illustrates, the requests of commanders of both the Regional and Brussels Fire Departments to deploy more ambulances to the scene were denied various time after the arrival of the first MUG doctor on scene at 08:17. This, despite various desperate requests of the present fire commanders of both regions to send and activate more resources because according to their frame, there was a lack of ambulances present. This indicates a breakdown of collective sensemaking and collaborative action between Emergency Center

Leuven and the fire departments.

It could be argued that the refusal of Emergency Center Leuven to send additional ambulances to the scene was based on the fact that they had received information from a situational report by the medical commander on scene at 08:19 noting 15 T1 and 15 T2 injured (Labruyère & Engels, parliamentary interrogations, 2016). Based upon this information and following procedure that only the medical commander could upscale, they relied upon this information and concluded that the activated means were sufficient. As the functional chef of Emergency Center Leuven stated: *''…We knew who was in charge and decided about upscaling. What you cannot do is leave this plan as this will create more chaos''* (Engels, 2016, parliamentary interrogations, p. 40). Yet, both the Regional and Brussels Fire Departments present on scene continued to notice a lack of ambulances and many untreated injured people on scene, and not being aware of the medical commander having provided a situational report to the Emergency Center Leuven they continued to request and demand additional ambulances. Their frame that not enough ambulances were present may further have been strengthened by the coordination decision between Emergency Center Leuven and Emergency Brussels to place ambulances at the flyover at 08:42. This decision was not communicated to the present emergency responders. As the duty head urgent medical care observed *''I can image that one is standing in front of the Sheraton hotel and looks to the right and does not see any ambulances, because they are located at the flyover zone a level lower''* (Van der Auwera, parliamentary interrogations, 2016, p. 291). This decision to not communicate this with the relevant emergency response organizations therefore increased further collective sensemaking processes negatively. Moreover, the lack of a visible command post and field commander present may have further hampered collective sensemaking.

The above illustrates that different situational awareness on the side of Emergency Center Leuven and the on-scene Medical Department (enough ambulances present) and on-scene Fire Departments (not enough ambulances present), as a result of different cues provided to the involved parties located at different geographical locations resulted in different interpretations of what was required. These different interpretations of the situation resulted in a breakdown of collective sensemaking. The different frames with regard to the factual situation then affected collaboration processes.

The factual overview also indicated that a discussion emerged between the designated adjunct fire commander and the Brussels fire commander. This was because the latter initially was under the impression that the blockage of ambulances came from the Regional Fire

Department. As such, collective sensemaking processes between the adjunct regional commander and the Brussels fire commander were also not aligned until this moment. This may be explained by the fact that initially no communication between the Brussels Fire Department and the Regional Fire Department occurred. As the designated fire commander stated: *''We did not know what the task of the Brussels Fire Department was at this point. Because we were located at Flemish-Brabant, our zone was authorized … However, there was no communication between us, when there are agreements that the department that provides assistance will adapt their radio frequency and talk on the channel of the department that is authorized. Brussels did not do this, resulting in us not having contact''* (Keymolen, parliamentary interrogations, 2016, p. 535).

3. Evacuation of the injured at Brussels Airport and Maelbeek Station

Additionally, the factual overview illustrated that after the second attack struck Maelbeek Station, a reorganization of evacuation to hospitals occurred at 09:11. That is, Emergency Center Leuven was informed by Emergency Center Brussels that the injured from Brussels Airport could no longer be evacuated to the hospitals located in Brussels. Meanwhile, communication difficulties arose at 09:26 as network saturation problems occurred for both mobile phone traffic and the ASTRID network which became saturated at 09:28. Consequently, the regulators of the advanced medical posts in Brussels Airport and Maelbeek Station could no longer use mobile phones.

The coordination decision to not allow evacuation of the injured in the direction of the Brussels hospital in the case of victims of Brussels Airport affected the evacuation protocol at Brussels Airport as the medical commander could no longer collaborate with these hospitals (Mergny, parliamentary interrogations, 2016). Moreover, network saturation resulting in the impossibility of mobile phone use by regulators resulted in no collaboration being possible with the relevant hospitals, as communication to ask about capacity of receival of the injured was not possible (Mergny, parliamentary interrogations, 2016; Vermylen, parliamentary interrogations, 2016) which affected sensemaking processes.

4. Designating the advanced medical post at Maelbeek Station

Lastly, the overview indicated that at Maelbeek Station, the advanced medical post was designated at a non-planned place as pre planned structures and locations were not usable as a result of the unforeseen circumstances and the geographical location of the attack. For this reason, the officer in command was confronted with an ambiguous and uncertain situation, as

a breakdown of collaborative action arose because different exits at different levels resulted in resources being spread across the two exits. Section 4.1.2.2 will discuss how officers in command coped with these four fragmentation moments.

4.1.2.2 Coping with fragmentation

1. Absence of a visible field commander and central command post

Designated fire commander

In the absence of a known and visible field commander and command post, the commanders had to be reliant upon their own initiatives to ensure collective sensemaking and collaboration processes. Although the designated fire commander attempted to organize an unofficial scrum between him, the police and medical commander to discuss the next steps, the latter never arrived as he was too busy providing aid at the advanced medical post at Brussels Airport, despite requests of Emergency Center Leuven to report there. Moreover, the designated fire commander stated: *''Our department gathered with the police department to see how to proceed. However, after a bomb car alarm, everyone scattered and there was no further contact''* (Keymolen, parliamentary interrogations, 2016, p. 534). Therefore, attempts at reaching interorganizational coordination organized by the commanders themselves also stranded. In short, the fire commander coped with the lack of a visible field commander by unofficially attempting to take upon this position himself. However, circumstances of insecurity, ambiguity and uncertainty hampered his attempt to reach integration, after which no further official meetings were organized.

2. Different frames: requesting ambulances at Brussels Airport

Emergency Center Leuven: the functional head

Emergency Center Leuven was confronted with conflicting information by the medical and fire department. As the functional chef present that day noted: *''When communication A gives an image and communication B gives another image this creates confusion … If we cannot directly correct this, this creates chaos''* and *''… Consequently, weird circumstances arose which triggered discussion internally''* (Engels, parliamentary interrogations, 2016, p.45).

In order to cope with the different cues presented to them, Emergency Center Leuven evaluated the contradictory cues internally by discussing and analyzing them in an attempt to figure out what the right course of action was. However, as the functional head notes himself,

these discussions required time and resources, which were not always present (Engels, parliamentary interrogations, 2016, p.40). Moreover, they evaluated the information by turning to the medical intervention plan. The aim of the medical intervention plan is to ensure optimization of available human and material resources in case of a disaster. It does so by sending a predetermined amount of vehicles to the scene. *''There were many questions, but we have a structure and at this point you have to stick to the structure … If you ask me if ambulances were rejected I say no, no assistance was refused. Instead, the team attempted to find solutions that were allowed within the procedures and plans. When we activate the plan at this point, we know who is in charge and who takes the decisions. You cannot leave the plan, if you leave the plan more chaos arises…''* (Engels, parliamentary interrogations, 2016, p. 40).

The above illustrates that upon being confronted with various conflicting cues, confusion arose with regard to these different cues presented to them. To cope with this Emergency Center Leuven discussed and evaluated the information by relying upon formal structures (the medical intervention plan) in an attempt to make sense of the situation. Consequently, updating of the cognitive frame of Emergency Center Leuven with regard to the conflicting information occurred in which Emergency Center Leuven sided with information coming from the medical commander, as he was in charge according to the medical intervention plan. As these cues were processed, action was then taken which resulted in the denial to send ambulances on scene upon request of the fire commanders. As such, sensemaking as dialogic practice to cope with conflicting information resulted in fragmentation as Emergency Center Leuven refused to send ambulances on scene, and collective sensemaking processes decreased further. Meanwhile, the expertise practice of sticking to protocol and reliance on role structures and communities of practice could be observed. That is, *''We knew who was in charge and decided about upscaling. What you cannot do is leave this plan as this will create more chaos'' (*Engels, parliamentary interrogations, 2016, p. 40). However, this staunch commitment to the common frame present in Emergency Center Leuven of sticking with formal structures in an attempt to make sense of the situation increased differentiation, while it also built up dysfunctional momentum as in the opinion of the fire commanders, Emergency Center Leuven continued to engage in a course of failing action. Updating of the cognitive frame occurred, but this did not result in a changed course of action.

Regional and designated fire commander

In order to cope with the decision of Emergency Center Leuven to not send ambulances, the post Zaventem commander initially attempted to contact the medical commander for thirty minutes. After failing to get through, he instead activated four ambulances himself at 08:24 which were sent to the scene. *''They did not want to send more ambulances, because only the medical commander could upscale … We then said that we would send four ambulances ourselves''* (Keymolen, parliamentary interrogations, 2016 p. 535). This illustrates that the post Zaventem officer first attempted to aim for integration by contacting the medical commander to ask for more ambulances and to inform why there were not enough ambulances present ('making sense of the situation'). However, not being able to contact the medical commander to receive information, he then broke protocol by sending ambulances himself. Protocol was broken, because protocol prescribed that only the medical commander could request additional resources and that only Emergency Center Leuven could activate ambulances. Meanwhile, this was also a cross boundary intervention, as the intervention resulted in the post Zaventem officer essentially penetrating the medical organization boundary, because the wellbeing of the injured persons present on scene was threatened by the action of a team member (i.e., Emergency Center Leuven). While the activation of additional ambulances resulted in more ambulances reporting to scene, the fire commander emphasized a breakdown of collaborative action, as the parties were now working independently of each other. Yet, it can also be argued that the post Zaventem commander accepted the situation for what it was, improvised and as a result coordinated by using fragmentation to ensure sufficient ambulances were present on scene (Wolbers et al., 2018; Comfort et al., 2010). Emergency Center Leuven responded by this however, by activating the self upon called resources in their system to adjust. Therefore, it could be argued that they integrated the fragmentating decision of the fire commander and restored control.

Brussels fire commander

The factual overview indicates that the Brussels fire commander requested five ambulances to his own dispatch between 08:27 and 08:31. Upon arrival on scene, the Brussels commander initially was under the assumption that the blockage to request additional ambulances came from the adjunct regional fire commander. Therefore, he confronted the adjunct regional commander present on scene in an attempt to better make sense of the situation. In hindsight he noted about this conversation *''I had a very lively contact with my colleague from Flemish*

Brabant … He told me however that he himself had requested thirty ambulances to be present'' (Du Bus de Warnaffe, parliamentary interrogations, 2016, p. 389). As such, it can be argued that the Brussels fire commander coped with fragmentation by aiming for integration by discussing the matter at hand. This turned in epistemic contestation because different interpretations were present. However, the two commanders were then separated by the regional commander who had arrived. With the newly obtained information (cue), the Brussels fire commander then updated his frame and made sense of the situation.

At 08:43, dispatching proposed to send the first requested wave of ambulances to Melsbroek, located North of Brussels Airport because Emergency Center Leuven did not allow the ambulances to deploy to the scene. Upon being confronted with this lack of collaboration, the Brussels fire commander instead ordered his dispatch to send ambulances immediately to the advanced medical post. He then called Emergency Center Leuven at 08:45, providing them with a situational update. Similar to the post Zaventem commander, he therefore broke protocol as he went against the standard operating protocol in which Emergency Center Leuven sends the units to the scene. Meanwhile, this is also an example of a cross boundary intervention, because the Brussels fire commander essentially took over control from Emergency Center Leuven, increasing role conflict further. Although he contacted Emergency Center Leuven afterwards, which can be seen as an attempt at integration, they still refused to send ambulances on scene and epistemic contestation arose this time between the Brussels fire commander and Emergency Center Leuven. The Brussels fire commander recalled that when talking with the dispatcher at Emergency Center Leuven *''…I was ready to explode and told him that my request for reinforcement of means was proportioned to the situation and his refusal to send them were recorded, after which I ended the call''* (Du Bus de Warnaffe, parliamentary interrogations, 2016, p. 389*).* This reaction can be explained if one considers the fact that different interpretations of who can upscale existed. That is, in the Brussels medical intervention plan it is noted that the Brussels fire commander can upscale resources, whereas federal regulation to which the area of Zaventem is subject prescribed that only the medical commander is allowed to upscale (Keymolen, parliamentary interrogations, 2016). As such, the Brussels fire commander was convinced he could upscale and heavily frustrated upon being denied the upscaling rights which he thought were necessary. After this, the need for more ambulances remained and with knowledge that the medical commander likely was present in the advanced medical post, and with knowledge he needed his permission to upscale, the Brussels fire commander made way to the advanced medical posts. At 08:55 he arrived there, after which the medical commander informed him

that more ambulances were required. Then, with approval of the medical commander, three radio messages were sent to request the second wave of five ambulances of Brussel to deploy to the scene.

In short, it could be said that the Brussels fire officer initially coped with fragmentation by aiming for integrative coordination. However, upon not achieving this, he sent ambulances to the scene by circumventing Emergency Center Leuven (using a breakdown of collaborative action). Hereafter, he attempted to improve collaboration by consulting and finding the medical commander after which he was able to request more ambulances on scene from the Emergency Center Leuven.

3. Evacuation of the injured at Brussels Airport and Maelbeek Station

Medical commander Brussels Airport

The factual overview illustrated that upon being confronted with communication difficulties as a result of network saturation, resulting in the inability to use mobile phones to contact the hospitals, the capacity in the advanced medical post quickly became limited as evacuation to hospitals was slowed down. To cope with this, the medical commander requested Emergency Center Leuven to inform them of the capacity of hospitals through the ASTRID system. Moreover, the less injured were evacuated to the military hospital where they were triaged, stabilized and evacuated to the hospitals instead. It could therefore be argued that the medical commander coped with fragmentation by distancing himself to get a better overview of the situation. He did so by delegating the tasks of triaging, stabilization and evacuation to the military hospital in the case of the less injured people. This freed up space in the advanced medical post, thereby enabling the attention of medical personnel to more injured persons, while removing less injured from an unsafe zone. Moreover, by requesting Emergency Center Leuven to inform them of capacity of hospitals, instead of letting a regulator do this himself, the evacuation process could continue, despite communication difficulties (Mergny, parliamentary interrogations, 2016). This was possible, because Emergency Center Leuven had requested additional personnel, and because of their fixed lines with hospitals (Engels, parliamentary interrogations, 2016) resulting in a workable solution However, by delegating tasks, it could also be argued that the medical commander lost overview and supervision over the evacuation process as he was no longer physically present and in control. Consequently, his accountability was affected. Meanwhile, by delegating the regulation of evacuation to hospitals Emergency Center Leuven after communication difficulties arose, the chance of

different situational awareness arose, as Emergency Center Leuven had access to fixed lines with hospitals and was informed of information which was then transferred to the medical commander on scene. Therefore, when transferring information, certain parts of information could have been lost affecting reliability and common understanding. While aiming for continuance of performance then, this increased chances of fragmentation as collective sensemaking was undermined. Lastly, this was a delegation from protocol, as regulation is the task of the medical commander.

Medical commander Maelbeek Station

The medical commander at Maelbeek Station faced similar discontinuity issues as a result of communication difficulties. Different from the medical commander at Brussels Airport, he coped with these issues by circumventing Emergency Center Brussels with regard to the most severely injured victims. Instead of consulting with Emergency Center Brussels, they were directly evacuated to the hospitals. Moreover, the task of regulation of evacuation of injured was fully delegated to Emergency Center Brussels. Similarly though, the medical commander sent certain injured to the military hospital to increase capacity on scene. Similar conclusions can therefore be reached as mentioned in the previous section.

4. Designating the advanced medical post at Maelbeek Station

Medical commander Maelbeek Station

The factual overview illustrated that the medical commander was faced with two exits located at two different levels, resulting in a fragmenting effect on human and material resources. This impeded him from getting a clear overview of the situation. He consulted with the field commander to discuss the situation. Hereafter, he designated advanced medical posts, thereby deviating from protocol prescribing to create a single advanced medical post. Moreover, he deviated from protocol by designating the advanced medical posts at a different place than prescribed in the BNIP of the metro.

By creating two advanced medical posts, the medical commander enforced fragmentation as these posts worked independently of each other for an hour. Moreover, by designating the advanced medical posts based on level of injuries (i.e. the Etterbeek advanced medical post was designated for severely injured, whereas the less injured were evacuated to Wetstraat) he delegated expertise as doctors were spread across the two advanced medical posts. When the situation became more under control, the two advanced medical posts were eventually merged again, as the remaining light wounded at the Etterbeek post were

transported to hotel Thon, using a STIB-MIVB bus, enabling the closure of the first advanced medical post. Here too, fragmentating elements were used to ensure adaptation. Hereafter, a return to integrative coordination could be observed.

4.1.3. Sub conclusion

Below, two tables are portrayed in which the key points of the analysis are portrayed. The first table portrays the analysis of identifying fragmentation. The second table portrays how the officers in command coped with fragmentation. These tables will be used to conduct a comparison between the cases in section 4.3.

Identifying fragmentation

	Initial cause	***Result***
Fragmentation moment 1	Coordination decision by zone commander to delegate the field commander position to the Police Department resulting in formal structures breaking down	Breakdown of formal structures: no visible field commander and central command post: interorganizational coordination and communication processes disturbed
Fragmentation moment 2	Emergency Center Leuven received different information from different commanders who had different frames, as they were located at different geographic locations, and presented with different cues resulting in different interpretations of what was required	Breakdown of collaborative action and collective sensemaking between Emergency Center Leuven and the medical commander (frame 1) and the Brussels and Regional Fire Departments (frame 2) as a result of different frames when requesting ambulances
Fragmentation moment 3	Communication difficulties and network saturation	Evacuation of the injured hampered: No collaboration possible between hospitals and medical commanders
Fragmentation moment 4	Ambiguity and uncertainty	Breakdown of formal structures: pre planned place for advanced medical post not feasible nor possible Different exits at different levels: human and material resources spread across two locations

Table 3.

Coping with fragmentation

Coping	*Designated fire commander*	*Regional fire commander*	*Brussels fire commander*	*Medical commander Brussels Airport*	*Medical commander Maelbeek Station*	*Functional head Emergency Center Leuven*
Fragmentation moment 1	1. Taking over control by organizing meeting	N/A	N/A	N/A	N/A	N/A
Fragmentation moment 2	2. Taking control by separating the Brussels fire commander and regional fire commander after discussion arises	1. Attempting to contact medical commander (sensemaking) 2.Activating four ambulances himself (cross boundary intervention, breaking protocol)	1. Discussing matter at hand with regional fire commander (sensemaking, epistemic contestation) 2. Sending five ambulances on scene on his own orders (cross boundary intervention, breaking protocol) 3. Contacting Emergency Center Leuven (sensemaking, epistemic contestation) 4. Searching for medical commander on scene: face to face contact (sensemaking)	N/A	N/A	1. Discussing, evaluating different information (sensemaking) 2. Turning to formal structures; medical intervention plan (sensemaking) 3. Sticking to protocol, not sending ambulances upon request fire commanders 4. Activating the self-activated ambulances by the regional fire commander
Fragmentation moment 3	N/A	N/A	N/A	1. Delegation of tasks to military hospital (breaking protocol) 2. Requesting Emergency Center Leuven to inform them (deviation from protocol)	1. Circumventing Emergency Center Leuven (breaking protocol) 2. Delegation of tasks to military hospital (breaking protocol) and to Emergency Center Brussels (deviation from protocol)	N/A
Fragmentation moment 4	N/A	N/A	N/A	N/A	3. Designating two advanced medical posts (breaking protocol) 4. Delegating expertise 5. Reuniting the advanced medical posts into one	N/A
Result	1. Aiming for integrative coordination 2. Aiming for integrative coordination	1. Aiming for integrative coordination 2. Using fragmentation	1. Aiming for integrative coordination 2. Using fragmentation 3. Aiming for integrative coordination 4. Restoring integrative coordination	1+2. Aiming for integrative coordination, resulting in fragmentation	1+2: Aiming for integrative coordination, resulting in fragmentation 3+4: Using fragmentation 5: Restoring integrative coordination	1+2+3 Aiming for integrative coordination resulting in fragmentation 4. Aiming for integrative coordination

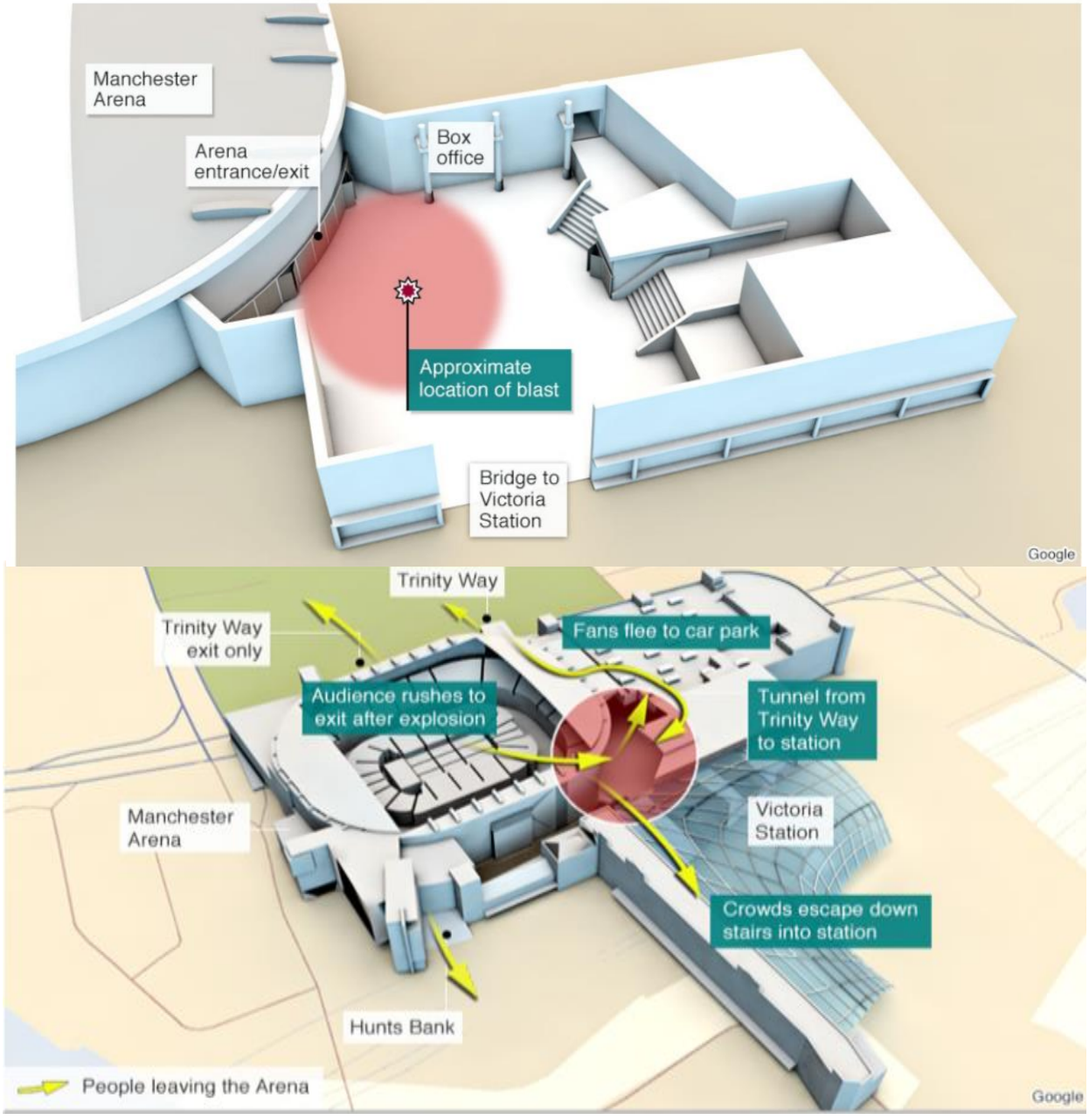
Table 4.

4.2 Manchester Arena Bombing: 22 May, 2017

4.2.1. Factual Overview

The event

On Monday 22 May, 2017, at 22:30, a suicide bomber ignited a home-made bomb in the foyer of the Manchester Arena, just after a performance by Ariane Grande had ended (Coyle, 2017). In total, 22 people died, and 119 more were injured (Bishop, Evans & Jones, 2018). Below, in figure 6, an overview of the location of the attacks is portrayed.



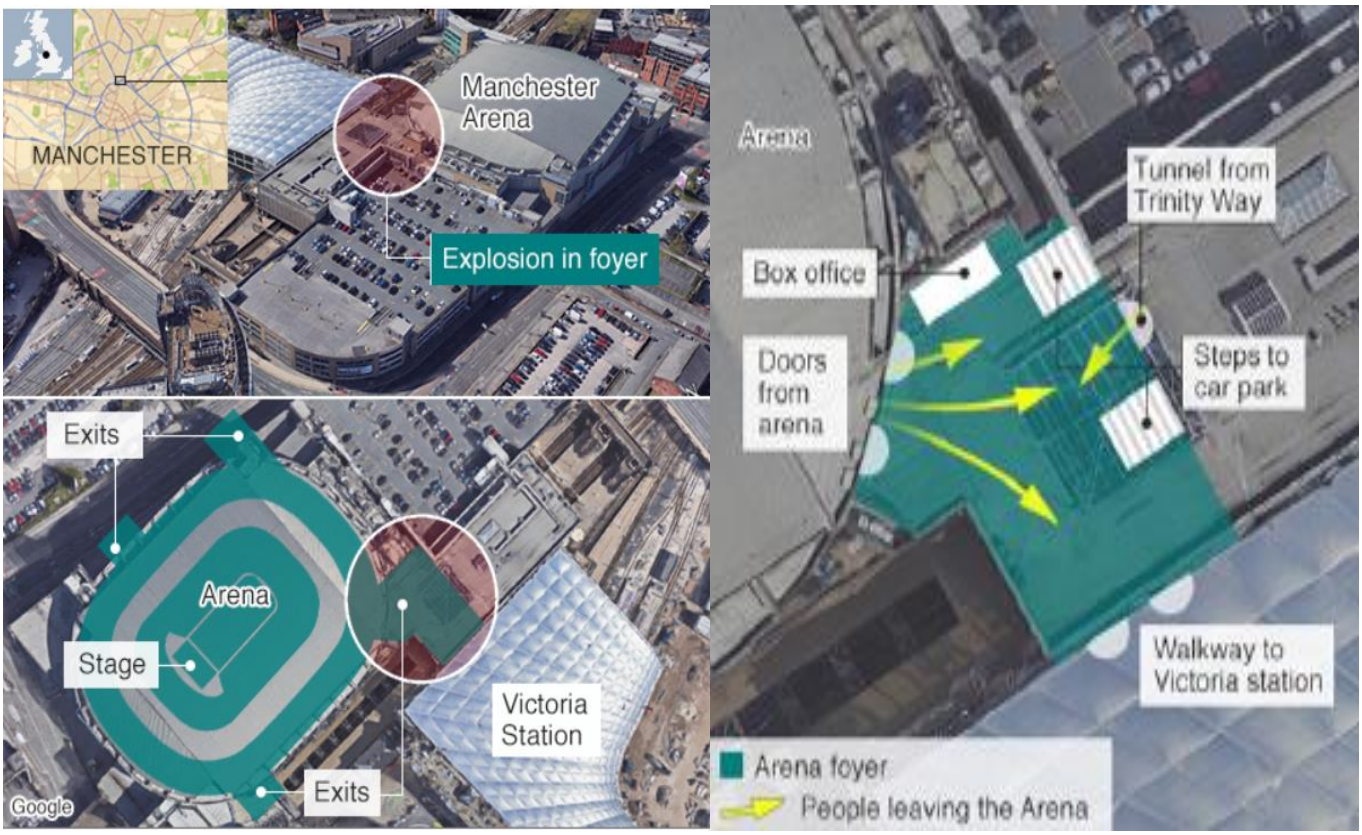


Figure 6. Location of the explosions Manchester Arena

A chronological overview of the emergency response operation

Upon hearing an explosion, four British Transport Police officers stationed at Victoria Station rushed to the scene after which British Transport Police (hereafter: Transport Police) requested assistance of their personnel through their radio ('Manchester: The Night', 2018). Hereafter, they informed the Greater Manchester Police (hereafter: Manchester Police) Force Control Room at 22:33 (Kerslake, 2018). Earlier, at 22:32, the North West Ambulance Service (hereafter: Ambulance Service) Cumbria and Lancashire Emergency Operations Center had been informed of the incident, with reports ranging from exploding speakers to multiple gunshots (Kerslake, 2018). Moreover, at 22:35, the North West Fire Control Room (hereafter: NWFC) was notified of the incident in which instances of gunfire, an explosion, a bomb and active shooter were mentioned. Upon Manchester Police Force Control Room's receival of notification of the attack at 22:33, a log was created and sent to the Force Duty Officer (hereafter: FDO). Unsure of what had occurred, he authorized Armed Response Vehicles to deploy to the scene who arrived at 22:37 (Kerslake, 2018). Meanwhile confronting similar confusion, NWFC activated both the EXPLOSION and BOMB procedure of Greater Manchester Fire and Rescue Services (hereafter: Manchester Fire Services) at 22:36. Moreover, at 22:37, the Ambulance Services activated its specialist teams and

ambulances (Kerslake, 2018). Meanwhile, transport police and members of the public provided first aid to the injured in and outside the foyer. A Transport Police Sergeant took up the position of operational police commander and assessed the situation. Hereafter, he declared a major incident, after which he provided the Transport Police Force Control Room with a METHANE update at 22:39, noting sixty casualties (Kerslake, 2018). METHANE is an acronym and is used to communicate the following information:

M - Major Incident declared?
E - Exact location
T - Type of incident
H - Hazards present or suspected
A - Access - routes that are safe to use
N - Number, type, severity of casualties
E - Emergency services present and those required

He then conducted a security risk assessment and decided it was irresponsible to evacuate the first responders, although he feared for a Paris Style Attack (‘Manchester: The Night’, 2018). Meanwhile, a self-deployed advanced paramedic of the Ambulance Services had arrived on scene at 22:42 and took over casualty management from Manchester Police. At 22:43, the first armed Manchester police arrived and the operational firearms commander took over the operational police commander position. Upon arrival, a security sweep was ordered by Manchester Police, ensuring the area was safe from active shooters and a situational report was provided to the FDO at 22:44, briefing a bomb had exploded and that initial thoughts were that a second bomb could be present, and that the injured civilians had gunshot wounds (Kerslake, 2018).

Meanwhile, the advanced paramedic had conducted a medical situational assessment, and declared a major (medical) incident at 22:46 to the Ambulance Emergency Center (Heward, 2017). After a home deployed strategic trained manager of the Ambulance Services arrived, the advanced paramedic and the strategic trained manager discussed the casualty management plan. Shortly after, the latter took on the medical operational commander position and designated the entrance of the station as the casualty clearing station. The advanced paramedic then reentered the foyer and began casualty triage. When Hazardous Area Response Teams arrived, they were informed that the foyer was not safe by the medical operational commander. Two unprotected technicians volunteered to enter and assisted the advanced paramedic, while the other team members assisted the medical operational commander with the establishment of the Casualty Clearing Station (Kerslake, 2018).
Upon receiving the situational report from the Operational Firearms Commander at 22:44, the

FDO expected a Paris Style attack involving a bomb and a marauding terrorist firearms attack. For this reason, he declared the Operation PLATO Contingency at 22:47. The activation of PLATO enabled the FDO to request additional armed forces from military and neighboring police, resulting in a quick upscaling of armed officers on scene (Kerslake, 2018). The declaration of Operation PLATO required the FDO to notify sixteen other agencies of the declaration, including Manchester Fire Services and Ambulance Services. However, Manchester Fire Services and Ambulance Services were not informed, because the FDO was overwhelmed. Moreover, the FDO assumed that because the agencies were aware of the incident and an active shooter, they were also aware of the PLATO contingency being activated. Although the Arena was now a considered a hot zone, the FDO decided to keep the responders in place, using professional discretion. A hot zone in relation to the Operation Plato contingency meant that it was an area in which terrorist activity was still ongoing. For this reason, only suitable trained and equipped police firearms officers are allowed in the area to neutralize the terrorist. To illustrate, figure 7 below portrays which emergency response organizations are allowed in the safety zones during the Operation PLATO contingency.

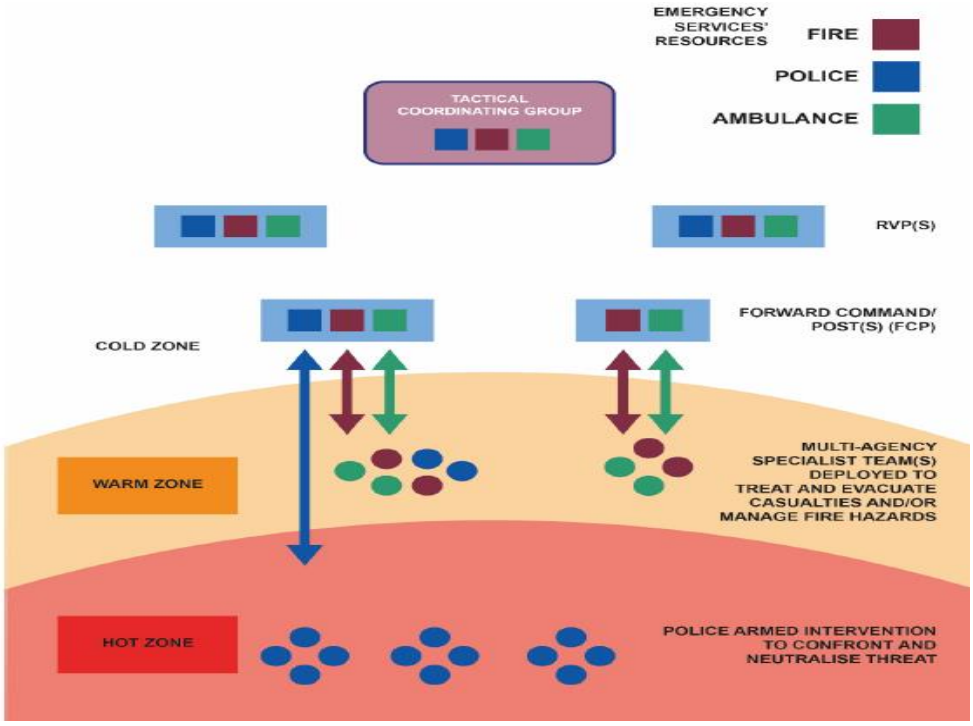


Figure 7. Operation Plato Contingency: hot, warm and cold zone

Keeping the responders in place was based on the fact that the FDO was aware of the increasing presence of firearms officers on scene, while explosives sensing dogs had also been deployed, making it an increasingly safe place in which leaving casualties unattended was irresponsible. The FDO also activated a Force Command Module, located at the Manchester Police Force Headquarters, while also assuming the position of Tactical Firearms Commander, and monitoring regular police activities. As a result, the phone of the FDO and the Force Control Room was constantly ringing. Although protocol prescribes informing all partners of the establishment of the strategic and tactical groups within the Force Command Module, this did not occur. Nonetheless, Ambulance Services and Manchester Police silver and gold commanders were present in the Force Command Module (Kerslake, 2018).

At 22:49, twelve ambulances were present and the other ambulances were redirected to the Ambulances Services rendezvous point at Manchester Central Fire Station (Kerslake, 2018; Heward, 2017). At 22:58, the advanced paramedic and medical operational commander were notified by Transport Police and Arena staff that evacuation could commence. At this point the PLATO contingency had been declared, but the Ambulance Services were not aware of this (‘Manchester Arena Bombing’, 2018). Because the ambulances consisted of spine, sked and scoop stretchers which required training, the operational medical commander made the decision to not use the stretchers from Ambulance Services, as explanation to members of the public and other first responders on how to use them would have delayed the evacuation, while simultaneously draw Ambulance Services staff in to assist with evacuation. This would undermine safety as Ambulance Services personnel would be increasingly present in the foyer, while also drawing their attention away from providing first aid. Consequently, injured were evacuated using metal crowd barriers and display boards. With an increasing amount of injured arriving at the casualty clearing station, the casualty clearing station was extended to the railway station (Kerslake, 2018).

At 23:23, the ground assigned police tactical firearms commander arrived after which he conducted an assessment in which he concluded there was no hot zone. However, because the risk of concealed attackers or a secondary bomb had not been negated, the resources enabled by the Operation PLATO contingency were still required. For this reason, he designated the zone as a warm zone and security sweeps were conducted across the arena. (Kerslake, 2018). From 00:15, the police tactical firearms commander took over command of the entire firearms operation and JESIP scrums between Ambulance Services, Manchester Police and Transport Police were held in which key information about security was discussed. A first risk assessment was then conducted and it was decided between the medical

operational commander and police tactical firearms commander to put Operation PLATO on standby in the train concourse area so that Ambulance Services could continue. It was at this point, that Ambulance Services first became aware of PLATO as at 00:18, the medical strategic commander asked the police tactical firearms commander for a situational report (Kerslake, 2018). Throughout this process, Manchester Police was confronted with various incidents across Manchester. At 22:35, 00:18, 00:39, 01:30 other false alarms and incidents were responded to while at 23:10, Manchester Police had been convinced a secondary attack was imminent (Kerslake, 2018).

Meanwhile at Manchester Fire Services

Upon NWFC being notified of the incident at 22:35, two protocols were triggered. Firstly, the EXPLOSION protocol was activated upon receival of a notification through 999 by a member of the public that an explosion had occurred. This resulted in a pre-alert being sent out to the nearest station: Manchester Central Fire Station. However, this pre-alert was never confirmed, resulting in the standing down of the activated Manchester Fire Services crew at 22:45, because the alarm expired (Kerslake, 2018). Secondly, the BOMB protocol was activated which required notification of the on duty NILO and the designation of a rendezvous point for Manchester Fire Services. The on duty NILO, who was located twenty two miles away from the incident was notified of an explosion and uncertainty about the nature of the attack at 22:40. He was also informed that Manchester Police had designated Cathedral Car Park as the multiagency rendezvous point. After being informed, he began making his way to the scene by car. Because of the information of a potential shooter, the on duty NILO expected the declaration of a marauding firearms attack and the Operation Plato contingency to occur. He assessed the risk of deploying Manchester Fire Services units to the Manchester Police rendezvous point, but could not reach the FDO to gain a better overview of the situation (Kerslake, 2018). Unable to reach the FDO, the on duty NILO designated the Philips Park Fire Station as Manchester Fire Services' rendezvous point, because the Manchester Police rendezvous point located at Cathedral Car Park was located in the 500m exclusion zone. Consequently, two pumps present at Manchester Central Fire Station were relocated to the Manchester Fire Services rendezvous point. As these pumps left the station, they noticed incoming ambulances towards Manchester Central Fire Station, because the Ambulance

Services had declared Manchester Central Fire Station as rendezvous point (Kerslake, 2018). Figure 8 below portrays the above mentioned rendezvous points.

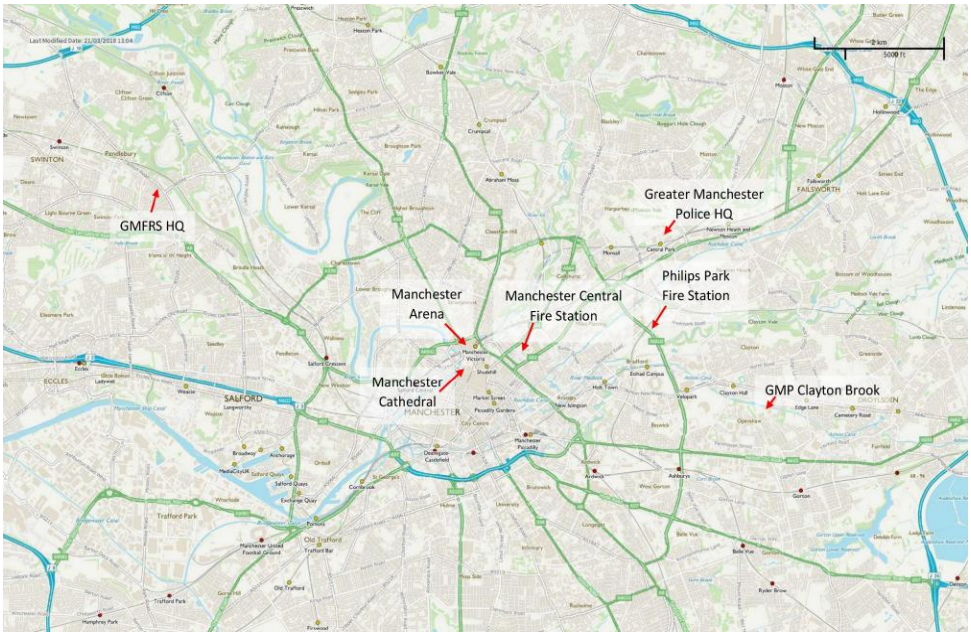


Figure 8. Rendezvous points Manchester Fire Service, Manchester Police and Medical Services

While on his way to the the Manchester Fire Services rendezvous point, the on duty NILO attempted to contact the FDO seven times. At 22:48 he informed NWFC that he could not reach the FDO. Additionally, he informed NWFC that the Specialist Teams were now mobilized at the rendezvous point. After this call, an incoming call from an operator of NWFC notified the on duty NILO of reports of an active shooter. Although Manchester Police corrected this information a minute later, stating it were shrapnel wounds to NWFC, the on duty NILO was not notified of this correction. Instead, the Duty Group Manager, present at the Command Support Room was made aware. Throughout the operation, the Manchester Fire Services radio channel was not informed, neither was the NILO channel. Moreover, the Manchester Police major incident radio and other channels were monitored by NWFC, but no information was transmitted. Eventually, a NILO activated himself and reported to the Manchester Police Force Command Module at 00:04 (Kerslake, 2018).

Earlier, two NILOs had arrived at the rendezvous point at 23:23 and 23:36 respectively and shortly after, at 23:40, the on duty NILO arrived. At this point, four fire trucks, two specialist teams, and three NILOS were present at the rendezvous point. Upon arrival at the rendezvous point, the NILOs were questioned by Manchester Fire Services crews who had watched social media and wondered why they had not been deployed yet. The most senior NILO then took on the position of Officer in Charge and contacted the Chief Fire Officer at 23:53 for the first time. After consultation, the resources at the Manchester Fire

Services rendezvous point were relocated to the closest known safe zone ‘Manchester Central Fire Station’ at 23:58, as media coverage illustrated Ambulance Services using it as a rendezvous point, where they arrived at 00:04. At this point, the on duty NILO did not inform the other two NILOs that Manchester Police had designated a multiagency rendezvous point closer to the scene, because he considered the zone unsafe. Upon arrival at Manchester Central Fire Station, the Officer in Charge noticed rotating ambulances between the Manchester Central Fire Station, the arena and hospitals and was surprised by the fact that the ambulance workers were not wearing ballistic protection. Moreover, the NILO Officer in Charge was confronted with more social media coverage of the incident. Hereafter, the NILO officer prepared Special Response Teams to move forward (Kerslake, 2018).

While the NILOs were gathered at Manchester Central Fire Station, most senior officers of Manchester Fire Services, including the Chief Fire Officer had deployed to the Command Support Room earlier, upon request of the NWFC Room at 11:15 (O’Reilly, 2018). At this point no officers were present or had been deployed to the Manchester Police Force Command Module, where multiagency coordination was occurring. At 00:12, the Chief Fire Officer called the Ambulance Services Bronze who he knew well to ask how they could assist in the emergency response operation, in which he was informed of Operation PLATOs standby status. Hereafter, the Chief Fire Officer contacted the Officer in Charge at the rendezvous point and ordered to stop the special teams from moving forward. Instead, he ordered the deployment of three standard fire pumps and crews and the NILOS. While ordering this, he did not inform the officer in charge of the Operation PLATO standby status (Kerslake, 2018). The NILOs then prepared to send regular crews forward. However, at 00:20, the NILOs were informed by the NILO present at the Force Command Room that the Operation PLATO contingency had been declared because the latter had overheard a conversation about Operation PLATO in which he was informed that armed police had been deployed one and a half hour earlier (Pidd, 2018). With confirmation that the Operation Plato contingency indeed was happening, they then contacted the Chief Fire Officer to renegotiate the deployment of the specialist teams with the Command Support Room, instead of sending regular crews, because they were still under the impression that Operation PLATO was active, but this was denied (Kerslake, 2018).

At 00:27, Manchester Fire Services regular crews arrived at Corporation Street and from there, four trucks drove to place of intervention where they arrived at 00:37. However, Manchester Fire Services could not immediately enter the concourse because the on duty NILO followed standard operation procedures which required permission of the Chief Fire

Officer, as he was now the officer in command. Once on the concourse, Manchester Fire Services assisted the present emergency services with casualty caring and transportation. At 00:59, a first operational inter-agency meeting was held in which all agencies were represented. The last injured person was evacuated at 02:46 (Pidd, 2018; Kerslake, 2018).

4.2.2. Analysis

4.2.2.1. Identifying fragmentation in the emergency response operation

1. Different safety frames: the delayed arrival of Manchester Fire Service

The factual overview illustrated that upon being notified of the incident, all three emergency services were confronted with conflicting information of what had occurred (i.e., a bomb explosion, active shooters, gunshot wounds, exploded speakers). The FDO confronted this ambiguity and uncertainty by deploying armed response vehicles to the scene to increase situational awareness and to ensure security, after which the operational firearms commander took over command at 22:43 and provided the FDO with a situational update. Quickly after, the operation PLATO contingency for a marauding firearms attack was declared, resulting in Manchester Police initially operating under the impression that the area was a hot zone (frame 1) which later was became a warm zone. Hereafter, operation PLATO was put on standby. Meanwhile, an advanced paramedic nearby the station had self-deployed and could therefore provide Ambulance Services with a medical and safety situational update earlier, increasing situational awareness. Because they were not aware of the fact that Operation PLATO had been declared, they continued first responding because their own risk assessment resulted in considering the scene to be safe enough as a result of the increasing firearms presence on scene (frame 2). However, Manchester Fire Services did not arrive at Manchester Arena until 00:37. Instead, the on duty NILO had been under the impression that this was a marauding firearms terrorist attack, expecting the operation PLATO contingency to occur, as initial reports had mentioned a bomb and gunshot wounds. Consequently, Manchester Fire Services arrived almost two hours after the incident because the commander considered the scene not safe enough to deploy to (Kerslake, 2018). This indicates that different frames and interpretations of security were present with regard to whether it was safe to deploy teams to the scene and what was going on. This indicates a breakdown of collective sensemaking. It could be argued that the breakdown of collective sensemaking affected collaboration processes as Manchester Fire Services was completely out of the loop for most of the emergency response operation.

The absence of Manchester Fire Services on scene was caused by four factors that caused a lack of situational awareness. Firstly, NWFC Room activated both the EXPLOSION and BOMB protocol at 22:36. The EXPLOSION protocol was triggered by an incoming 9/11 call which resulted in a pre-alert being sent to Manchester Central Fire Station, close to the Manchester Arena. However, this alarm was never confirmed by NWFC as NWFC was simultaneously executing tasks related to the BOMB protocol. Consequently, the pre-alert expired at 22:45, resulting in no physical commander or team being present on scene (Kerslake, 2018). Meanwhile, Transport Police and armed units could provide Manchester Police with clear indications of what was occurring, while the Ambulance Services had a paramedic that was close to the area who had self-deployed, resulting in frequent updates to their control room. This was not the case for Manchester Fire Services (O'Reilly, 2018, min. 2:33-3:03). Secondly, the activation of the BOMB procedure resulted in the on duty NILO becoming the tactical officer in command. However, the on duty NILO was located twenty two miles from the incident, thereby lacking situational awareness too (Kerslake, 2018). Thirdly, the FDO broke protocol by not informing the on duty NILO of the Operation PLATO contingency that had been declared (Kerslake, 2018). Moreover, the on duty NILO could also not contact the FDO to clarify the matter, because he was overwhelmed with tasks. Lastly, the on scene emergency response organizations were too busy with first responding, resulting in no multidisciplinary METHANE updates being sent (Kerslake, 2018). These combined circumstances, both as a result of coordination actions of Manchester Fire Services and Manchester Police, and contextual circumstances resulted in the NILO being unaware of what was occurring which resulted in a breakdown of sensemaking as he committed to the frame of an insecure scene for too long as will become clear in section 4.2.2.2.

2. The absence of Manchester Fire Services on scene

On scene, Ambulance Services, Transport Police and Manchester Police were confronted with the absence of Manchester Fire Services human and material resources. As a result of Manchester Fire Services absence, the Manchester Fire Services Special Response Teams were not present. The Specialist Response Teams were equipped with Sked stretchers which could be used to quickly extract casualties from the hot and warm zone (Kerslake, 2018). Moreover, the lack of firefighters present resulted in the absence of additional trained personnel required to use the stretchers present at the ambulances. Consequently, the absence of Manchester Fire Services affected the evacuation process on scene, resulting in increased

action ambiguity with regard to evacuation. Having said that, section 4.2.2.2. will discuss how officers in command coped with these fragmentation moments.

4.2.2.2. Coping with fragmentation

1. Different safety frames: the delayed arrival of Manchester Fire Service

On Duty National Interagency Liaison Officer

Phase 1

The factual overview indicated that the on duty NILO was confronted with reports ranging from a bomb explosion to an active shooter. Upon being confronted with these conflicting cues, the sensemaking process of the on duty NILO was interrupted. He coped with this by turning to the formal predesignated structure that was in place. That is, the standard operating principles prescribed that the FDO would further inform the on duty NILO and the Ambulance Services on the safety status. However, with no incoming phone call from the FDO, he then attempted to contact the FDO himself to obtain more clarity about the nature of the incident. However, at this point, he could not reach the FDO. Considering the fact that the on duty NILO was located twenty two miles away from the scene and with no physical commander present as a result of the pre-alert having expired, the on duty NILO could therefore not verify the information and update his frame. However, based on the information he was provided with (gunshots, active shooter, explosion) his frame was that it was expected that this attack was a marauding firearms attack, meaning operation PLATO would be declared (hot zone). Therefore, he conducted a risk assessment, after which he decided that it was not safe to deploy crews or a commander to the Manchester Police multiagency rendezvous point, because the Manchester Police multiagency rendezvous point was located in the 500m exclusion zone prescribed by the Operation PLATO protocol. Instead, he designated Philips Park Fire Station as the Manchester Fire Services rendezvous point in the hope that while he made his way to the scene he could reach the FDO (Kerslake, 2018). In hindsight, the Chief Fire Officer said about the NILOs decision: *''The complication is when you are the first officer receiving that information and you have a picture in your mind of one, five, ten gunman with automatic guns roaming around in the city center just picking people of willingly, would you be inclined to send operational firefighters and fire engines straight in the middle of that?, and the answer is no''* (O'Reilly, 2018, min. 4:52-5:16)

However, by designating Philips Park Fire Station at 22:40, resources were relocated further away from the scene (see below).

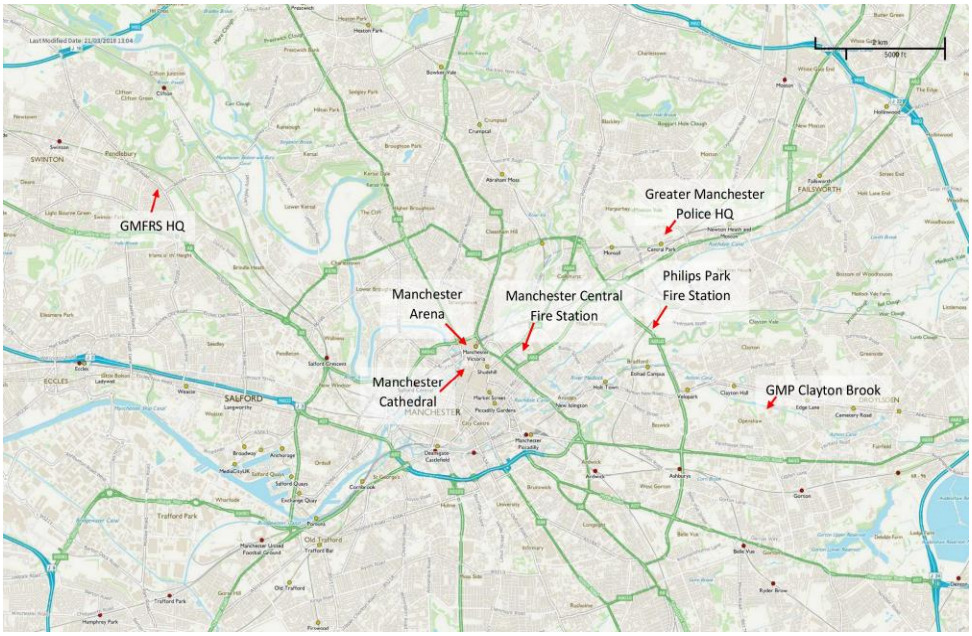


Figure 9. Rendezvous points Manchester Fire Service, Manchester Police and Medical Services

As such, the on duty NILO denied himself the chance to update his frame. For example, two pumps located at Manchester Central Fire Station relocated towards Philips Park Fire Station. As these pumps left the station, they noticed incoming ambulances towards Manchester Central Fire Station, because the Ambulance Services had declared Manchester Central Fire Station as rendezvous point (Kerslake, 2018). If the rendezvous point had been Manchester Central Fire Station therefore, Manchester Fire Services could have increased their situational awareness by making use of the intelligence that the Ambulance Services received from their commander on scene. Meanwhile, the fact that ambulances were incoming was an important contradictory cue that was seen by two pumps of Manchester Fire Services, yet this did not result in an update of their cognitive frame of insecurity nor action path chosen. This is indicated by the fact that they never expressed this concern to their officers in command. While it can be argued that at this point the on duty NILO did not have sufficient information to move forward, the NILOs coordination decision contributed to him not being able to seek contradictory cues, as the geographic distance away from the scene impeded him from doing so. A failure of updating therefore arose.

Phase 2

After having designated the rendezvous point, the on duty NILO attempted to contact the FDO seven times more, until at 22:48 he informed NWFC that he could not reach the FDO. In this call he noted *"I've been trying to get hold of the Force Duty Officer, but they're not picking up for obvious reasons, they're probably really busy"* (Kerslake, 2018, p. 166). Indeed, the FDO was overwhelmed by various tasks demands resting upon him. To illustrate, the FDO was activating and setting up a Force Command Module, he was the initial tactical firearms commander, and he had to monitor the regular police activities. Moreover, the FDO assumed that because the emergency organizations were aware of an active shooter, this equated the idea that Operation PLATO was active, therefore not informing the partner agencies of the Operation PLATO status. While the on duty NILO coped with the sensemaking failures by again turning to formal structures, he did not do more to seek contradictory cues, despite him noting that the FDO was busy for obvious reasons. The on duty NILO could have requested NWFC to obtain information about the status of Operation PLATO contingency. In addition, the on duty NILO could have activated another NILO to deploy to the scene at his own risk, while the on duty NILO was still on his way, to increase situational awareness. Lastly, he could have send an officer to instantly report to the Force Command Module where interorganizational coordination was occurring (Kerslake, 2018). Instead, the on duty NILO coped with the breakdown of sensemaking by sticking to protocol. This resulted in no updating of the cognitive frame of insecurity and a marauding firearms attack occurring by the on duty NILO. As a result, the commitment to a frame of a marauding terrorist attack and a hot zone remained, resulting in action ambiguity.

Phase 3

After this, an incoming call from a NWFC operator informed the on duty NILO of reports of an active shooter. Although Manchester Police corrected this information a minute later, stating that the victims had shrapnel wounds to NWFC, the on duty NILO was not notified of this correction. Instead, the Duty Group Manager, present at the Command Support Room was informed. The information of an active shooter was an important confirmatory cue to the on duty NILO, as this strengthened his commitment to the frame of an ongoing marauding firearms attack occurring. The correction could have provided the on duty NILO with a contradictory cue, but was never received. Meanwhile, it could be argued that upon being provided with this information, the expectations resting upon the NILO with regard to

ensuring safety protocol strengthened his commitment to this frame even further. Similarly, it could be argued that that because of the high position of the on duty NILO, his identity (and therefore position) prevented him from sending people out in the unknown. That is, as the chief fire officer noted *''If firefighters had been sent … and six firefighters get killed. Then we are dealing with the police and health and safety executive charging our officers and me as the chief fire officer with group negligence manslaughter and corporate manslaughter''* (O'Reilly, 2018, min. 6:31-6:58). These latter two circumstances therefore also enforced the sensemaking failures.

Phase 4

The factual overview also indicated that the on duty NILO arrived at the Philips Park Fire Station at 23:40, where he was joined by two other activated NILOs. They were then questioned by the present Manchester Fire Services crews why they were not deployed yet, as they had seen social media images of other emergency services being present. This indicates a voice of concern, while it forms an important contradictory cue to the frame of unsafety. Meanwhile, the on duty NILO saw social media images of ambulances using Manchester Fire Station as their rendezvous point. It could be argued that upon being confronted with a voice of concern by crews, and upon seeing this social media image, situational awareness with regard to which zones were safe increased (Kerslake, 2018). Before, the frame was present that this was an ongoing marauding firearms attack and that anything within the 500m exclusion zone was not safe. However, upon processing these cues, updating with regard to the latter frame occurred enabling action. To illustrate, upon being confronted with these cues, the most senior NILO on scene took on the position of Officer in Charge and contacted the Chief Fire Officer located at the Command Support Room at 23:53, after which the Manchester Fire Services resources were relocated to the closest known safe zone Manchester Central Fire Station at 23:58 in order to take the next steps from there.

However, this decision to forward troops to the nearest 'known' safety zone was based upon the mistaken idea that Manchester Police had not designated a multiagency rendezvous point. Because the on duty NILO had mentally excluded the designated multiagency rendezvous point by Manchester Police as the closest safe zone, he had not confirmed this important contradictory cue with the NILO in charge, resulting in the latter not fully being informed. As such, while updating of the cognitive frame occurred as contradictory cues were processed based on the voice of concern and social media images revising the cognitive frame of what was now the safest zone, the revised action path as a result of a revised frame was still

the wrong action path. Meanwhile, the NILOs were still under the impression that it was not safe to send crews to Manchester Arena. Therefore, continuity of dysfunctional momentum could be observed as the NILO Officer in Charge continued to engage in a course of failing action.

The NILO in charge (1)

Considering the NILO in charge takes over from the on duty NILO because he was the most senior officer, the next part analyzes coping processes of the NILO in charge. Upon arrival at Manchester Central Fire Station at 00:04, the NILO Officer in Charge noticed rotating ambulances between Manchester Central Fire Station, the arena and the hospitals (cue 1). He was also shocked by the fact that the Ambulance Services crews were not wearing ballistic protection (cue 2). As such, the NILO in charge was confronted with two important contradictory cues to the frame that this it was not safe to deploy to the scene because there was an ongoing marauding firearms attack. Firstly, the rotating ambulances indicated that this was not an ongoing marauding firearms attack. Secondly, the fact the Ambulances Services were not wearing ballistic protection (seemingly) indicated that there was no hot or warm zone. Important to note though, is that at this point there in fact was a warm zone, but the Ambulance Services were not aware of this. Either way, these cues formed important contradictory cues to the frame present. Nonetheless, while these cues were noticed, this did not result in the updating of the cognitive frame of the NILO in charge. This is indicated by the fact that the NILO in charge prepared to move Special Response Teams forward. The Special Response Teams wear ballistic protection are sent to warm zones. However, at 00:12, the Chief Fire Officer ordered the NILO officer to stand down (Kerslake, 2018). This is because the Chief Fire Officer now had coped with the fragmentation by deviating from protocol as he took over control, as becomes clear in the next section.

Chief Fire Officer in Command

NWFC notified the Duty Group Manager present at the Command Support Room of the correction that the victims had shrapnel wounds instead of gunshot wounds. As a result, a contradictory cue was presented to the Command Support Room. However, the cognitive frame that a marauding firearms terrorist attack was occurring was not revised at the Command Support Room. The Chief Fire Officer said about this *''What we had been told was that some of the casualties had gunshot wounds, but that was very quickly reassessed to shrapnel wounds. But we were also told that there was an active shooter. The first time that*

we were given any kind of information that said that there was possibly a reduced risk of that was close to half past twelve in the morning the next day, that's two hours after the incident started'' (O'Reilly, 2018, min. 5:41-6:05). This indicates that the Chief Fire Officer was confronted with conflicting information (cues) about what had occurred. Not able to verify this information and process these conflicting cues, commitment to the frame of insecurity remained, and no contradictory cues were sought. The chief commander in hindsight said about this: *''Certainly I have learned that my failure was that I did not test what I believed was in place enough to make sure that it worked''*(O'Reilly, 2018, min. 7:35-7:47*).*

Moreover, the Chief Fire Officer did not deploy anyone to the Force Command Module to increase situational awareness, while the Ambulance and Police services did. Consequently, no officers were present at Manchester Police Force Command Module until 00:04, when an off duty NILO activated himself and coped with the inaction of the Command Support Room by self-deploying to the Force Command Module. The factual overview illustrates that shortly after at 00:15, the NILO present at the Force Command Module overheard a conversation about Operation PLATO in which he was informed that armed police had been deployed one and a half hour earlier and that PLATO was active. Although by self-deploying he circumvented the Command Support Room and the on duty NILO, thereby enhancing fragmentation, it could be argued that this contributed to integration with the other agencies as situational awareness increased. Meanwhile, to cope with the breakdown of sensemaking, the Chief Fire Officer had called the medical operational commander who he knew well at 00:12 to ask how they could assist in the emergency response operation, in which he was informed of Operation PLATOs standby status. The Chief Fire Officer thus used his social network to increase situational awareness; He actively sought contradictory cues to update the common frame of insecurity and did so by using improvisation. However, this certainly occurred too late, resulting in a considerable delay of Manchester Fire Services resources on scene (Kerslake, 2018). Hereafter, the Chief Fire Officer contacted the NILO in charge at the rendezvous point and ordered to stop the special teams from moving forward. Instead, he ordered the deployment of three standard fire pumps and crews and the NILOS. While ordering this, he did not inform the officer in charge of Operation PLATO standby status.

It could be argued that the Chief Fire Officer ended fragmentation between Manchester Fire Services and the police and medical department by using fragmentation. That is, with a new cue being presented to him (Operation PLATO on standby), this cue was processed which resulted in the updating of the cognitive collective frame deeming

Manchester Arena an unsafe zone. This enabled the Chief Fire Officer to finally break the action paralysis as he activated the Manchester Fire Services crews and sent them on scene. By intervening and effectively taking control from the NILO, the Chief Fire Officer deviated from the BOMB protocol which prescribed that the NILO was in charge of these decisions. While this resulted in the effective deployment of crews to the scene, this also caused fragmentation, this time within the Manchester Fire Services organization as the Chief Fire Officer circumvented the NILO in charge.

The NILO in charge (2)

Shortly after command was taken from the NILO in charge by the Chief Fire officer, the NILOs were informed by the self-deployed NILO at the Force Command Module that the Operation PLATO contingency was active. This cue reaffirmed the cognitive frame that the NILO had of the situation, namely that it was too dangerous to deploy regular crews on scene. Meanwhile, the Chief Fire Officer was aware of Operation PLATO being on standby. Consequently, different information present to different officers at different times, resulted in different interpretations of the safety situation. This resulted in different opinions on what resources were required and had to be deployed. As a result, epistemic contestation arose because the NILO in charge attempted to renegotiate deploying the specialist teams to the scene instead of sending the regular teams with the Command Support Room. However this was denied. As such, the NILO coped with this conflicting information by contacting the Chief Fire Officer in an attempt to discuss the matter at hand.

At 00:37, Manchester Fire Services arrived at Manchester Arena. Upon arrival the crews were delayed by the NILO in Charge, because he assumed that the Chief Fire Officer was now the incident commander. Because the Chief Fire Officer was the incident commander, the NILO in charge required permission of the Chief Fire Officer to enter the scene. Therefore, additional delay occurred. It could be argued that while the intervention and deviation of protocol by the Chief Fire Officer resulted in ending the breakdown of collaborative action and sensemaking as teams were now sent on scene, it also resulted in a small delay of entry at the scene, as ambiguity and uncertainty about permission to enter increased. Either way, it could be argued that the Chief Fire Officer coped by using a fragmentation perspective to coordination as he deviated from protocol which resulted in him circumventing the NILO in charge, yet contributed to a workable solution for the problems faced.

Medical Operational Commander

The Ambulance Services were not aware that the Operation PLATO contingency had been declared and that they initially were working in a hot zone, and later warm zone, because Manchester Police had not informed them of this decision. Meanwhile, the decision to keep first responders in place by the FDO resulted in no contradictory cues being presented to the medical operational commander. Upon finally being informed of the status of Operation PLATO and the warm zone declaration at 00:15, after a scrum about security was held, the medical commander processed this cue by putting the Operation PLATO status on standby in the train concourse so that Ambulance Services could continue and collaboration processes were not hampered. This was done in consultation with the police tactical firearms commander. Consequently, it can be argued that the medical commander coped with this initial lack of collective sensemaking by improvising and deviating from protocol, as putting Operation PLATO on standby never occurred before.

2. Lack of collaboration between Manchester Fire Services and on-scene emergency response organizations

Medical Operational Commander

The overview also showed that the medical operational commander decided to not let Ambulance Services, Manchester Police, Transport Police and members of the public use sked or scoop stretchers, because of the absence of sufficiently trained personnel that could use these stretchers. This is because explanation to members of the public and other first responders on how to use them would have delayed the evacuation, while simultaneously draw Ambulance Services staff in to assist with evacuation. This would undermine safety as Ambulance Services personnel would be increasingly present in the foyer, while also drawing their attention away from providing first aid. As such, the medical operational commander coped with the absence of Manchester Fire Services by improvising in which the injured were evacuated using metal crowd barriers and display boards (Kerslake, 2018). Although this went against safety and health protocol, this resulted in an efficient solution as it enabled evacuation to continue. Breaking protocol in an attempt to cope with the absence of Manchester Fire Services can therefore be observed.

4.2.3. Sub conclusion

Similar to the previous sub conclusion, this section consists of two tables in which the key points of the analysis are portrayed which will be used for comparison in section 4.3

Identifying fragmentation

	Initial cause	*Result*
Fragmentation moment 1	Manchester Fire Services, Ambulance Services received conflicting information about what occurred (ambiguity and uncertainty), resulting in different frames present for the different emergency response organizations Hereafter, Manchester Fire Services and Ambulance Services were not informed by the FDO on the status of Operation Plato as a result of different task demands and different interpretation of awareness of the involved organizations and further contact was not made (lack of communication) resulting in a breakdown of formal structures No communication by the on scene organizations with Manchester Fire Services	Breakdown of collective sensemaking between the Ambulance Services, Manchester Police and Manchester Fire Services: - Ambulance Services initially operated under the idea that there was no Operation Plato contingency (Frame 1) - Manchester Police operated under the idea that this was an ongoing marauding firearms terrorist attack with Operation Plato declared (hot zone) (Frame 2) - Manchester Fire Services operated with the idea that this was a marauding terrorist firearms attack and that Operation Plato would be declared (hot zone) (Frame 3)
Fragmentation moment 2	-The absence of Manchester Fire Services human and material resources on scene .	- No collaboration between Manchester Fire Services and present on scene organizations possible

Table 5.

Coping with fragmentation

Coping	*On Duty NILO Officer*	*NILO in charge*	*Chief Fire Officer in Command*	*Medical Operational Commander*
Fragmentation moment 1	**Phase 1:** 1. Turning to standard operation principles which prescribed the FDO would inform him (sensemaking, sticking to protocol) 2. Attempting to contact the FDO to obtain information/clarity about the incident (sensemaking, sticking to protocol) 3. Conducting a risk assessment (sticking to protocol) and designating a safe zone outside the 500m perimeter in the 'hot zone' (sticking to protocol) **Phase 2:** 1. Attempting to contact the FDO seven times (sticking to protocol, sensemaking) **Phase 3**: 1. Confirmatory cue processed, commitment to cognitive frame strengthened after updating (sensemaking) **Phase 4:** 1. Contradictory cues processed as a result of social media images showing ambulances leaving from Manchester Fire Station and voice of concern (sensemaking)	1. Taking control by the most senior NILO: contacting the Chief Fire Officer and decision to sent the crews the nearest safe zone: Manchester Fire Station (sensemaking) 2. Contradictory cues not processed (rotating ambulances between Manchester Central Fire Station, arena and hospitals), Ambulance Services not wearing ballistic armory resulting in specialist teams prepared to move forward (sensemaking)	1. No deployment to the Force Command Module 2. Contradictory cue sought: contact made with the Ambulance Services operational commander to ask about Operation Plato Status (sensemaking) 3. Taking over control from on duty NILO: orders the NILO in charge to stand down and send regular crews instead (cross boundary intervention, breaking protocol)	1. Processing cue by putting Operation PLATO status in standby (breaking protocol) after discussion (sensemaking)
Fragmentation moment 2	N/A	N/A	N/A	Allowing injured to evacuate with metal crowd barriers and display boards (breaking safety and health protocol)
Result	Phase 1 to 4: Aiming for integration, resulting in fragmentation	1+2: Aiming for integration, resulting in fragmentation	1. Aiming for integration, resulting in fragmentation 2. Aiming for integration, resulting in fragmentation 3. Using fragmentation	Aiming for integration

Table 6.

4.3 Comparison

In the previous sections, a thorough and in depth analysis of the individual cases was conducted. This section will first compare the causes of fragmentation, and then compare the coping processes of officers in command using the tables presented in the sub conclusions of section 4.1 and 4.2 to draw conclusions and identify common processes.

Identification and causes of fragmentation

Brussels Bombings v Manchester Bombing

	Initial cause	Result
Fragmentation moment 1	Coordination decision by zone commander to delegate the field commander position to the Police Department resulting in formal structures breaking down	Breakdown of formal structures: no visible field commander and central command post: interorganizational coordination and communication processes disturbed
Fragmentation moment 2	Emergency Center Leuven received conflicting information from different commanders who had different frames, as they were located at different geographic locations, and presented with different cues resulting in different interpretations of what was required	Breakdown of collaborative action and collective sensemaking between Emergency Center Leuven and the medical commander (frame 1) and the Brussels and Regional Fire Departments (frame 2) as a result of different frames when requesting ambulances
Fragmentation moment 3	Communication difficulties and network saturation	Evacuation of the injured hampered: No collaboration possible between hospitals and medical commanders
Fragmentation moment 4	Ambiguity and uncertainty	Breakdown of formal structures: pre planned place for advanced medical post not feasible nor possible Different exits at different levels: human and material resources spread across two locations

	Initial cause	Result
Fragmentation moment 1	Manchester Fire Services, Ambulance Services received conflicting information about what occurred (ambiguity and uncertainty), resulting in different frames present for the different emergency response organizations Hereafter, Manchester Fire Services and Ambulance Services were not informed by the FDO (coordination decision) on the status of Operation Plato as a result of different task demands and different interpretation of awareness of the involved organizations and further contact was not made (lack of communication) resulting in a breakdown of formal structures No communication by the on-scene organizations with Manchester Fire Services	Breakdown of collective sensemaking between the Ambulance Services, Manchester Police and Manchester Fire Services: - Ambulance Services initially operated under the idea that there was no Operation Plato contingency (Frame 1) - Manchester Police operated under the idea that this was an ongoing marauding firearms terrorist attack with Operation Plato declared (hot zone) (Frame 2) - Manchester Fire Services operated with the idea that this was a marauding terrorist firearms attack and that Operation Plato would be declared (hot zone) (Frame 3), resulting in a delayed arrival of Manchester Fire Services on scene
Fragmentation moment 2	The absence of Manchester Fire Services human and material resources on scene .	No collaboration between Manchester Fire Services and present on scene organizations possible

Table 7.

Table 7 indicates that a first commonality is that in case of fragmentation moment two (Brussels Bombings) compared with fragmentation moment one (Manchester Bombing) the initial breakdown of collective sensemaking arose as a result of individual emergency response organizations receiving conflicting and different information at different times about the nature of the situation. In the case of Emergency Center Leuven, the commander was confronted with the medical and fire commanders reporting different situations with regard to the amount of required ambulances. In the case of the Manchester Bombing, the on duty NILO was presented with conflicting information about what had occurred by their control room NWFC. Upon being confronted with circumstances of ambiguity and uncertainty, the commanders in both cases enacted their individual sensemaking processes to process the cues provided to them. However, in both cases their individual sensemaking processes resulted in a further breakdown of collective sensemaking which affected collaborative action, as the decisions and action paths they chose after having processed these cues resulted in a denial to send ambulances on scene upon request of the fire commanders (Brussels Bombings) and the delayed arrival of Manchester Fire Services at Manchester Arena (Manchester Bombing).

Secondly, when one compares fragmentation moment one (Brussels Bombings) with fragmentation moment two (Manchester Bombing), a common trend to be observed is that the initial coordination decision by emergency response organizations coordinating from a distance resulted in formal structures breaking down. In the case of the Brussels Bombing, the zone commander's decision to delegate the field commander position to the Police Department resulted in no visible field commander and central command post. As a result, there was no formal structure in place to achieve formal interorganizational coordination, resulting in commanders being effectively out of the loop of each other's actions (no collective sensemaking). In the case of the Manchester Bombing, while there was a clear incident commander (the FDO) ensuring interorganizational coordination, the FDO neglected to inform the emergency response organizations on the status of the attack and Operation PLATO as a result of high pressure and various task demands. Moreover, he could not be reached. This resulted in the absence of a key formal structures designed to ensure and assist in collective sensemaking as well. In both cases, therefore, the individual commanders had to be reliant upon their own initiatives to ensure coordination. Lastly, in both cases, communication difficulties strengthened the breakdown of collective sensemaking which affected collaboration processes.

Coping with fragmentation

Brussels Bombings

Coping	*Designated fire commander*	*Regional fire commander*	*Brussels fire commander*	*Medical commander Brussels Airport*	*Medical commander Maelbeek Station*	*Functional head Emergency Center Leuven*
Fragmentation moment 1	1. Taking over control by organizing meeting	N/A	N/A	N/A	N/A	N/A
Fragmentation moment 2	2. Taking control by separating the Brussels fire commander and regional fire commander after discussion arises	1. Attempting to contact medical commander (sensemaking) 2.Activating four ambulances himself (cross boundary intervention, breaking protocol)	1. Discussing matter at hand with regional fire commander (sensemaking, epistemic contestation) 2. Sending five ambulances on scene on his own orders (cross boundary intervention, breaking protocol) 3. Contacting Emergency Center Leuven (sensemaking, epistemic contestation) 4. Searching for medical commander on scene: face to face contact (sensemaking)	N/A	N/A	1. Discussing, evaluating different information (sensemaking) 2. Turning to formal structures; medical intervention plan (sensemaking) 3. Sticking to protocol, not sending ambulances upon request fire commanders 4. Activating the self-activated ambulances by the regional fire commander
Fragmentation moment 3	N/A	N/A	N/A	1. Delegation of tasks to military hospital (breaking protocol) 2. Requesting Emergency Center Leuven to inform them (deviation from protocol)	1. Circumventing Emergency Center Leuven (breaking protocol) 2. Delegation of tasks to military hospital (breaking protocol) and to Emergency Center Brussels (deviation from protocol)	N/A
Fragmentation moment 4	N/A	N/A	N/A	N/A	3. Designating two advanced medical posts (breaking protocol) 4. Delegating expertise 5. Reuniting the advanced medical posts into one	N/A
Result	1. Aiming for integrative coordination 2. Aiming for integrative coordination	1. Aiming for integrative coordination 2. Using fragmentation	1. Aiming for integrative coordination 2. Using fragmentation 3. Aiming for integrative coordination 4. Restoring integrative coordination	1+2. Aiming for integrative coordination, resulting in fragmentation	1+2: Aiming for integrative coordination, resulting in fragmentation 3+4: Using fragmentation 5: Restoring integrative coordination	1+2+3 Aiming for integrative coordination resulting in fragmentation 4. Aiming for integrative coordination

v Manchester Bombing

Coping	*On Duty NILO Officer*	*NILO in charge*	*Chief Fire Officer in Command*	*Medical Operational Commander*
Fragmentation moment 1	**Phase 1:** 1. Turning to standard operation principles which prescribed the FDO would inform him (sensemaking, sticking to protocol) 2. Attempting to contact the FDO to obtain information/clarity about the incident (sensemaking, sticking to protocol) 3. Conducting a risk assessment (sticking to protocol) and designating a safe zone outside the 500m perimeter in the 'hot zone' (sticking to protocol) **Phase 2:** 1. Attempting to contact the FDO seven times (sticking to protocol, sensemaking) **Phase 3**: 1. Confirmatory cue processed, commitment to cognitive frame strengthened after updating (sensemaking) **Phase 4:** 1. Contradictory cues processed as a result of social media images showing ambulances leaving from Manchester Fire Station and voice of concern (sensemaking)	1. Taking control by the most senior NILO: contacting the Chief Fire Officer and decision to sent the crews the nearest safe zone: Manchester Fire Station (sensemaking) 2. Contradictory cues not processed (rotating ambulances between Manchester Central Fire Station, arena and hospitals), Ambulance Services not wearing ballistic armory resulting in specialist teams prepared to move forward (sensemaking)	1. No deployment to the Force Command Module 2. Contradictory cue sought: contact made with the Ambulance Services operational commander to ask about Operation Plato Status (sensemaking) 3. Taking over control from on duty NILO: orders the NILO in charge to stand down and send regular crews instead (cross boundary intervention, breaking protocol)	1. Processing cue by putting Operation PLATO status in standby (breaking protocol) after discussion (sensemaking)
Fragmentation moment 2	N/A	N/A	N/A	Allowing injured to evacuate with metal crowd barriers and display boards (breaking safety and health protocol)
Result	Phase 1 to 4: Aiming for integration, resulting in fragmentation	1+2: Aiming for integration, resulting in fragmentation	1. Aiming for integration, resulting in fragmentation 2. Aiming for integration, resulting in fragmentation 3. Using fragmentation	Aiming for integration

Table 8.

Sensemaking

Table 8 indicates that in both cases, during fragmentation moment two (Brussels Bombings) and fragmentation moment one (Manchester Bombings), the commanders initially coped with conflicting information by turning to formal structures (medical intervention plan, standard operating principles) to assist in the sensemaking process. In the case of the Brussels Bombings, the functional head of Emergency Center Leuven discussed and evaluated the cues with his team. Similarly, in the case of the Manchester Bombing, the on duty NILO wished to discuss the cues with the FDO. However, because the on duty NILO could not reach the FDO, his sensemaking process was halted because he could not rely on the formal structure.

Consequently, in the case of the Brussels Bombings, the conflicting cues were processed within the framework of the medical intervention plan, after which it was decided

to not send more ambulances on scene, because this was the competence of the medical commander. Cues were therefore linked to the cognitive frame resulting in updating, however this did not result in a changed course of action. Instead, it strengthened a breakdown of collective sensemaking, because on scene fire commanders were confronted with different cues (lack of ambulances present) and could not understand the decision by Emergency Center Leuven to not send additional ambulances. Moreover, they considered this a refusal of collaboration.

Because the on duty NILO could not rely upon the FDO, the on duty NILO stuck to protocol in a further attempt to make sense of the situation and conducted a risk assessment after which he designated a rendezvous point outside of the 500m exclusion zone, thereby impeding his sensemaking process further as he denied himself the chance to seek contradictory cues or update his frame. Taking these two instances into account, a similarity to be observed therefore is that in both cases, sticking to procedure and turning to formal structures by commanders to make sense of the situation had an opposite effect; it created further fragmentation as collective sensemaking and collaboration processes were disturbed.

Further coordinated action

Emergency Center Leuven refused to send ambulances on scene, and Manchester Fire Services could not collaborate with the FDO, neither had its resources on scene. In the case of the Brussels Bombings, the regional fire commander coped with this by seeking contact with the medical commander, who could not be reached. Similarly, the on duty NILO attempted to contact the FDO seven times more, but could not reach him. Both attempts indicate an attempt at integrative coordination. However, with contradictory cues presented to the fire commanders at Brussels Airport to the frame of Emergency Center Leuven, the regional fire commander and Brussels fire commander coped with the breakdown of collective sensemaking and collaborative action by breaking protocol and cross boundary intervention by sending ambulances on scene. Contrarily, in the case of the Manchester Bombing, the on duty NILO continued to stick with protocol, and continued to attempt to reach the FDO. Because he had taken away the chance to seek contradictory cues by relocating away from the scene, and because of no physical commander present he could not adequately update his frame. Meanwhile, he had absorbed confirmatory cues stating there was an active shooter which had strengthened his commitment to the wrong frame resulting in dysfunctional momentum. As the individual analysis indicated, this process continued until arrival at the rendezvous point, where the NILO in charge took over. However, here too, failure of updating

could be observed as the on duty NILO neglected to tell the NILO in charge of the established multiagency rendezvous point by Manchester Police. Hereafter, at Manchester Fire Station, the NILO in charge neglected to process contradictory cues (rotating ambulances, unprotected teams), and he therefore he remained in the wrongful frame. In short, until now, and unlike in the case of Brussels Bombings, the fire commanders did not cope with fragmentation adequately. Although the commanders initially attempted to ensure integration by sticking to protocol, this resulted in further fragmentation as confirmatory cues were absorbed and contradictory cues were accommodated. Eventually the NILO in charge prepared the special crews to move forward, but even this action indicates failure of updating was present.

This breakdown of sensemaking and collaborative action was ended at 00:12, when the Chief Fire Officer actively sought a contradictory cue and used his social network to obtain information by calling the Ambulance Services operational commander. Similar to the fire commanders in the case of the Brussels Bombings, he then coped with the breakdown of collective sensemaking and collaborative action by breaking protocol and cross boundary intervention by taking over control and sending the regular crews forward. As such, while different sensemaking processes can be observed, eventually this resulted in similar coping actions in both cases. That is, in both cases the commanders initially aimed for integration. Hereafter, upon not being able to reach integration, coordinated action was taken which had a fragmenting effect, but which resulted in workable solutions to the problems at hand.

Moreover, in the case of the Brussels Bombings, an attempt to return to integrative coordination could be observed after things settle down. For example, the Brussels fire commander sought contact with Emergency Center Leuven after having sent the ambulances on scene, and he also searched for the medical commander on scene, after which the last ambulances were sent.

Lastly, although under different circumstances, breaking protocol as a means of coping with fragmentation returned various other times. The Manchester medical commander coped with the absence of Manchester Fire Services during evacuation by breaking health and safety protocol. Similarly, when he heard about the status of Operation PLATO and realized this would negatively affect collaboration processes, he coped with this by putting Operation PLATO in standby modus, something that had never occurred before, allowing for continuance of evacuations. Lastly, in the case of Brussels Bombing, when the medical commanders were confronted with a lack of collaboration with the hospital as a result of communication difficulties, they delegated tasks to the military hospital, and to Emergency Center Leuven thereby breaking protocol. In another instance, the medical commander at

Maelbeek Station coped by designating two advanced medical posts which was also a deviation from protocol. Shortly after however, he reunited these command posts, indicating a return to integrative coordination.

Chapter 5: Discussion

This study has provided practical insights into the cause of fragmentation and more importantly, into how officers in command coped with fragmentation in the emergency response operation during coordination. The next part will discuss the meaning of the findings in light of the academic debate.

5.1 Cause of fragmentation

The findings of both cases illustrated that conflicting information present to officers in command resulted in ambiguity and uncertainty after which sensemaking was enacted by the officers in command. However, conflicting and different cues available to the officers in command resulted in different interpretations of the situation. Different interpretations of the situation resulted in different action paths being taken, because collective sensemaking processes were not aligned. Moreover, communication difficulties further hampered collective sensemaking processes as with lack of communication, circumstances of ambiguity and uncertainty further increased. Because collective sensemaking processes were not aligned, a breakdown of collaboration occurred.

This practical finding confirms Martin (1992, p. 134) vision noting that a lack of communication, and circumstances of ambiguity, complexity and conflicting information results in various explanations being possible. Moreover, it confirms Maitlis & Sonenshein, 2010, p. 557) finding that as a result, interpretive indeterminacy and epistemic differences arise because *‘’individuals draw on different knowledge bases to develop different understandings about what is happening and what should be done to prevent crisis’’.* The different information, and conflicting cues presented to the various emergency response organizations at different stages essentially caused a breakdown of collective sensemaking, which affected coordinated collaborative action (Martin 1992; Wolbers et al., 2018). Weick (1995) is therefore right to state that sensemaking is a critical organizational activity.

Secondly, discontinuity of the regular interorganizational coordinating activities of officers in command as a result of high pressure, ambiguity and uncertainty, and because of coordination decisions made by the commanders resulted in formal structures ensuring interorganizational coordination breaking down, which affected collective sensemaking and collaboration. This confirms Hirsch et al. (2015) recent study that in case of terrorist attacks, formal structures break down in unexpected ways as a result of ambiguity and uncertainty,

creating further ambiguity and uncertainty and eventually cause fragmentation (Wolbers, et al., 2018).

5.2 Coping with fragmentation

Sensemaking

A key finding of the comparison was that a commonality in both cases was that the commanders initially turned to formal structures and procedures to assist in the sensemaking and coordination process. However, in both cases reliance on protocol in an attempt to make sense of the situation affected collective sensemaking and collaboration processes negatively. As such, while Weick, Sutcliffe & Obtsveld (2005) note that turning to formal structures can assist in sensemaking, and thereby enable coordinated collaborative action (Maitlis & Christianson, 2014), my findings indicate that is not always the case; In fact, it can cause fragmentation. This is because a commitment to formal structures and procedures can result in blind spots that impede adaptation (Maitlis and Sonenshein, 2010). Indeed, relying too tightly on formal structures and procedures can impede the commander to adequately update his cognitive frame, as the attempts of updating are then executed within the fixed frame of having to stick with procedures resulting in accommodation of confirmatory cues (Cornelissen et al., 2014) while intentionally or non-intentionally disregarding contradictory cues, for example as a result of group think or because of blind spots (Matilis & Sonenshein, 2010).

Secondly, Christianson (2019) found that while one can notice a cue, process it, and thereby update the cognitive frame during unexpected and fast unfolding events, this does not mean that the action path is revised, or that updating occurred adequately. While effective teams monitor and interpret new cues rapidly and take action, less effective teams *''fail to monitor and confirm cues with others, overlook or misinterpret cues, and delay investigating cues and developing plausible explanations, they also delay testing explanations, often being sidetracked by patient care tasks''* (Christianson, 2019, p. 45). This contrast of effective vs. less effective teams was particularly visible in the case of coping with sensemaking issues arising. That is, in the case of the Brussels Bombings, the fire commanders actively sought contradictory cues and updated their frames (e.g. face to face contact with the medical commander, discussion with the regional fire commander, calling with Emergency Center Leuven, calling the medical commander), eventually leaving formal structures behind, taking action and breaking protocol. However, in the case of the Manchester Bombing updating and

searching for contradictory cues did not occur adequately, while contradictory cues were disregarded, confirmatory cues were absorbed and cues not shared, resulting in the delayed arrival of Manchester Fire Services. This confirms Barton & Sutcliffe (2009) and Cornelissen et al. (2016) notion that updating the cognitive frame by constantly re-evaluating information and seeking contradictory cues is crucial to avoid a breakdown of sensemaking resulting in a breakdown of collaborative action, because failure to do so will result in dysfunctional momentum building up in which the organization continues to engage in a course of failing action.

Further coordinated action

Okhuysen & Bechky (2009) state that coordination is based on three integrative conditions: predictability, accountability and common understanding. However, the findings of this study indicate that this is not always the case when coping with fragmentation. That is, when confronted with fragmentation, commanders in both cases initially coordinated by attempting to ensure the three integrative conditions of coordination. Common understanding was sought by commanders seeking contact with other commanders by phoning them. Predictability was ensured by reliance on protocol, and accountability was achieved by having a commander in charge. However, coordination occurred by turning to (in)formal structures in which rigid reliance on protocol strengthened a breakdown of collaborative action as sensemaking processes were disturbed. Therefore, by ensuring integration, this undermined effectiveness of coordination. Although in a later phase, the coordination practices occurred more out of the box, for example by seeking face to face contact which improved coordination, the findings illustrate that the three integrative conditions can also be a double edged sword and do not always guarantee effective coordination in case of sudden onset crises. This finding is in line with Wolbers et al. (2018) observation that in an attempt to achieve integration, one often triggers fragmentation.

Moreover, the findings illustrated that when the situation was no longer under control, and the commanders no longer saw a means to reach integrative coordination, the commanders coped with fragmentation by accepting fragmentation for what it was, and actively used its virtues as a means of coordination. To illustrate, the cross boundary intervention and breaking of protocol of commanders as a result of improvisation resulted had a fragmenting effect as the emergency response organizations worked separately from each other. Yet, the effect was that more ambulances reported to the scene in the case of the Brussels Bombing, while the late cross boundary intervention and breaking of protocol by the

Chief Fire Officer ended the absence of Manchester Fire Services on scene. Similarly, commanders, by delegating tasks and expertise in an attempt to cope with fragmentation, while aiming for integration in fact increased fragmentation, but this resulted in improved collaboration processes as workable solutions were created. As such, by inventing novel and creative solutions to the situation at hand by using virtues of fragmentation, adaptation was enabled which ensured effective coordination and improved resilience as workable solutions to the situation at hand were created. Therefore, while authors such as Argote (1982), (Heath & Staudenmayer, 2000), (Bechky (2003), Bechky (2006), Brown, Colville & Pye (2015) argue that that effects of fragmentation should be reduced at all cost, because fragmentation results in differentiation which supposedly undermines integrative and effective coordination, the findings of this study indicate that this notion is not applicable in case of a sudden onset crises, where reaching integration is not always possible and fragmentation is inevitably present.

Wolbers et. al (2018) study already created a foundation to consider fragmentation as a means of alternative coordination. The authors suggested a fragmentation perspective to coordination, when achieving integrative coordination was not possible. The practical findings and examples of this study support Wolbers et. al. (2018) notion that a fragmentation perspective to coordination can be fruitful in the case of sudden-onset crises where ambiguity and uncertainty ensure that fragmentation arise. The findings confirm that using fragmentation as a means of coordination can be a feasible option, because by using fragmentation, novel and workable solutions to the coordination issues at hand are created which contribute to resilience as it enables improvisation, creativity and adaptation to an ambiguous and uncertain situation at hand (Comfort et al. 2010; Williams et al., 2010; Mendonca & Wallace ,2004; Rerup, 2001; Kendra & Wachtendrof, 2003). Coordination was adapted to the needs of the commanders in the field and this was crucial in achieving effective coordination because as Okhuysen & Bechky (2009), Jarzabkowski et. al (2012), Kellog et. al (2006), Gkeredakis (2014) and Faraj & Xiao (2006) observe: coordination is always in flux which makes it an emergent process which requires adaptation. Important to note is that this does not mean that fragmentation must always be used. Contrarily, the findings indicate that while fragmentation can be used as a means to overcome coordination issues, a return to integrative coordination could often be observed after, when the situation became more under control. Crucial to remember however, is that commanders must not be discouraged to use fragmentation when dealing with a breakdown of collaborative action and sensemaking, because it can in fact improve resilience and contribute to an improved situation on scene.

Chapter 6: Conclusion

This research has aimed to answer the following question: ‘’*How did officers in command cope with fragmentation during the coordination practice of the emergency response operation of the Brussels Bombings in 2016, compared to the Manchester Arena Bombing in 2017?*’’ This question was raised to provide more clarity about the phenomenon of fragmentation in relation to coordination of the emergency response operation during sudden onset crises.

This research found that in both cases, the commanders initially were confronted with conflicting information affecting sensemaking processes. They coped with this by relying on procedures in an attempt to make sense of the situation. Moreover, in both cases reliance on formal structures had an opposite effect; it created further fragmentation as sensemaking and collaboration processes were disturbed. Indeed, in the case of the Brussels Bombings this resulted in Emergency Center Leuven not willing to send ambulances on scene upon request of the fire commanders. In the case of the Manchester Bombing this resulted in the delayed arrival of Manchester Fire Services on scene resulting in no collaboration between the three leading agencies.

Upon being confronted with this breakdown of collective sensemaking and collaborative action, commanders coped by initially aiming for integration by contacting the relevant emergency response organizations to obtain a better overview of the situation. However, upon not being able to reach the relevant commanders, the fire commanders of the Brussels Bombing then broke protocol and conducted a cross boundary intervention as they activated and sent ambulances on scene on their own orders, while this was the competence of the medical department and Emergency Center Leuven. Contrarily, in the case of the Manchester Bombings, the officers in command stuck in a wrongful frame for a substantial amount of time, because they continued to rely upon formal structures to increase their situational awareness, instead of improvising themselves. Moreover, confirmatory cues were absorbed and conflicting cues were accommodated, resulting in blind spots. Only after a substantial amount of time, the Chief Fire Commander used his social network to stop the breakdown of sensemaking after which he - similarly to the commanders in the Brussels Bombing - broke protocol and conducted a cross boundary intervention, only this time by taking over control from the strategic commander and ordering the troops to move forward to the scene.

This illustrates that officers in command initially coped with fragmentation during coordination by aiming for integration. However, upon being confronted with the inability to achieve integration, they then used the virtues of fragmentation to invent novel and creative solutions to the problems that arose in the fast-paced environment of emergency management. While these novel and creative solutions undermined integration, these solutions simultaneously ensured that coordination was practiced effectively, as adaptation and improvisation increased the officer in commands' capability to cope and adapt coordination.

While the majority of studies consider fragmentation to be a deficiency of coordination, this research provides support for a less well known perspective to coordination: the fragmentation perspective to coordination. Recognizing that fragmentation can in fact increase resilience by using its virtues to enable adaptation to fast-changing environments is an important step in ensuring that crisis management is practiced effectively. This does not mean that integrative coordination should be disregarded. However, in case of sudden onset crises, researchers should switch away their attention from researching ways to avoid and reduce effects of fragmentation and instead begin researching how and when fragmentation can be used to ensure and increase effective coordination, as this will improve resilience.

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Appendices

Appendix A: Timeline Brussels Bombings

Time	Actor group	Name	Event
07:58	Terrorist	Islamic State (ISIS)	Two suicide bombs explode at Brussel Zaventem Airport
07:59	Emergency Center Leuven	112 Dispatcher	Receives first notification of bomb explosions
08:01	Military	Guy Schotte	Receives first report of two bomb explosions at Zaventem Airport from dispatch
08:02	Police	DIR POL (Zaventem) Jean-Pierre Devos (Airport police)	Arrrives at departure hall Zaventem
08:02	Police	DIR POL (Zaventem) Jean-Pierre Devos (Airport police)	Begins evacuation, requests the communication centrum to send in DOVO (explosive specialist teams)
08:02	Fire Department	Dispatcher 02	Receives first notification of bomb explosion from Emergency Centre Leuven
08:02	Medical Services	Head Nurse MUG - Luc Orlangs	Receives first notification of bomb explosion from Emergency Centre Leuven
08:05	Fire Department	Fire Department Zaventem	Leaves headquarters towards place of intervention
08:06	Federal Police	DAO (Directie Operaties Bestuurlijke Politie)	First teams are sent to Zaventem
08:06	Fire Department	Fire Department Brandweer Vilvoorde	Leaves headquarters towards place of intervention
08:06	Police	Federal Police	Notifies CrisisCentre of bomb explosion
08:06	Government	CrisisCenter	Organizes a coordination meeting after most important participants arrives between 08:20 08:50
08:10	Military	Guy Schotte	Receives information of at least 30 wounded
08:10	Fire Department	Fire Department Heliport (Brussel)	5 trucks, 1 fire ambulance, 1 UCL, 1 UVB leave for Zaventem
08:10	Medical Services	DIR MED (Zaventem) Eric Mergny	Informed about bombexplosion by Emergency Centre Leuven - Heads towards Zaventem
08:12	Medical Services	Temporal DIR MED (Zaventem)	MUG Doctor Arrives at scene and takes on DIR-MED until Eric Mergny arrives
08:14	Fire Department	Fire Department Zaventem	Arrive at Departure Hall - Request announcement Medical Disaster Plan
08:14	Police	DIR POL (Zaventem) Jean-Pierre Devos (Airport police)	Informs Dispatch Police of explosion + what resources are required
08:14	Police Department	Dispatch	Receive notification of bomb attack
08:14	Fire Department	DIR FIRE (Zaventem) Dirk Keymolen / DIR CP OPS	Declare major incident to emergency centre Leuven and request more ambulances
08:15	Emergency Services		CP-OPS organized at airport for interagency coordination
	Fire Department/DOVO		Informal coordination meeting held
08:16	Medical Services	3 MUG, 10 Ambulances	Present at Airport
08:17	Medical Services	Temporal DIR MED	Provides update to Emergency Centre Leuven: requests additional MUG team + 5 ambulanc
08:20	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Leaves Fire Headquarters Heliport for Zaventem
08:23	Military	Guy Schotte	Receives information of at least 100 wounded
08:24	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Requests declaration of Province Emergency Plan to Emergency Centre Leuven
08:24	Fire Department		Requests ambulances from area Vilvoorde & Londerzee
08:25	Police	DAO (Directie Operaties Bestuurlijke Politie)	Herbert Veyt arrives at crisiscentre (BZ)
08:26	Fire Department	ADJ DIR OPS (Zaventem) Opstal	Reports 30 severely injured, various deads to Emergency Centre Leuven: request more ambulances
08:27	Fire Department	ADJ DIR OPS (Zaventem) Opstal	Ambulance request rejected. Adj- DIR Ops wants at least 30 ambulances
08:27	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Between 08:27 - 08:31 request 5 extra ambulances
08:28	Military	Guy Schotte	Receives call from DOVO that it is sending a team to Zaventem Airport
08:27	Local Government	Mayor Zaventem Francis Vermeiren	Provincial crisis commitee called in
08:29	Government	Governor Lodewijk de Witte	Provincial disaster phase announced
08:30	Medical Services	ADJ DIR MED (Zaventem) Luc Orlangs	Arrives at Zaventem
08:30	Government	CrisisCentre	Receives question whether Metrosystem must be shut down by Prime Minister of Brussels Cabinet
08:32	Fire Department	Brussels Fire Commander Tanguy du Bus du Warnaffe	Arrives at Zaventem, requests more ambulances
08:35	Fire Department	Brussels Fire Commander Tanguy du Bus du Warnaffe	Requests more ambulances to own dispatch (Brussels Emergency Center)
08:36	Fire Department	DIR BR / DIR CP OPS (Zaventem) Dirk Keymolen	Arrives at Zaventem Airport and asks if provincial phase has been announced yet
08:36	Airport	BelgoControl/Director Zaventem Airport	Airtravel shut down
08:36	Government	Minister of Mobility - Ben Weyts	Level 4 terror alarm at all airports on all Flemish Airports, Belgium
08:37	Emergency Services		Rumor there is another bomb - All emergency services rush away from scene
08:37	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Requests more ambulances to own dispatch (Brussels Emergency Center)
08:39	Military	Guy Schotte	Receives update of at least 20 deceased, suspicious colli & evacuation departure hall
08:40	Medical Services	DIR MED (Zaventem) Eric Mergny	Arrives in Zaventem and is informed. Designates FireDepartment Airport as Advanced Med Post
08:40	Medical Services	DIR MED (Zaventem) Eric Mergny	Distributes tasks: Doctor for medical post. Doctor for triage at departure hall. Person for parking ambulances.
08:40	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Contacts Emergency Centre Leuven - Reports many untreated wounded people. Requests ambulances.
08:40	Emergency Center Leuven	Dispatcher	Receives call Fire Commander, but refuses to send more ambulances. Important informatio withheld
08:41	Government	CrisisCenter	Order to evacuate entire Airport & request to take into full safety protocls for evacuation wounded
08:41	Airport	Brussels Airport	Tweet that two bombs have exploded and request not to come to Airport
08:43	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Hears from own Dispatch that Emergency Centre Leuven still rejects sending in more ambulances
08:45	Fire Department	Brussels Fire Commander Tanguy du Bus de Warnaffe	Contacts Emergeny Centre Leuven again - Provides medical situational report - Ambulances rejected again
08:45	Government	CrisisCenter	Decision increased safety measures for trains, airports, TEC, MIVM, Nuclear Plants, Harbors.
08:45	Government	CrisisCenter	Confirms decision shut-down of Metrosystem to M-P Cabinet Brussels
08:45	Government	OCAD	Level 4 terror alarm for whole area
08:45	Fire Department	DIR FIRE (Zaventem) Dirk Keymolen	Contacts municipality to declare municipal emergency phase
08:50	Emergency Services		Entire departure hall evacuated
08:52	Government	CrisisCentre	Decision evacuation of entire Brussels Metro System & shut-down until noon
08:54	Emergency Center Leuven	112 Dispatcher	Receives call evacuation emergency services due to danger
08:55	Fire Department		Wishes to do a departure hall sweep, but police prevents them from doing so
08:55	Fire Department	Brussels Fire Commander Tanguy du Bus du Warnaffe	Notes that the Advanced Medical Post is too small for amount of injured
08:56	Military	Guy Schotte	Receives information that it were two suicide attacks, that departure hall has been evacuated, perimeter has been installed and wounded are being taken care of
08:57	Government	Minister-President	Receives confirmation that Metrosystem must be shut-down & shuts-down metro system
09:00	Government	Federal Procureur	Confirmation explosions of terrorist attack
09:00	Military	Guy Schotte	Receives information from CrisisCentre (BZ): question where the soldiers are located & warning that they will need them

09:02	Emergency Center Leuven	112 Dispatcher	Evacuation emergency services due to danger
09:03	Military	Basis Koksijde	2 helicopters available for transport wounded
09:03	Government	Minister of Internal-Affairs	Announcement Federal Crisis Phase and activation Crisis Cell
09:04	Government	OCAD	Notification to all receives of level 4 warning sent
09:06	Police	DAO (Directie Operaties Bestuurlijke Politie)	DAO sends radiophonic broadcast through ASTRID-netwerk to 10 Federal Police Communication & Information Centres (CICs).
09:07	Police	DAO (Directie Operaties Bestuurlijke Politie)	Head DAO mails confirmation to head railway police on wrong email address (personal address)
09:08	Military	Guy Schotte	Receive update CrisisCentre (BZ): 3 bombs, 2 exploded. Request for extra troops to other airports
09:09	Military	Guy Schotte	Federal police informs military of 100 wounded, 20 dead, level 4 alarm airports and no met until 12
09:11	Terrorist	Islamic State (ISIS)	Explosion Maelbeek Metro Station
09:11	Military	Guy Schotte	Receives notification of of detachment Delta of explosion/bomb Maelbeek
09:11	Emergency Center Brussel	110 Center - Dispatcher	Receives notification of witness that an explosion occurred
09:11	Emergency Center Brussel	110 Center - Dispatcher	Sends out a double fire convoi to Maelbeek Metro Station
09:12	Public Transport	MIVB	Activates BLACK-OUT plan for metro: metro-traffic shuts down and people are evacuated
09:12	Military	Guy Schotte	First SITREP published noting that DOVO was on its way to Zaventem Airport. Province Plar
09:15	Emergency Services		Military Hospital Activated First responding begins at Maelbeek Metro Station
09:15	Medical Services	DIR MED (Maelbeek) Olivier Vermylen	Gets into contact with DIR POL and DIR FIRE
09:15	Medical Services	DIR MED (Maelbeek) Olivier Vermylen	Evacuation and assessment difficult due to various exits
09:17	Emergency Center Leuven		Evacuation emergency services due to supspicious package at Zaventem Airport (false)
09:19	Military	Guy Schotte	Massive Casualty Plan For Military Hospital activated
09:20	Fire Department	Brussels Fire Commander Tanguy du Bus du Warnaffe	Leaves for Maelbeek Station
09:23	Public Transport	MIVB	Receives decision to close Brussels Metro Station
09:24	Emergency Services	Ambulances/EHBO FIRE	Arrive at Maelbeek Station
09:26	Military	Guy Schotte	Confirmation of one explosion at Mealbeek Metro Station
09:27	Public Transport	MIVB	Closes Brussels Metro Station
09:28	Emergency Center Brussel	110 Center - Dispatcher	5 pumps that were on their way to Zaventem are requested to return and go to Maelbeek
09:30	Fire Department	Second Commander (Maelbeek) - JP Labruyere	At least 50 casualties
09:31	Police	DAO (Directie Operaties Bestuurlijke Politie)	Notes that ASTRID Network became saturated
09:31	Emergency Centre Leuven	112 Dispatcher	Evacuation emergency services due to bombcar Zaventem (false)
09:35	Emergency Centre Leuven	112 Dispatcher	MUG-services of colonne Henegouwen sent to Maelbeek
09:35	Fire Department	DIR CP OPS (Maelbeek) Tanguy du bus de Warnaffe	Arrives at Maelbeek and takes DIR CP OPS. CP OPS becomes operational
09:38	Military	Guy Schotte	Receives notification of saturation ASTRID network
09:42		CMT	Makes mobile antenne ready for immediate use to improve communication methods
09:43	Emergency Services	Fire Department/Medical Services	Consultation between DIR MED and DIR CP OPS to create 2 Advanced Medical Posts
09:50	Fire Department	Second Commander (Maelbeek) - JP Labruyere	Maelbeek Station fully evacuated
09:50	Military	Guy Schotte	Receives update of 15 dead at Maelbeek
10:00	Military	Guy Schotte	Delta states metro is closed, begins closure of train stations, question whether stranded passengers can be located to Peuti
10:00	Military	Guy Schotte	Decision made to move logistical hub to Heverlee
10:00	Government	Provincial Coordination Committee	Meeting Provinciaal Coordination commitee. Meanwhile also contact with various governments in Brussels Region
10:04		DIR FIRE (Zaventem) Dirk Keymolen	Receives notification of who DIR-CP Ops Zaventem is: Commissaris Van Vosselare
10:05	Local Government	Strategic Cel CrisisCenter	Receives notification on communication difficulties emergency services
10:09	Military	Guy Schotte	Receives order to activate 300 more soldiers
10:11	Government	CricisCentre	Confirms terrorist attack in Maelbeek Metro Station
10:14	Government	Vice Premier & Minister of Digital Agenda	Tweet Brussels Network is saturated
10:20	Media	VRT Media	Wetstraat Evacuated
10:29	Public Transport	MIVB	Evacuation Brussels North, Central & South stations
10:30	Military	Guy Schotte	First coordination meeting
10:32	Government	CrisisCenter	Announces all public transport in Brussels is down
10:35	Government	Premier Charles Miguel	Tweets to ask people to stay inside
11:15	Public Transport	Buses	Evacuate people outside of Zaventem
11:16	Charity	Red Cross	Opens up website Iamsafe.be
11:19	Defense	Land Forces	225 army personell guard Brussels
12:00	Public Transport	MIVB	STIB-MIVB tweets that buses, trams and metros have been shut down
12:21	Emergency Center Leuven	112 Dispatch	Evacuation emergency responders departure hall Zaventem on request police
12:30	Fire Department	DIR CP OPS (Maelbeek) Tanguy du bus de Warnaffe	Discipline 1 + 2 no longer needed. Consultation with DIR POL Maelbeek: CP OPS ended
13:00	Fire Department	DIR CP OPS (Maelbeek) Tanguy du bus de Warnaffe	Announced end CP OPS and closure Advanced Medical Posts
13:00	Government	CrisisCenter	Recommendations to citizens: First time declaration level 4 danger: first time terrorist attac named
13:21	Police	DOVO	Package found by DOVO
13:36	Media	VRT Media	34 Dead, 136 wounded
14:15	Emergency Center Leuven	112 Dispatch	Receives call from DIR MED of controlled explosion Zaventem Airport by DOVO
14:40	Media	VRT Media	All wounded evacuated to hospitals
14:46	Government	Mayor Brussel	Press Conference: 106 wounded, 17 severely injured
14:56	Medical Services	DIR MED (Maelbeek) Olivier Vermylen	Informs Emergency Center Leuven that medical intervention plan has ended
15:00	Government	Minister of Mobility - Jacqueline Galant	Announcement Trainstations South, Centrail and North open at 16:00 - Safety guaranteed
15:30	Police	Police Voorkempen	Picture with suspect online: search for male in white jacket
15:37	Media	VRT media	Car for deceased to pick up deceased Zaventem
16:00	Government	Minister of Mobility - Jacqueline Galant	Large train stations in Brussels open: Brussel-South, Central and North. Airport remains clo
16:53	Media	VRT media	Civilians do not have to stay inside anymore according to media
17:12	Media	VRT media	Everyone in stations is bodychecked
17:22	Overheid	Governor Lodewijk de Witte	Governor confirms 1 bomb did not explode in Zaventem Airport
18:04	Overheid	Municipality Zaventem	1300 stranded travelers taken care of in Sporthal Zaventem
19:11	Police	Police Brussel	HouseSearch Schaarbeek (Nailbomb and IS flag found)
19:46	Police	Police Brussel	Large police action in Schaarbeek
01:07	Police	Police Brussel	2 other nailbombs found through taxi driver because baggage had to be left home

Appendix B: Timeline Manchester Bombing

Time	Actor group	Name	Event
22:31	Terrorist	Salman Ramadan Abedi	Suicide bomb explodes in the foyer area of the Manchester Arena
22:31	Police	BTP	Four officers stationed at Victoria Station rush towards the scene.
22:31	Police	BTP	Officers working at the office nearby heard the explosion and rushed toward the scene
22:31	Police	BTP	Report from BTP officer at the scene mentions wounds of "bolts and nails"
22:32	Police	BTP	BTP and members of the public provide first aid
22:32	Police	BTP Sergeant: Kyle Gordon	Takes command of the emergency response coordination at the scene
22:32	Medical Services	NWAS	NWAS receives calls on possible explosion
22:33	Police	GMP Force Control Room	GMP is alerted of possible explosion: Log created and sent to FDO
22:33	Police	GMP: Force Duty Officer	Not clear of type of incident, but alerts GMP Armed Response Vehicles to go to Arena
22:35	Fire Department	North West Fire Control Room	Notified by GMP Force Control Room operator on explosation during an unrelated conversation
22:35	Fire Department	North West Fire Control Room	Activates ACTION plan for EXPLOSION, Activates ACTION plan for BOMB
22:35	Fire Department	GMFRS	GMFRS received no calls from partner agencies at the scene
22:37	Medical Services	NWAS	Resources were deployed and contact made with GMP and GMFRS
22:39	Police	BTP Sergeant: Kyle Gordon	METHANE report to BTP control room
22:39	Police	BTP Sergeant: Kyle Gordon	Major incident is declared with 60 plus casualties
22:40	Fire Department	North West Fire Control Room	National Inter-Agency Liaison Officer notified of explosion + designated GMP rendezvous point
22:40	Fire Department	Duty National Inter-Agency Liasor	Suspects escalating Marauding Terrorist Firearms Attack: Designates GMFRS rendezvous point
22:40	Fire Department	GMFRS	4 Pumps leave to relocate from Manchester Fire Station to GMFRS Rendezvous point
22:40	Fire Department	Duty Natonal Inter-Agency Liason	Wishes to increase situational awareness: cannot get through to FDO to confirm danger
22:40	Fire Department	North West Fire Control Room	999 call came in and activated automated pre-alert
22:41	Police	GMP	Armed response vehicle arrives at the scene
22:41	Fire Department	North West Fire Control Room	Messages Duty National Inter-Agency Liaison Officer on possible gunshots wounds and active shooter
22:42	Fire Department	North West Fire Control Room	GMP advised that the gunshot wounds were in fact shrapnel wounds, update was sent to Duty Group Manager but not sent to the National Inter-Agency Liaison Officer
22:42	Medical Services	Advanced Paramedic: Paddy Ennis	First paramedics arrive at the scene, casualty management taken over from BTP
22:43	Police	GMP	First armed police arrive, GMP take over control from BTP
22:43	Police	GMP	GMP inspector takes command from BTP sergeant: becomes GMP Bronze (Operational Firearms Commander)
22:43	Police	GMP Bronze	GMP inspector remained in the foyer in order to obtain situational awareness
22:44	Police	GMP Bronze	Provides First Situational report to FDO mentioning gunshot wounds
22:44	Medical Services	NWAS Advanced Paramedic: Padd	METHANE report to NWAS control room
22:45	Fire Department	GMFRS	Pre-alert expired and local units were to stand down
22:46	Medical Services	NWAS Advanced Paramedic: Padd	Major incident is declared
22:46	Medical Services	NWAS Silver Trained Manager	Arrives + Enters the concourse, conducts assessment
22:46	Medical Services	NWAS Silver & NWAS Advanced P	Consideration of Immediate Action Casualty Management Plan
22:46	Medical Services	NWAS Silver & NWAS Advanced P	Adv. Paramedic: conducts triage. Silver: Becomes NWAS bronze + sets up Casualty Clearing Station
22:46	Medical Services	NWAS Hazardous Area Response	Briefed by NWAS Bronze: Foyer not safe. 2 unproteced technicians assist Advanced Paramedic in casualty triage
22:46	Medical Services	NWAS	Other ambulances are redirected toward NWAS rendezvous point
22:46	Police	GMP	Road closures start
22:46	Police	GMP Bronze	GMP Bronze perceived that the coordination of parties at the scene went well and additional resources were not needed (e.g. GMFRS)
22:46	Medical Services	NWAS/BTP/Public	Casualties are evacuated by using improvised stretchers as stretchers were not available
22:47	Police	GMP	Starts treating the response as a possible terrorist incident
22:47	Police	GMP FDO	FDO declares operation PLATO due to risk of marauding firearm terrorist attack
22:47	Police	GMP FDO	Military and special police units are notified on PLATO, NWAS and GMFRS are not
22:47	Police	GMP FDO	Force Command Module activated at GMP Headquarters
22:47	Police	GMP FDO	Initiates mutual aid arrangements with neighboring police and military
22:48	Police	GMP FDO	FDO uses discretion to deviate from protocol: No evacuation of emergency services
22:48	Fire Department	Duty National Inter-Agency Liasor	Contacts NWFC that he cannot get through to FDO
22:48	Fire Department	North West Fire Control Room	Informs NIALO that there are reports of an active shooter
22:48	Fire Department	Duty National Inter-Agency Liasor	Informs NWFC that he has mobilised the GMFRS Special Rescue Teams to GMFRS rendezvous point
22:49	Medical Services	NWAS	Twelve ambulances arrive at the scene
22:55	Police	GMP	Urges people to stay away from the incident
22:58	Medical Services	NWAS	Movement of injured from foyer towards Victoria Station commences
23:10	Police	GMP	Lockdown of Picadilly Train Station (expectation further attack may be imminent)
23:20	Medical Services	NWAS	NWAS Gold Trained Manager arrives, takes over casualty station & NWAS bronze
23:20	Medical Services	NWAS	NWAS Gold Trained Manager does not have to engage Tactical Coordinating Group
23:23	Police	GMP	Ground Assigned Tactical Firearms Commander (TFC) arrives
23:23	Police	GMP TFC	Takes control of Picadilli Train Station + Arena
23:23	Police	GMP TFC	Perceives that there is no hot zone, yet risk is still present: warm zone: PLATO resources required
23:23	Police	GMP TFC	Uses armed police to search the Arena
23:23	Emergency Servic	GMP/NWAS	From this time onwards, JESIP 'scrums' between NWAS and GMP were held and led by TFC
23:30	Fire Department	GMFRS	Command Support Room fully operational

23:30	Fire Department	GMFRS	Command Support Room fully operational
23:35	Police	GMP	False alarm: Potential Active Shooter and suspect package left behind at Manchester Cathedral (treated as potential terrorist attack)
23:40	Fire Department	GMFRS	Two further Liaison Officers were called in and the three rendezvoused at Philips Park
23:40	Fire Department	GMFRS	Inter-agency radio was quiet at this time
23:49	Fire Department	Chief Fire Officer: Peter O Reilly	Arrives at Fire Command Support Room
23:53	Fire Department	GMFRS	Most Senior Liaison Officers appointed himself as the officer in charge
23:53	Fire Department	GMFRS	Officer in Charge & Chief Fire Officer converse on phone for first time
23:58	Fire Department	GMFRS	The Pumps, NIALOS, Special Response teams relocate to Manchester Fire Station
00:04	Fire Department	GMFRS	GMFRS assets arrive at Manchester Fire Station where they met NWAS personnel going to and from the scene
00:04	Fire Department	Self Deployed Duty NIALO	Arrives at GMP Force Command Module
00:12	Fire Department	GMFRS	The Chief Fire Officer telephoned a NWAS bronze officer about the assistance fire could give
00:15	Fire Department	Self Deployed Duty NIALO	Overheard a conversation about declaration of operation PLATO
00:15	Police	TFC	Takes full control of firearms operation
00:15	Emergency Servic	NWAS/GMP	First shared risk assessment was undertaken during one of the many "scrums"
00:15	Emergency Servic	NWAS/GMP	TFC and bronze NWAS commander agreed on "PLATO on standby"
00:18	Police	GMP	False alarm: Suspicious package at North Manchester General Hospital
00:18	Medical Services	NWAS Gold Commander @ FCM	Asks GMP Silver for Operation PLATO status & hears of Standby Status for FIRST time
00:27	Fire Department	GMFRS	Three fire engines and the Duty NIALO made their way towards the scene after request from the conversation with the NWAS bronze
00:37	Fire Department	GMFRS	First three fire engines arrive at the scene and started to assist NWAS with casualty movement
00:39	Police	GMP	Royal Oldham Hospital in lock down (False Alarm)
00:59	Emergency Servic	Emergency Services	First inter-agency meeting where all agencies were present
01:30	Police/Military	Military Explosive Ordenance Dis	Potential further explosive device at Mitre Hotel on Cathedral Gates
01:35	Military	Military Explosive Ordenance Dis	Disrupt potential further explosive device
02:30	Local Governmen	Manchester City Council	Reception Centre at Etihad Stadium opened
02:46	Medical Services	NWAS	All injured transported to the hospital
03:08	Fire Department	GMFRS	Fire crews stood down
04:15	Emergency Servic	Emergency Services	Strategic Multi-Agency meeting at GMP Force Headquarters
08:30	Emergency Servic	Emergency Services	First meeting of the Coroners, GMP Senior Identification Manager and the Deputy Senior Identification Manager

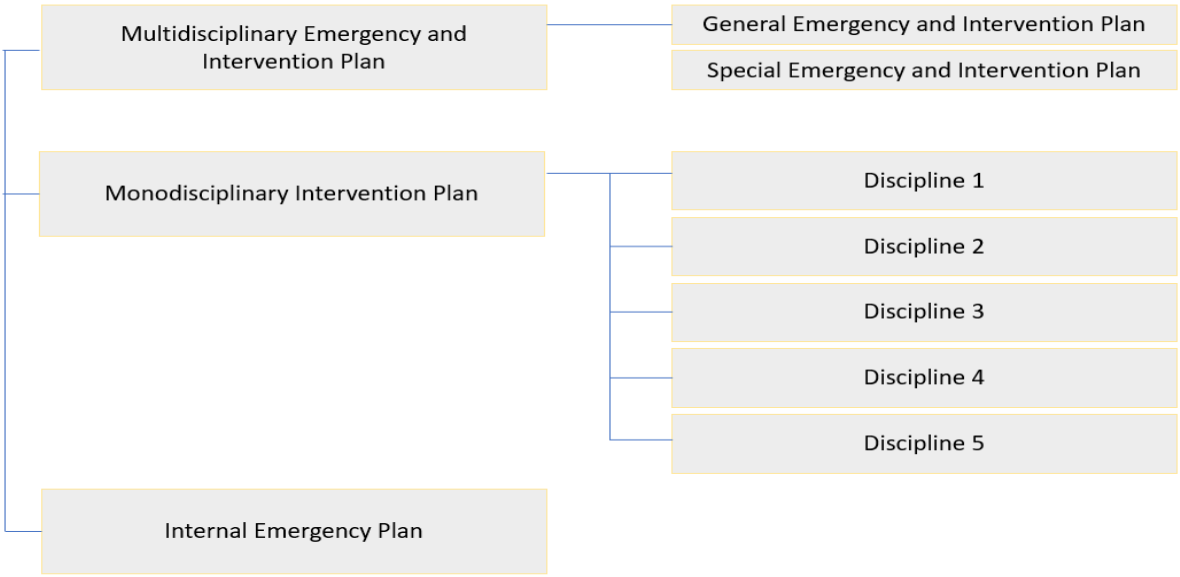
Appendix C: Emergency Planning & Crisis Management Plans: Belgium

Royal Resolution of 16 February 2016

The Royal Resolution of 16 February 2006 regarding emergency and intervention planning, and the Ministerial Letters NPU-1, NPU-2, NPU-3, NPU-4 and NPU-5 that follow from it, regulate the organization of emergency response organizations in case of a disaster in Belgium (Koninklijk besluit betreffende de nood- en interventieplannen, 2006). Below, a brief selection of the most important aspects of emergency responding required to understand this thesis are included and explained.

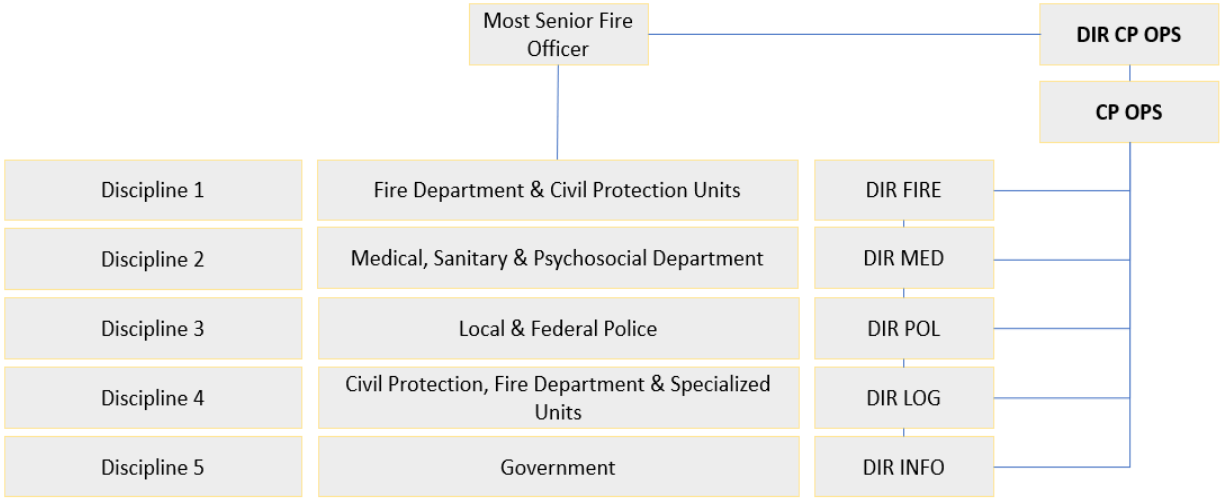
Emergency Plans

Belgium has three types of emergency plan. Firstly, there is the multidisciplinary emergency and intervention plan. The multidisciplinary emergency and intervention plan is divided in the General Emergency and Intervention Plan (ANIP), and the Special Emergency and Intervention Plan (BNIP). While the ANIP holds general directives and information to ensure the coordination of emergency situations (e.g. Provincial Emergency and Intervention Plan), the BNIP supplements the ANIP in case of a specific risk (e.g. Airport or Metro Station Plan). Secondly, there is the monodisciplinary intervention plan. The Monodisciplinary Intervention Plan arranges the intervention modalities of one discipline, in accordance to the Multidisciplinary Emergency and Intervention Plan (e.g. Medical Intervention Plan). Lastly, internal plans exist. This is a document for internal use which focuses on reducing the harmful effects of an emergency situation by developing material and organizational emergency measures which were prepared by the company or institution concerned (Federale Overheidsdienst Binnenlandse zaken, n.d.). Below, a visual representation of the above described plans is portrayed.



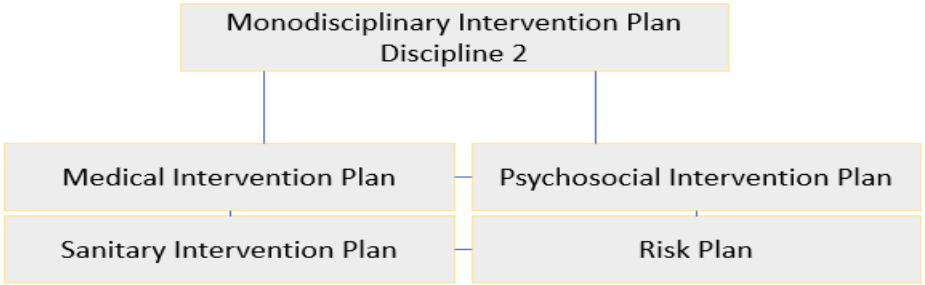
Operational coordination and disciplines

The emergency response organization of Belgium consists of five disciplines that are concerned with disaster emergency operations. Within each discipline, operational coordination lies with the designated director (or commander). In case multidisciplinary coordination is required, a CP OPS (central operational command post) is created which consists of at least the five directors from the different disciplines. The DIR CP OPS is in charge of interorganizational coordination and this position is exercised by the most senior fire officer present at the place of intervention. However, this position may be practiced by another officer in charge of a different discipline, in case that discipline is deemed more suitable (Federale Overheidsdienst Binnenlandse zaken, n.d.). Below this structure is portrayed.



The Monodisciplinary Intervention Plan of Discipline 2

The monodisciplinary intervention plan of discipline 2 consists of four components: the Medical Intervention Plan, the Psychosocial Intervention Plan, the Sanitary Intervention Plan and the Risk Plan Noodplanning en rampenhulpverlening, n..d.). Below this is visually portrayed.



The next section zooms in on the most essential elements of the Medical Intervention Plan.

Medical Intervention Plan (MIP)

The aim of the Medical Intervention Plan is to ensure optimization of available human and material resources in case of a disaster. The Emergency Center or the medical dispatching can formally declare the MIP, but it can also be automatically be activated in case of a large amount of injured. In addition, the first emergency services present (discipline 1,2,3), the DIR-MED or his adjunct, and the Federal Health Inspector can request the MIP (Noodplanning en rampenhulpverlening, n.d.).

Requirements of medical intervention plan and alarming

As portrayed below, there are three phases of medical intervention plan, based on severity of the situation. Below, the requirements for the declaration of the first phase of the medical intervention plan is portrayed. Moreover, it indicates which resources and how many have to be alarmed.

Level	Requirements	Alarming of Resources
Medical Intervention Plan	- 5 severely injured and/or - 10 wounded of which the severity of the injuries is unknown and/or - More than 20 people in potential danger	- Federal Health Inspector and adjunct - Dir-MED and adjunct - Psychosocial Manager - 3 MUG - 5 ambulances - Quickly Usable Resources

Upscaling of resources

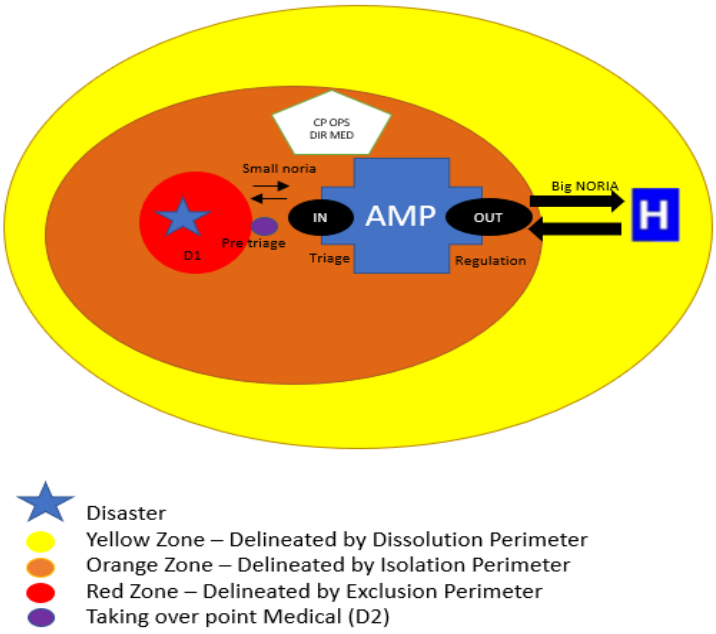
Upscaling through the extended medical intervention plan and MAXI-MIP is possible, but only in case the requirements below are met.

Level	Requirements	Alarming of Resources
Extended Medical Intervention Plan	- 20 severely injured and/or - 40 wounded of which the severity of the injuries is unknown	- Federal Health Inspector and adjunct - Dir-MED and adjunct - Psychosocial Manager - 10 MUG - 20 ambulances & Red Cross - Quickly Usable Resources
Maxi-Medical Intervention Plan	- 50 severely injured and/or - 100 wounded of which the severity of the injuries is unknown	Federal Health Inspector and adjunct - Dir-MED and adjunct - Psychosocial Manager - 20 MUG - 40 ambulances & Red Cross - Quickly Usable Resources

Moreover, upscaling is possible upon request of the first MUG doctor on scene, on instruction of the medical commander or federal health inspector or on request of the coordination and crisis center of the government. Important to know however, is that the MAXI-MIP was not formally existent yet during the terrorist attacks of 22 March, 2016. However, medical services had already been practicing with this plan. Important to note as well is that resources are not instantly pooled to the incident. Rather, the second wave of resources from neighboring regions will be positioned at collection points next to important ways and offered in a dosed way. That is, when the MAXI-MIP is declared, there will be rendezvous points to which all ambulances go, after which they are deployed to the scene in an orderly matter (Noodplanning en rampenhulpverlening, n..d.).

Ensuring security

On the disaster scene, the area will always be distributed in three zones, the red zone, orange zone and yellow zone to ensure security. Below this is visualized.



The red zone is the danger zone, in which the incident occurred. The exclusion perimeter delineates the red zone. The danger zone is only accessible for the emergency services, specialists and technicians in case of permission of the field commander. The orange zone is delineated with the isolation perimeter. In this zone, the logistic support of emergency services is organized. This zone is accessible for emergency services and residents. The yellow zone, is delineated with the dissolution perimeter. This is the zone in which necessary measures are taken to ensure entrance of emergency services and to ensure a brief running of

emergency actions. The yellow zone is accessible for everyone. However, it is not recommended to be present in this zone, unless it is absolutely necessary (Noodplanning en rampenhulpverlening, n..d.).

Organization medical care discipline 2

Upon arrival of the injured people in the orange zone, Discipline 2 (medical department) will conduct a pre-triage in which the injured are quickly medically evaluated, and categorized based on severity of injuries. This is achieved by providing them with red, yellow or black labels. Hereafter, the injured person will be transported to the advanced medical post where another round of triage occurs. Patients are then stabilized, categorized and registered. Upon entry, the injured are divided in T1 (immediate medical treatment required, surgery within <6 hours, T2 (medical treatment can be delayed, surgery within 6>18 hours, and T3 (medical treatment can be delayed or is not urgent, surgery after 18> hours) and stabilized before they will be transported to hospitals in the region (Noodplanning en rampenhulpverlening, n..d.).

Designation of Advanced Medical Post

The advanced medical post must be placed in the orange zone, in an existing building that is divided in zones, in tents using different zones, or in an open room. It must be a safe place, and its designation is a multidisciplinary decision. It must be easily accessible and extendable in case of lack of capacity (Noodplanning en rampenhulpverlening, n..d.).

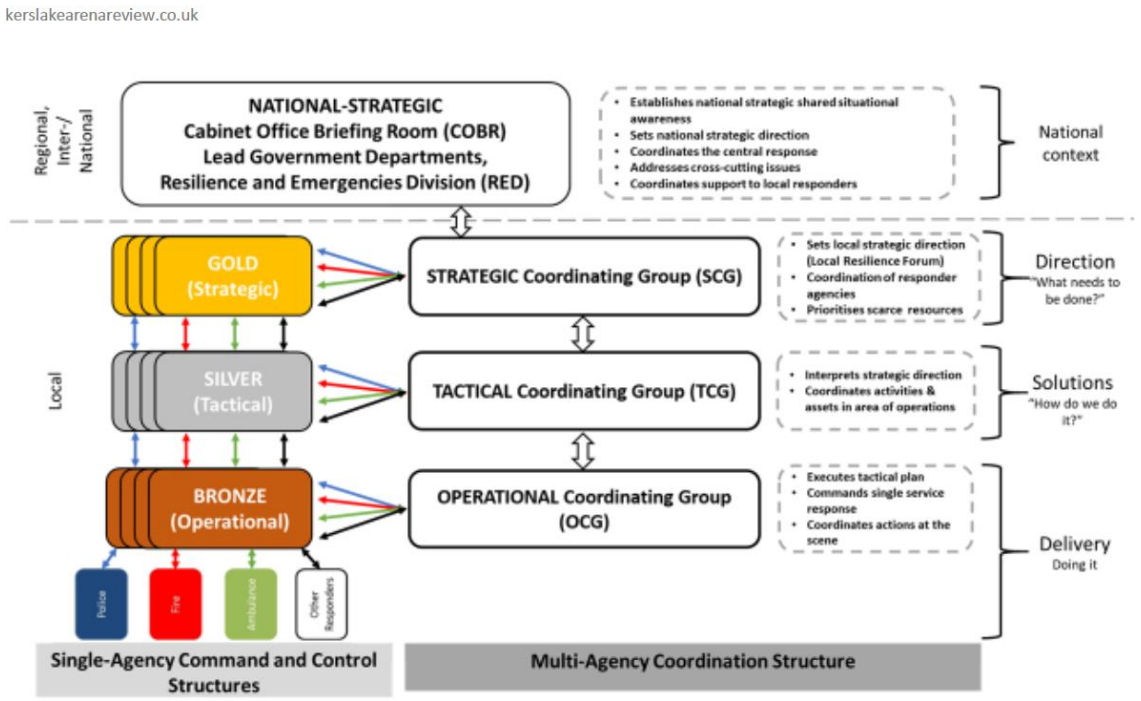
Appendix D: Emergency Planning & Crisis Management Plans: United Kingdom

Civil Contingencies Act 2004

The Civil Contingencies Act 2004 regulates emergency planning within the United Kingdom. It designates three categories of responders: Category 1: the police department, Category 2: the fire department, and Category 3: the medical department. Through the Greater Manchester Resilience Forum, these categories interact with each other, as the Civil Contingencies Act requires the involved organizations to collaborate through means of information sharing, risk assessments, emergency planning, communication and business continuity.

Operational Coordination

Operational Coordination is reached through a three tier system. Below a visual representation is provided of the organization of disaster management.



In case of a mono organizational response, a three tier system applies in which commanders take upon the role of either Gold (strategic), Silver (tactical) or Bronze (operational). In case a multidisciplinary response to a disaster is required, the Silver and Gold managers will report to the Strategic and Tactical Group, located in the Force Command Module at the Manchester Police headquarters. Bronze managers will report to the operational coordination group which is located at the Manchester Police force control room and which is overseen by the FDO, who takes on the position of incident commander (Kerslake, 2018).

In addition to this framework, Manchester Police and Ambulance Services also have their own control rooms. Manchester Police uses the Force Control Room, and the Ambulance Services work through their Emergency Operation Centers. Manchester Fire Services does not have a control room itself, but collaborates with North West Fire Control, a public sector company (Kerslake, 2018).

Lastly, the different disciplines can initiate separate command and control facilities to assist in the emergency response operation. For the Ambulance Services, this is the regional operations coordination center, and for Manchester Fire Services it is the Command Support Room. These facilities must often be set up ad hoc as they do not operate on a 24/7 basis (Kerslake, 2018).

Joint Emergency Services Interoperability Principles

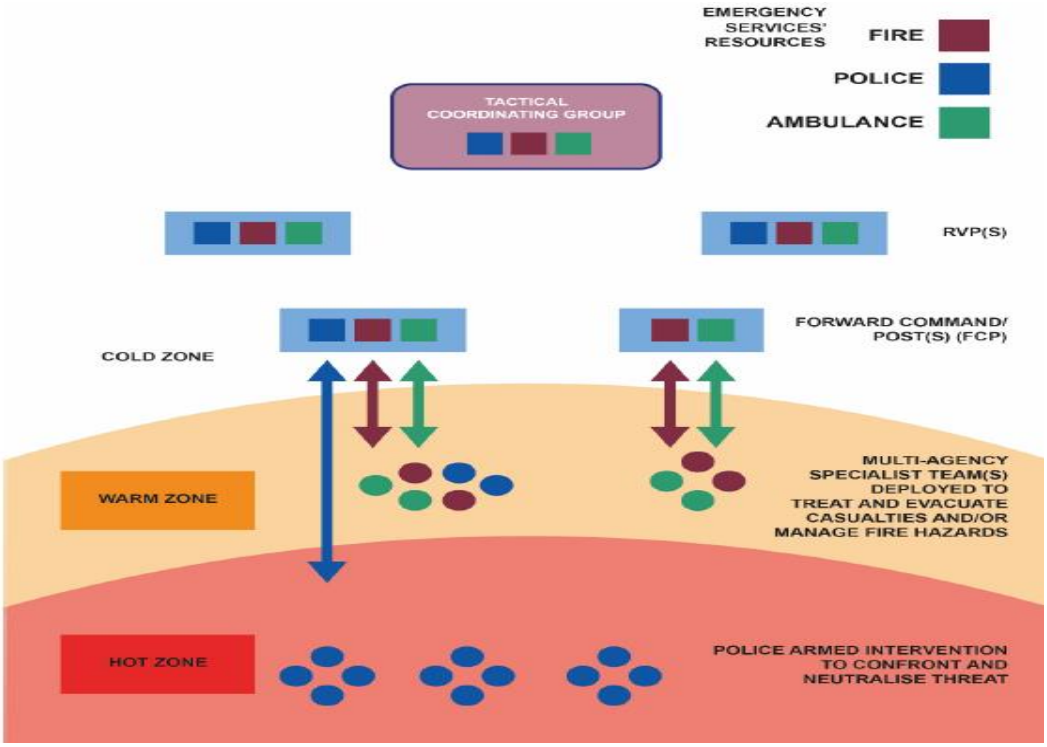
Because of the increasing threat of terrorism, the United Kingdom has introduced Joint Emergency Services Interoperability Principles (JESIP) to improve interorganizational coordination and collaboration processes. The JESIP Interoperability framework was introduced in 2013, and is based on five principles: Coordination, Communication, Shared Situational Awareness, Joint Understanding of risk and co-location. Through engagement of the tactical and strategic coordination groups at the Force Command Module, these principles must be encouraged. Moreover, through the organization of on-scene scrums, multi-agency briefings can be held to ensure operational coordination (Kerslake, 2018).

The JESIP principle of joint understanding of risk is conducted through a predetermined risk procedure that all agencies use, involving a five step process. Similarly, the JESIP principle of shared situational awareness is reached through the use of the METHANE framework, which obliges the organizations to communicate with one and another regularly through a METHANE message (see below) (Kerslake, 2018).

M - Major Incident declared?
E - Exact location
T - Type of incident
H - Hazards present or suspected
A - Access - routes that are safe to use
N - Number, type, severity of casualties
E - Emergency services present and those required

JESIP during terrorist attacks

One of the most important elements of the JESIP Interoperability framework is its focus on a Marauding Terrorist Firearms Attack. When a no notice Marauding Terrorist Firearms Attack is suspected or is occurring in real time, the Operation PLATO contingency for a marauding firearms attack must be declared. This will result in the area being separated in three zones: the hot, warm and cold zone. Firstly, the hot zone is the area where terrorist activity is still ongoing. Only suitable trained and equipped police firearms officers may enter the scene to neutralize the terrorist. In the warm zone, there is no active terrorist activity, but it is still not safe to enter. Non-police responders may enter the scene if they wear protective clothing to extinguish fire and evacuate the injured. Discretion is allowed in the warm zone, not the hot zone. The cold zone is the zone in which terrorist activity has ended and in which non-specialist responders may also assist. Below, a visual representation of the respective zones is portrayed (Kerslake, 2018).



The Joint Operating Protocols also prescribe that in case Operation PLATO is declared, the emergency response organizations must be informed of this declaration. Similarly, they must be informed of the establishment of the tactical and strategic coordinating groups in the Force Command Module (Kerslake, 2018).