Emergency Notification Systems and Their Use in an International Airport

Tammi L. Zufall

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Emergency Notification Systems and Their Use in an International Airport

A Master Thesis

Submitted to the Faculty

of

American Public University

by

Tammi Zufall

In Partial Fulfillment of the

Requirements for the Degree

of

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DEDICATION

I dedicate this thesis to my parents who taught me the importance of getting a college education from an early age. Their constant guidance and encouragement throughout my life has helped me to get to this place. I am thankful for the lessons in hard work and discipline as well as being shown that anything is possible if you are willing to fight for it. Neither of my parents were able to complete their own degrees. I dedicate mine to them, as they were there with me every step of the way on my journey.
ACKNOWLEDGEMENTS

I have had many amazing mentors throughout my educational life, from elementary school through my college years. If it weren’t for these people taking the time to acknowledge me, my strengths and weaknesses, I might not have made it this far in my degree path.

I would also like to take the time to thank my family. They have suffered through many late night study sessions, helped me study for exams and edited my many papers over the years. So Bryan, Chris, Kirsten and Lauren I love you and appreciate all that you have done to help me get to this point. I know that without your support I would not have made it to this point in my educational journey.
ABSTRACT OF THE THESIS

EMERGENCY NOTIFICATION SYSTEMS AND THEIR USE IN AN INTERNATIONAL AIRPORT

By

Tammi Zufall

American Public University System, August 14, 2016

Charles Town, West Virginia

Professor Deborah Laufersweiler-Dwyer, PhD, Thesis Professor

This research examines the different emergency notification systems at use in an international airport. For this research project the airport examined is the Seattle-Tacoma International airport in Seattle, Washington. The current systems used are examined for their intent and actual usage, to determine if they are effective or can be improved upon. The question asked is just that, can the current emergency notification systems in place be improved upon or is there a need for a change to a different system. The number of varied populations who access an international airport at any time require a unique set of systems to be effective in an emergency. The needs in this atmosphere will be evidenced by the case study included in this research, involving a shooting at Los Angeles International Airport in 2013. Research will be conducted using published materials as well as interviews with those that use the current emergency notification systems a Sea-Tac. This information will be evaluated and then compared with the established needs for an international airport in any number of emergency situations, with the added concern for privacy laws and security issues that might pertain to those involved.
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Emergency Notification Systems and Their Use in an International Airport

The goal of this research is to examine the many different emergency notifications systems available for use in an International Airport, in this case the Seattle–Tacoma International Airport, to determine their effectiveness. Another component of this research will be to look at the possibilities of revision or replacement of the current systems, if determined necessary, to make the overall system more efficient.

Statement of the Problem

An international airport is a unique atmosphere made up of many different groups of people. These groups of people could include public safety and fire department personnel, bag handlers and flight attendants, as well as restaurant employees and of course passengers. Because of the extreme variations in the groups of people accessing the airport at any given hour of the day 365 days of the year, the need for effective, adaptive communication in an emergency situation becomes critical. Getting out pertinent emergency information to a police officer should be handled differently than it would be to a cashier at the coffee shop or grandma traveling from Omaha to visit the grandkids.

Many of the current emergency notification systems in the Sea-Tac international airport are geared to assist one or two specific populations. These systems can be used by various departments at the airport for different situations. Many times this accessibility by multiple users can lead to redundant or misinformation at many levels, which is not only inefficient but could be life threatening in certain situations.

The many different types of emergencies that can occur at an international airport make the need for an adaptable notification system even more crucial. When they hear about an emergency at an airport most people immediately think of a plane crash or some kind of
emergency landing situation. Along with aircraft emergencies, in today’s world the next thought might be some sort of terrorist activity. These activities could range from explosive devices and chemical or biological warfare, to actual active shooter situations. One of these situations, an active shooter at a Los Angeles airport, will be discussed in this research as an example of the further need for more effective emergency notification systems. There are other emergencies that could happen at an airport as well including earthquakes or floods, fires, fuel spills, environmental hazards, large snow storms etc. These different emergencies would be handled in a prescribed manner, determined by airport policy or state or federal laws. The emergency notification for each scenario could be different, in the method used for the notification as well as the groups that might need to be notified and what information each particular group might need.

**Purpose of the Study**

The purpose behind this research is determine if the emergency notification systems at facilities like Sea-Tac International Airport can be improved. Whether this means enhancing the current system, or the possibility of the need to look into a whole new system, will be determined and/or recommended by the research. Any findings might also then be applied to other large multiuse facilities such as university campuses or large governmental complexes.

**Research Method**

The research for this study will be completed using information acquired in different manners, much of the research will be completed using training and procedural manuals already in existence at the Port of Seattle. There will also be interviews conducted with employees at the Port of Seattle who use the current emergency notification systems. This interview process and survey instrument has been approved by the I.R.B. There will also be information obtained by
various authors and periodicals who work in or study the field of emergency notification systems, particularly in airports and similar facilities.

**Literature Review**

This literature review will be divided into four separate sections. Each of the four sections will reference the area of concern covered by the research that is described in this paper. The first area addressed will be in relation to a case study used for this document. The second area to be addressed will be a review of the literature that covers the current practices concerning emergency notification and response in large multiuse facilities, such as an international airport. The next section will address the review of research that supports the need for change in these types of facilities. Finally, the last section will cover research that is concerned with the different and new areas that are available in today’s world to help with making emergency notification systems more efficient and effective.

**Subject of Case Study**

The Case Study referenced in this document is one that occurred in November of 2013 at Los Angeles International Airport in Los Angeles, California. The study involved an attack at a security checkpoint located in the airport by a subject with a large number of weapons. The case study examines what happened that day and how things might have turned out differently with a different emergency notification system in place (Botehlo & Martinez, 2013).

**Current Practices**

An emergency is defined by Merriam-Webster dictionary as “a serious, unexpected, and often dangerous situation requiring immediate action” (Merriam Webster, 2016). This definition accurately describes emergency situations and disaster management in general. Many publications referencing homeland security agree that in a crisis effective communication can
mean the difference between a successful and a disastrous outcome (Homeland Security News, 2014).

All airports are subject to a variety of emergencies that could happen at any time. The emergencies can take many different forms and can occur with little or no warning. Because of this possibility all airports, no matter what their size, are required to design and maintain an airport emergency plan for their facility. This plan is meant to include an emergency plan, or framework, covering procedures needed for an effective emergency response for many of the possible scenarios that might occur. The FAA Airport Emergency Plan was written as a guideline for airports, to assist them in building their own plan while still adhering to strict federal regulations. The FAA requires individual airport emergency plans to cover instructions for everything from earthquakes, power outages and fires to bombs, hazardous materials, terrorist activities and actual airplane crashes (U.S. DOT, 2010, p. 2). Even though each of these scenarios have different requirements, many of the same basic emergency procedures can be implemented at the onset of the emergency. The idea behind the airport emergency plan is to give those that work at the individual airports a plan to rely on immediately at the onset of an emergency. Once the plan has been initiated it can be modified and expanded to include the particulars of any specific scenario.

The Seattle –Tacoma International Airport Plan is the emergency plan created by the Emergency Management Division of the Port of Seattle (2011). This plan defines the emergency procedures expected to be performed in the event of an emergency at the airport terminal or the immediate surrounding properties also owned by the Port of Seattle. This plan covers the basic procedures to be followed by various entities, including but not limited to police, fire, and emergency medical personnel as well as airport duty managers and emergency management
professionals. While this plan covers the basic emergency notifications systems to be used it is not extensive enough to cover all of the possible systems that might be accessed by various users. A revision of this current plan to include new and improved forms of emergency notifications could help tremendously to provide a more effective, efficient service to employees as well as the public who utilize the airport.

Airports follow many of the same procedures for emergency management in critical situations that are used for other facilities and situations. However, airports are different in the fact that they have a large, diverse customer base that they must be able to reach quickly in an emergency situation. This base includes public safety and fire personnel, airport management, airline employees, vendors and passengers just to name a few. Because of these diverse populations an airport needs to have access to various types of communication to reach people in an emergency. An airport is also unique in the varied types of emergency situations that can occur there at any given time. Anything from a fire or hazmat situation, to a terrorist attack, plane crash or even a quarantine situation can happen at any moment. Because these situations may have different groups to be notified, as well as different levels of notification in general, the airport needs to have a flexible, multi layered notification system. In their book about airport operations and emergency management, Price and Forrest discuss the need for a different, adaptable notification system while still maintaining a fairly structured general emergency plan. The goal being to make the transition from normal airport operations to emergency operations and then back again as quickly and efficiently as possible (Price & Forrest, 2016, p. 390).

The Need for Change

The number of passengers coming through international airports is growing every year. At Seattle- Tacoma International airport passenger traffic went up by 13.4 percent in
2015 (Garnick, 2015). To help accommodate the increase in passengers, airport themselves are growing as well. With this growth comes more employees and vendors to meet the needs of the travelers. Of course an increase in people served, as well as airport size, means an increase for the possibility of emergency situations occurring. With the large number of people who could possibly be affected and the variety of different types of emergencies that could occur, there is the need for a multilayered, easily adaptable notification system. In the publication Design Challenges for Integrated Disaster Management Communication and Information Systems, the authors emphasize the need for current information to be delivered quickly requiring the use of both internal and external communication systems coordination (Meissner, Luckenbach, Risse, Kirste and Kirchner, 2002). These requirements are held to be especially true when the population being served by the notifications system is diverse. In an airport setting there will be public safety and fire personnel, airport employees, vendors and their employees as well as passengers and the family members who are dropping them off or picking them up. Some of these people will have training for emergency situations, but many will not. There may also be language and cultural barriers, as well as people with various disabilities or special need. These reasons, referenced by John Linstrom in his publication about secure crisis communication in airports, just emphasize the need for a multi-tiered system. The airports’ need to notify certain populations at specific times can change with each situation. With a centrally located system that would allow for the users to pick and choose the mode and populations notified, each situation could be dealt with on an individual basis (Linstrom, 2016).

This type of adaptable system is especially needed in an airport setting, due to the rather unique combination of governmental as well as private organizations that exist there. Oded Shekel addresses this need in his article about the importance of emergency collaboration. This
collaboration is necessary between public safety agencies, but also between the varying entities involved in an emergency, no matter who they are (Shekel, 2016). Sometimes the best way to gauge the success of a response to an emergency situation is to take a look at how things unfolded before, during and after an emergency occurred. FEMA advises in their publications on the field of emergency management, that the mitigation phase can be the best time to learn about what worked and didn’t work in any given emergency situation. An emergency response can be improved by adjusting a response style or the type of equipment or other resource that might have been lacking previously (FEMA, 2016).

As with all emergencies, no matter what or where they are, the goal is to get help as quickly and safely as possible to those involved. In their publication Fragkiadakis, Askoxylakis, Tragos & Verikoukis emphasize the need for interoperable, multi-operator communication networks in emergency situations. Again this research addresses the need for a notification or communication system that can be adapted to whatever emergency situation might be occurring at any time. An example could be an active shooter situation where people need to be advised to leave the area immediately depending on details, or to shelter in place for safety if the situation dictates that action. Situations like this one are a perfect example of how one situation can require two different types of emergency notification depending on the information given.

The majority of the literature accessed for this section of the research supports the need for a change in the current emergency notification systems in the airport communities. The need for an at will, very adaptable system is obvious and necessary to improve the current responses. With the possibility of ever changing emergency scenarios and the growing, daily influx of passengers and employees in an airport setting the need is immediate and critical to ensure the safety of those involved.
New and Improved Emergency Notifications

In his essay about leveraging emergency notification alerts, Leiva (2014) argues about the importance of creating a new emergency alert system or in the least changing the current one. He emphasizes the need for this new system as a critical component in assisting law enforcement and emergency managers in the ability to do their jobs effectively (Leiva, 2014).

With all of the current technology available there is no reason that the current systems can’t be updated to be more effective overall. The Oklahoma Public Safety Network publication about emergency communications states, “The inability to relay incident scene information directly can jeopardize lives” (2016). This statement holds true for any emergency scene anywhere, regardless of the size or scope.

One way to address the unique emergency notification needs at an airport would be to build their own individual Emergency Notification System (ENS). This system would be built using the specific needs of the airport and its customers. Similar systems are being used today, in the case of University campuses as an example. Tailor made ENS systems, like the one in use at Virginia Tech at the time of the on campus shooting in 2007, allow use of many different modes of communication to be effective (Educause, 2010). These systems can combine traditional notifications systems with text to speech functions, emails, social networking sites, campus websites and Twitter just to name a few. These types of ENS systems can be easily adapted to the needs of an airport community.

Much of the research done on this project has involved training bulletins and operations manuals related to the current emergency notification systems at the Seattle-Tacoma International Airport (Sea-Tac). While all of these systems are still useable, they can be used
more efficiently and effectively. The current systems cover internal and external paging systems, reader boards, pre-recorded and free form public announcements, emails and pages or texts etc. The operations manuals reveal that there is a definite room for adjustment and improvement within the system that already exists (Everbridge Mass Notifications Systems, 2014, p. 2). The current prescribed usage leads to confusing or redundant information frequently being dispersed. Changes in the current prescribed way of use would make the system more efficient overall.

Additions to the current system could be useful as well. The use of social media has become prevalent in our daily lives today. The use of social media as a tool for dissemination of emergency information is becoming the norm in many emergency management communities. According to Dina Fine Maron, the use of social media in disaster situations allows people affected to help take personal control of their own situation and fosters a feeling of empowerment as well (Maron, 2013). The use of social media is an effective way to get information out to the people who might not regularly access the conventional media outlet sources. Even the federal government, FEMA, has a social hub site that covers events using Twitter, Facebook and other social media sites (FEMA, 2016). Social Media is just one of the many possibly additions for improvement to the existing emergency notification systems.

The literature reviewed here supports the need for updated, multi-tiered, user friendly emergency notification systems in general. The need for this type of system is especially critical in a setting like that of an international airport. A revised system that can reach the customers affected by any particular emergency in a timely fashion, that is easily accessed would be a valuable addition to the SeaTac emergency system. This enhanced system, along with the use of social media, could save lives by effectively reaching more people in an emergency situation.
Theoretical Framework/Approach

The purpose of this research document is to examine the current emergency notification systems in use at the Seattle-Tacoma International Airport. A study of how and when they are used and how they can be improved overall will be determined. The goal of the research is to examine the current technologies in use to determine what works and what needs to be improved. It will include a look into the unique needs of a large diverse complex, such as an international airport, to determine what methods can address their specific needs for emergency notification. An improved system can be more effective and efficient, and may be utilized as an industry wide model, thus achieving the ultimate goal of saving lives and property at Sea-Tac and other airports.

The primary resource tool for this study will be the training and operations manuals for the various systems in use currently at Sea-Tac. There are various systems used by different divisions for different situations. The research will be conducted to ensure that the systems are being used correctly, by those originally intended to operate them. Further research will determine any shortcomings including, but not limited to, dissemination of incorrect or redundant information, in the current system. Another area of concern to be researched is the possible need for a centrally located emergency notification center as opposed to the various locations accessed by different users currently.

Further research will be done accessing current literature written reference the needs of a large facility, such as an international airport, in particular. The needs of an airport are varied, and for this reason, they require a specific set of needs to be met. The varied populations in an airport setting require many different forms of emergency notification to be available for use in the case of an emergency. The literature cited will emphasize the needs of these varied
populations as well as the many possible emergency situations that can occur there. The research shows needs differ greatly in the case of an active shooter, an earthquake or an airplane crash, and these issues need to be addressed.

Another area that will be looked at is the possible use of social media outlets as a way to get the word out in an emergency situation to those at the airport or even those enroute. The literature supports the use of social media whenever possible, as it has such massive appeal in today’s world. The use of sites such as Twitter and Facebook, for example, could be a great way to get information out quickly to a large number of people in a very short time. There will have to be consideration given, when using social media outlets, to the importance of either sensitive or confidential information that can’t be given out to the public as well. The benefits will have to be weighed against the constrictions in each situation individually to determine if social media will be used and to what extent.

The majority of the literature accessed for this research document supports the hypothesis that there is a need for a change to the emergency notification system currently used at Sea-Tac international airport. The enhanced system should be a multilayered, cohesive and centrally located one to be most effective. Due to the varied populations working and traveling in an airport setting, as well as the sheer number of people there at any given time, the system will need to be specifically tailored to meet the required parameters. Add to this the possibility of the many different emergency scenarios that could ultimately occur in an airport setting and the need for a flexible, multi-tiered emergency notification becomes even more obvious. The system will need to be user friendly, and adaptable as well, for it to be most effective in maintaining the ultimate goal of protecting lives and property at Sea-Tac.
Another resource that will be examined, will be a case study referencing an airport shooting that occurred in a Los Angeles airport a few years ago. This case study emphasizes the need for a comprehensive and user friendly emergency notification system in a setting like this. The disastrous outcomes in this case study will support this theory and show what can happen when the emergency notifications systems fail in a large airport with many diverse populations.

**Research Design and Methodology**

This research design and methodology section describes the current practices and procedures concerning emergency notification systems at SeaTac International Airport, the methods that will be used to obtain current information regarding these systems. It will also discuss the means that will be used to study and interpret the acquired information to determine if there is a need for change.

**Research Goals**

This research attempts to explore the current emergency notifications systems in use at the Seattle Tacoma International Airport, as a model for other similar facilities, and to determine if the systems need to be modified, updated or replaced. The goal being to have available and be able to implement the most user friendly, effective, multi-tiered emergency notification system possible for use at Sea-Tac. Implementation of this type of system will help Sea-Tac achieve their ultimate goal, that of protecting the lives and property of those who utilize the airport either as employees or travelers.

**Research Design**

The style of design that will be used for this research project will be that of social constructivism, because the hypothesis is based on the influence of events and those interacting with the systems in question. Because these factors have an influence on the data being collected
Emergency Notification Systems

and used for this project it will take on the relativist style, using data collected to compare and evaluate possible outcomes.

The atmosphere of an international airport, as far as the amount and varied populations of people who are in and out of the facility daily, make this a unique place to study. This factor, along with the many varied possibilities of different emergency situations occurring at any time of the day or night make emergency notifications systems a crucial part of the safety picture. The different needs for emergency procedures, including but not limited to the possibility of evacuations or sheltering in place, make the use of an adaptable, user friendly emergency notifications system a must.

Institutional Review Board (IRB)

Prior to conducting the personal interviews portion of the research for this project, an application was submitted to the Institutional Review Board. This application included the projected research goals, subjects to be interviewed and a sample survey instrument. IRB approval was obtained on 6/27/2016 allowing the researcher to begin the interview process at that time. A copy of the IRB Approval letter, the research instrument, an informed consent form and a letter of permission are provided in Appendices section of this document.

Setting

The potential research participants will be found within the Port of Seattle itself. These employees will be those that have used or have had knowledge of the prescribed use of the current emergency notification systems at SeaTac International Airport. These interviews are important as the information received will be from those who actually use or know the intended use of the current systems as they exist now.
Population

The use of the current systems, and possibilities of a new or improved system, require the use of primary and secondary data to be used. The primary data will be information collected from individuals who use the systems or are directly affected by the systems use. This primary data will be collected with the use of interviews conducted with some of the people who use and/or have administrative privileges for the systems in question. These interviews will consist of a fairly structured set of questions, with some room left for opinions or expansion of answers and topics provided them. There will be six to eight subjects interviewed, depending on availability, all of whom will be current employees of the Port of Seattle.

Secondary Data Source

The secondary data to be collected will come from user and procedure manuals for the current systems, as well as literature found that pertains to the topics related to the research question. These two forms of data will be mostly of the qualitative nature, relying on the input from people regarding their opinions and experiences. The quantitative method was considered and rejected due to the nature of the varied emergency situations possible relating to the need for emergency notification. These differing situations require the need for the users or incident commanders involved to make changes and sometimes split second decisions that could not be represented in a quantitative manner.

Data Analysis

The analysis of the data will begin with the results from the interviews and the data collected regarding the intent and actual use of the current emergency notification systems. The analysis will determine if the systems are being used as they were originally intended, and if they are effective in general. This information will be determined by comparing the experiences of the
various users with each system. What problems might they have with the systems, and have they any suggestions for improvements? How often have they used any of the systems and in what context? These answers will determine if their input was from a possible one-time glitch in a system or from an ongoing problem that needs to be looked into. Another aspect of the research that will be considered at this point will be the security clearance needed by the various users of any particular system. Are there systems that require a higher security clearance for its users making it, or some of its components, unavailable for a particular set of possible users?

This research will also determine if there is a possibility to expand on the current systems in use, without having to add additional equipment or software. Are there ways to utilize the current systems, or modify them by adding other components for particular users with a minimal cost. The alternative of replacing ineffective systems entirely could be very expensive, but this will be considered in this research as well. The existing literature written regarding the use of emergency notification systems to effectively save lives, will also be considered and applied to the Sea-Tac airport facility. The researcher will use inductive reasoning to determine the feasibility of the proposed theory of the need for a better, multilayered, cohesive emergency notification system in large, diverse facilities such as an international airport.

**Case Study**

On the morning of November 1, 2013 a male walked into Terminal 3 of the Los Angeles International Airport after being dropped off curbside. The male proceeded into the airport, carrying an innocuous looking duffle bag, and walked up to the nearest TSA checkpoint. The male, later identified as Paul Anthony Ciancia, pulled a rifle out of the bag and began shooting. He shot a TSA officer in the chest at point blank range, before taking the escalator to the next level of the airport. The shooter then returned to the checkpoint, shooting the wounded
TSA officer again, before continuing through the checkpoint to the secure side of the airport. As The gunman entered the concourse area he continued firing wounding three other people. Three of the four subjects shot were TSA agents. The gunman continued into the food court area of the airport, where he was shot four times by responding officers. Ciancia survived his injuries and was later prosecuted for numerous charges including murder (Botelho & Martinez, 2013).

As a result of this incident, many discrepancies were discovered in the existing emergency systems at the Los Angeles International Airport. The different systems that were immediately evident were those involving emergency notifications, evacuation procedures and airport communication in general.

The first line of emergency notification available to agents at the TSA security checkpoints, as well as at numerous other airport locations, were duress alarms that went directly to the police department. One of the TSA agents at the affected checkpoint picked up the duress phone and dropped it without saying anything before running from the scene. This open line was the first indication to the police department that there was an emergency. The dispatcher on the other end of the line could hear screaming and gunfire. However, even though the phones connected directly to the police department, the dispatchers were not able to tell which of the many panic phone locations this was coming from. This lack of information added to the already chaotic situation and delayed necessary emergency response (Pistole, 2014).

The evacuation in regards to this incident was chaotic to say the least. There were no instructions given, in any form, to the passengers or employees in the area. People were running in all directions, looking for avenues of escape or places to hide. With no direction, many people unknowingly ran back towards the shooter as he was moving about the airport. Passengers and employees ended up scattered all over the airport property, some even on the airfield itself where
planes were actively landing and taking off, making effective control of the scene and any witnesses almost impossible (Botelho & Martinez, 2013).

Airport communications in general were challenging, at best, during this event. The communication between law enforcement, the fire department, businesses and workers were all effected by the utter chaos involved during the situation and the aftermath. It was revealed later that the shooter had a vendetta against TSA in particular, which fortunately kept the scene to a smaller area overall (Botelho & Simon, 2013). With the amount of ammunition he had in his bag, had he just shot randomly there might have been hundreds of people injured or killed before he was apprehended.

Almost immediately after the incident the criticism for the lack of emergency communication and notification systems at LAX began. Many expressed particular concern over the lack of communication between the many airport employees and the travelers accessing the airport at the time of the shooting. As a result of the events in November 2013 a consulting firm was hired to review this event and how things unfolded. This report was based on several different sets of information. Some of the information was received from the various different agencies that responded to the scene. Other information was gathered by reviewing video from closed circuit cameras, dispatch logs, 9-1-1 calls and radio transmissions (Associated Press, 2014). The resulting eighty-three-page report, released March 18, 2014, covered what did and didn’t work and included recommendations for the future (TSA, 2014).

The recommendations from the report covered several different areas of concern. Upgrading technology and interoperability was one of the areas where change was discussed. This was of special concern in relation to the police and fire departments on site, as well as those other agencies that responded to assist. It was determined the airport police and fire department
commanders added to the confusion by setting up multiple command posts in the beginning of the incident. These actions clearly diminished the important communications needed between the two agencies as well as the airport communications and emergency operations center. Another area where technology was lacking was in the training and use of the red emergency phones at the TSA checkpoints. It was recommended that these phones be updated to include the location of the phone automatically when the caller picks it up (Transportation Security Administration, 2014).

Another area of concern was the lack of training for all of the employees involved including, but not limited to, TSA. The need for basic training for the procedure in emergency situations like this was apparent. This training was recommended to include active shooter scenarios, as well as evacuation procedures. Training was also recommended for the police and fire departments involving the use of Incident Command and the setting up a unified command post in future situations (TSA, 2014).

Another direct result of the LAX shooting, was the introduction of H.R.4802 - Gerardo Hernandez Airport Security Act of 2014. This bill, named after the TSA employee fatally shot at LAX, was intended as “an act to improve intergovernmental planning for and communication during security incident at domestic airports” (Congress.gov, 2014). This bill covered the need for the department of Homeland Security to reach out to airports where TSA agents work and to oversee the implementation of improved security procedures. It also required that a DHS representative present any analysis or findings to Congress. It directly references the need for training as well as the interoperability of communications needed by the fire, police and medical personnel responding to these incidents at airports. The proposed bill goes into much greater detail about how and when these things should occur and what the
implications would be if they weren’t followed. The bill was introduced to Congress, at this
time it has been passed by the House but not passed by the Senate (govtrack.us, 2014).

The shooting at LAX in November 2013 is a perfect example of the need for a better
emergency response system in large airports. The need for a cohesive system that can address the
many possible scenarios that might occur at any time in these facilities is imperative to the
continued goal of the preservation of life.

**Results**

There are various emergency notifications systems available for use at Sea-Tac
International airport at this time. Some systems have a very specific list of users and others are
available to many different groups at the airport. Some systems have applications that can be
specifically used by those with security clearance and others do not. Because of these differences
some systems can be used congruently while others are not compatible at all. The following is an
overview of the current systems available, their specific intended use and the users who can
access them.

**Everbridge**

The Everbridge Mass Notification System is the most commonly used emergency
notification available at Sea-Tac. The intended use for the Everbridge system is to send
notifications to selected groups before, during and after specific events. This system can be
accessed by various groups throughout the airport for various reasons (ACC Director, personal
communication, July 8, 2016).

The Everbridge System has several different applications that can be accessed depending
on the needs of the intended group or the event that is occurring. One of the applications that the
Everbridge System offers is the ability to determine what information will go out to whom and
when it will be sent. The system allows different administrators to assign various people to
different groups depending on their job classification or level of security clearance. This
application makes the system a valuable tool at many different levels within the airport. The
system also allows for the use of a GIS system, to send information to an individual or group in
reference to a geographical area in or around the airport (Everbridge Suite User Guide, 2016, p.
3).

The Everbridge System is managed by various managers, or administrators, within the
airport. The organization administrator can set up the groups to be included in the various
messaging needed or access by their organization. Group managers can manage and send the
needed notifications within their defined, predetermined groups. After the group managers there
are users at various levels who can actively send messages out to the predefined groups as
needed. These messages can be delivered in a variety of methods including text, voice mail or
emails (Everbridge Guide, 2016, p. 5).

The Everbridge System, in most cases is used as a group notification system, to advise
various predetermined groups of information pertaining specifically to their job at Sea-Tac. This
system can be accessed by various users, at many different security levels within the airport. For
example, if an exceptional incident of some kind occurs at the airport, a group text or email
might be sent to the various managers or supervisors that the incident may effect. These incidents
could be anything from a power outage causing a few minutes of interruption in the airport
shuttle trains to an airplane crash or major earthquake. This same system could be used by an
operator in the police and fire communications center to advise other employees of a sick call
resulting in possible overtime coverage being needed. Each of these uses is important for the
group involved but obviously, they are not all exactly on the same level of emergency (ACC Director, personal communication, July 8, 2016).

One of the characteristics that Everbridge offers is of specific use to the emergency management and addresses the emergency notification needs. The system allows its users to create an incident for a specific emergency. Once created the user can send notifications to specific groups advising of the onset of the incident as well as continue to update the groups as the incident progresses. This part of the system allows the user to keep the same group updated with the same information in the same time frame about a specific emergency situation. This application is intended to keep information timely and accurate for all of those in the communication loop that has been established (Everbridge Guide, 2016, p. 8).

The control panel, or Dashboard, for Everbridge is available to all users who have permissions granted for its use. Each group has different permissions granted to them specifically in relation to their job specifications and/or security clearances. Each Dashboard is set up to be easily followed by the user to be allow them to get the correct messages to the correct people. Some of these messages are preset and some are open templates allowing the user to compose their own message depending on the information needed or available (Everbridge, 2016, p. 11). The majority of the true emergency related messages are sent by either the Airport Communications Center (ACC) or the Police and Fire Dispatch Center at SeaTac. These messages in general would be directed to those in charge in the police and fire departments as well as the Emergency Management division the Public Information Officers and others in the higher management positions at the airport.

Another important aspect for emergency notification provided by the Everbridge System are the contact lists for the people to be notified, in whatever situation needed, which are updated
frequently. These current contact lists allow for the important information to get to the people that need access to it immediately. This system also allows for time stamps for all notifications sent and has an option for a confirmation of receipt to be sent as well. There are also options available for broadcast cycles and durations, to be able to repeat the message in whatever forms as long as it is determined necessary (Everbridge, 2016 p. 526).

Airport Paging Systems

There are two different forms of airport paging systems available at Sea-Tac airport. The first system is the the overhead paging systems that can be heard frequently going off in any airport in the United States. The second paging system is not as well known, called the Flight Information Display System (FIDS), it allows for the option of a visual page as opposed to the more common audible ones (ACC Director, personal communication, July 8, 2016).

The overhead paging system is primarily used to put out an audible message to a passenger, or group of passengers with specific information. A common use for this system might be to advise a passenger to return to a location for a left behind piece of luggage or maybe to return to their vehicle because it needs to be moved. This system is also frequently used to page passengers who might have become separated from their family members or some other travel group. This audible paging system could be used for emergency situations as well to direct people in or out of buildings because of some danger or to deliver some other kind of emergency instructions. This system works well for emergency directions because it can be broadcast to a large amount of people all at once. This paging system is accessed by employees working in the Airport Communications Center, at the request of public safety representatives, those in airport management or sometimes even passengers.
The other paging system in use is the Flight Information Display System, commonly known in the airport by the acronym FIDS. This system allows for a visual page to be sent out over the flight information boards located all over the airport. The user is able to type in information that will be displayed across the bottom of the flight information boards underneath the arrivals and departures information. The display, generally in much bigger font than the flight information, is easily read and can be used in a wraparound format to keep repeating. The user also has the ability to surround the message in a red banner to make it even more visible. This paging format is generally used for passengers with hard to pronounce names as well as those that might be hearing challenged. In an emergency situation this system could be used to display emergency information or directions without having to make them audible. This system can also be used in conjunction with the audible overhead paging system as well to notify as many people as possible at one time of any danger or other pertinent information. This paging system, like the audible one, is accessed by employees in the Airport Communications Center (ACC Director, personal communication, July 8, 2016).

**Master Evacuation System**

The Master Evacuation System is a part of the Sea-Tac airports fire alarm system that can be used to provide notification of an emergency situation, both visually and audibly. The MES has coverage that include all of the terminal’s public areas broken down into zones. The zones include each of the separate concourses, the main terminal as well as the office tower at the center of the airport. The operator working the fire dispatch console is able to select any, or all of these zones, from her position for an emergency broadcast. There are other access zones to be able to make emergency announcements available to fire fighters throughout the airport should
the fire dispatch position become inoperable for any reason (Port of Seattle Fire Department Manual, 2014, p. 5).

When it is determined necessary to access the Master Evacuation System, the areas affected are chosen by the dispatcher or a designated fire fighter. At this point the user has the option to use a prerecorded message for the announcement or to make their own live voice announcement depending on the situation at hand. Along with the voice or prerecorded message there will be a visual strobe as well as a fire tone activation in the area chosen. This message system is used strictly for evacuation and life threatening situations only. The system is maintained by the fire department alarm specialists and is used only by the fire department and its representatives (Fire Prevention Specialist, personal communication, July 8, 2016).

**Reader Boards**

Located outside the airport buildings themselves, there are various reader boards available for use. Some of these reader boards are stationary and others are able to be moved about to different locations as needed. These reader boards are lighted signs that are available to display information to those traveling around outside the actual airport buildings. Much of the information is traffic related, either advising of heavy traffic on the arrivals or departures drives, or of various lane closures or road conditions. These boards are controlled by employees who work at the toll plaza at the airport. The toll plaza is the area of the airport where travelers pass on their way out of the garage or other parking areas. While most of the reader boards use is traffic related, they can be used in an emergency situation as well to direct people away from the airport in a disaster situation, or even to a safer route within the airport property. These boards could also display an emergency number or other information for those trying to get information
about loved ones in an emergency or disaster situation (Parking Supervisor, personal communication, July 18, 2016).

**Breach and Panic Alarms**

Throughout the airport main and satellite terminals there are various breach and panic alarms. These alarms are meant to be the first notice to the powers that be that there is a problem at certain secure points. There are several panic alarms located at each security checkpoint line in the airport. Some of these alarms are activated by pushing a button, and others are activated by the use of a phone line. These alarms are meant for use by the Transportation Security Administration (TSA) employees who staff the security checkpoints. The panic alarm activation sends an instantaneous signal to the police communications center which results in an immediate police response. These alarms identify the checkpoint number and the specific lane where the problem is, but not the type of incident. The alarms at the checkpoints are tested daily to make sure they are functioning correctly (Port of Seattle Police Training Manual, 2014, p. 128).

The breach security alarms are located at various secure doors and entrances and exits within the airport. These alarms are set off immediately when the secure door is opened or even if an attempt is made to open the door. Triggering this alarm will result in an audible and visual alarm going off at the site of the breach itself. The alarm also goes off in the the Airport Communications Center, where the employees are able determine where the breach is as well as obtaining a picture of the person(s) who caused the alarm. The ACC employees then send the information and the picture to the police communications center for immediate dispatch. These alarms are also tested regularly to be sure they are functioning correctly (ACC Director, personal communication, July 8, 2016).
Closed Circuit Television Cameras

There are approximately 1400 closed circuit television cameras located throughout the Sea-Tac airport property. These cameras are located in the terminals, garage, and along the arrivals and departures drives. There are cameras also covering the traffic entrances coming in and out of the airport as well as on the airfield itself. There are also camera views of every security gate connected to the airport, and many building that are on or near the airport property. This camera access allows for assistance with police and fire calls as well as other security issues that may occur. They can be used for everything from assisting with looking for missing children to helping determine where traffic problems might be about to occur. The cameras can even be used to help determine the extent of an aircraft emergency by allowing visuals of an incoming aircraft that has reported a problem. This could be anything from a report of landing gear not coming down to smoke or fire on an aircraft. The cameras can be accessed by various divisions within the airport including police and fire, the control towers, the parking division and the Airport Communications Center (ACC Director, personal communication, July 8, 2016).

800 MHz Radio System

The airport also has access to an 800MHz radio system. This system is used by the police and fire departments as well as the people who deal with airport operations overall. Because of this system the various divisions and employees are able to talk to each other or monitor each other’s frequencies if needed. This system also allows for interoperability with any other public safety departments who may respond to Sea-Tac airport to assist for an emergency incident or disaster (POSPD Training Manual, 2014, p. 45).
Social Media

Sea-Tac Airport has just recently begun implementing the use of social media as a notification system. They now have a social media representative who is able to put out notifications on Facebook as well as Twitter. This position is a new one and will be changing and evolving in the future as situations occur (Public Information Officer, personal communication, July 14, 2016).

Discussion

As Linstrom makes clear, there is a definite need to be able to communicate with the many different populations that can occupy an international airport at any given time. With the changes in today’s world, involving increased terroristic activity and the availability of information regarding explosives and biohazardous materials, this need becomes even more timely and imperative. The need for improved, cohesive, user friendly emergency notification systems in large, diverse facilities is a real concern.

Testing and building an emergency notification system for a large facility like Sea-Tac Airport in Seattle, Washington can be a difficult task. The needs, and populations, are constantly changing resulting in an environment that is far from a static one. Notification systems, policies and procedures regarding them can be put into place with the best of intentions, only to find they don’t work in a real life scenario. Unfortunately, many times the only real way to test these systems is to see how they play out when a real emergency happens. If the system works as it was planned that is great, but many times these emergencies prove the systems are fallible or need improvement, or in the case of the shooting at LAX are even disastrous.

In a facility as large and diverse as Sea-Tac Airport there are many different possible situations that can occur. Because of this the emergency notification systems need to be easily
adjustable, to address all different levels of emergency possible. Different situations will cause a
different level of alert, requiring different notifications and emergency actions. An effective
system would have procedures and protocols set up for any and all possible situations. There
would be extensive training and retraining involved with these systems by all employees who
might use them or even be effected by their use. There would be frequent testing of the systems
as well as drills for the users and the customers who might be concerned about or impacted by an
actual emergency occurrence.

The research behind the need for an effective, cohesive emergency notification system in
a large multi-use facility is important. The stakes involved are of the utmost importance, that of
saving lives. Unnecessary mistakes can result in the utmost price, not the loss of business, but the
loss of lives. The many customers accessing Sea-Tac or any other airport depend on the facility,
and its employees, to keep them safe before and after their flights, not just onboard the planes
themselves. For this reason, the need to examine the current emergency notification systems at
Sea-Tac for their effectiveness is especially pertinent and necessary.

Facilities like SeaTac not only serve diverse populations, they are governed by several
different types of entities. SeaTac is the property of the Port of Seattle, which is a government
agency. Because of this affiliation there are public funds, like those generated by taxes, used in
maintaining the facility and some of its employees. However, there are also a large number of
private businesses involved with the daily operations at Sea-Tac. Airlines pay fees for use of the
space at the airport for things like gate and runway access as well as office and concourse areas.
Another source of income are the many retail businesses that occupy space at the airport who
also pay for their ability to conduct business with the many customers passing thought the airport
on a daily basis. The property that is Sea-Tac airport, is spread out as well, doesn’t just cover the
concourses. They also include the parking garage, many maintenance and storage facilities and a large off site rental car facility just to name a few. All of these different entities and properties make places like Sea-Tac International Airport a challenge when it comes to many things, but especially emergency notification systems.

The following sections will cover the different areas identified early in this document in regards to the use of emergency notification systems at Sea-Tac. The discussion will be divided into the findings discovered after extensive research, giving different examples of emergency situations that might occur. This section will be followed by suggestions for the future of emergency notification for this facility and others like it.

**Emergency Notification Systems Usage**

There are many different possible situations that might be classified as an emergency at Sea-Tac International Airport. Each scenario will require different responses by different groups of people as well as possible different types of emergency notifications. These notifications might also be generated by different groups or agencies within the airport itself. The following are some examples of emergency situations that could occur at Sea-Tac and the current policy for notification and response.

**Natural Disasters**

Natural disasters can occur anytime, anywhere and can vary greatly in intensity. One of the first disasters one might think of in the Pacific Northwest are earthquakes, as the Seattle area is located in a major fault zone. Earthquakes happen quite frequently in this area, they vary greatly in their intensity, and policies and preparations are in place in case a large one should occur. The possibility of major damage from a strong earthquake is a very real one that would need an immediate response from many different agencies within Sea-Tac.
The first emergency notification system that is to be utilized is Everbridge, if the computer systems have not been damaged by the earthquake. This system would be used to page all Port of Seattle police officers and firefighters to check their welfare and location if they are in duty, or to call them in if they are not. If the computer system is down then this will be done, much more slowly, by phone contact. After confirming the safety of officers and firefighters on duty, the next step would be a check of the airport and surrounding areas for severe structural damage as well as injuries. At this point dispatch will also be required to send out a page to all of the command staff advising of the situation at hand, this is also done through the Everbridge system. At the same time the Airport Communications Center (ACC) will also be using the Everbridge system to page people on their incident staff list. Some of the people on the Command Staff page and the incident staff list are the same, so they will receive two pages from two different sources. These pages frequently have different information in them, as ACC and Police/Fire Dispatch have access to different information in general. This can lead to confusion on the part of some of those receiving the pages and many times will result in many unnecessary phone calls to clarify information (ACC Director, personal communication, July 8, 2016).

Depending on the severity of the damage or injuries, there may be a command post set up and incident command declared. The 800MHz radio system will be utilized for command to set up the command post, perimeter and any other necessary communication. This system can be accessed by the fire department as well as other airport employees who may be working the emergency. The 800MHz radio system can also be used by any other agencies that may be called in to assist the Port of Seattle police and fire departments.

Other emergency notification systems could be utilized in the case of an earthquake as well. Depending on the damage done, and whether the emergency power is affected, the
possibility of using the CCTV system to access various cameras to check for injured or trapped subjects is available. The Flight Information Display System (FIDS) boards and the overhead PA systems could also be used to direct people safely in or out of damaged areas of the airport. The Master Evacuation System (MES) may also be accessed at the request of the battalion chief to make evacuation announcements in any of the areas where they may be needed. The reader boards run by the toll plaza could also be set up to direct incoming or outgoing traffic safely away from the areas of damage, or even away from the airport in general (Unusual Incident Manual, 2011, p. 57).

The last step in the emergency notification system for an incident like an earthquake would be through the public information office. The on duty public information officer (PIO) would be one of those notified by the command staff page, and would respond to the scene immediately if possible. He will then gather information needed to notify the media outlets of the situation at Sea-Tac. He will disseminate the necessary information to the media as well as notifying the social media specialist at the airport. The social media specialist will put out information in various forums, such as Twitter or Facebook, advising people of delays or dangers that exist (Public Information Officer, personal communication, July 14, 2016).

The same procedures are followed for other natural disasters, such as snowstorms or floods. The same notifications pages are sent out by ACC and Police/Fire Dispatch to their assigned groups. Officers, fire fighters and other airport personnel will also check for structural damage and injuries. There may be problems with employees getting to work or getting them. There are several areas set up at Sea-Tac to provide for employees who are unable to get home. Pages will be sent through Everbridge to all employees to again, check their welfare and ability
to come in to work. The PIO will also send out info to the media outlets involving any delays or travel stoppages, and social media sites will be used as well to spread the word.

Natural disasters, even those considered fairly minor, can cause emergencies on the airfield as well. Even minor damage to a runway or taxiway can cause millions of dollars in lost revenue for the airlines, and the airport, who use them. Damage to an aircraft caused by an earthquake or even the delays caused by having to deice the wings or wait for fog to lift can also wreak havoc at an airport. These types of situations can result in the need for many various emergency notifications to be sent out. Command staff, airline heads, airport managers and field crew personnel will all need to be advised and emergency procedures initiated (Airport Emergency Plan, 2011, p. 108).

**Aircraft Emergencies**

In the event of an aircraft emergency, usually an imminent crash or equipment malfunction of some kind, there are a large number of emergency notifications that happen very quickly. The incident is usually reported to Police/Fire Dispatch on the tower crash phone, which is a direct line between the FAA Tower, the ramp tower and the dispatch center. The information is given involving the aircraft involved, the reported problem and the approximate location of ETA to Sea-Tac. Each incident is assigned a different alert level, from one to three, depending on the emergency declared. The dispatcher takes the information and immediately puts out a full response tone for all fire department equipment to respond. A broadcast is also put out on the police radio frequency advising of the incoming aircraft and its reported alert. As this information is being relayed to police and fire units, an Everbridge page is also sent to the command staff by dispatch. ACC, who also monitors incoming emergencies, puts out their version of an incident page as well (Airport Emergency Plan, 2011, p. 70).
The tower continues to relay information from the affected aircraft to the Police/Fire dispatcher, who passes it on to the fire battalion chief. The battalion chief will take incident command if it becomes necessary to establish. If the alert is because of an equipment malfunction many times the aircraft is able to land safely with little or no injury to passengers or crew members. In the event of an actual crash the incident command is established and the fire and police departments respond to start to search for the injured. Many times other agencies will be needed to assist the Port units. At the request of incident command, the dispatcher will call out for mutual aid as needed. These incoming units will use the 800mhz radio system, as it is available for multiple agency use. In general, most fire fighters on staff at the Port of Seattle Fire Department will be sent a page to come to work immediately, this page is also sent by dispatch on the Everbridge system. As injuries and damage are determined more command staff pages will be sent out with the updated information. Eventually the National Transportation Safety Board(NTSB) will take over the investigation of any crash site. An airplane crash scene can cover a very large area of ground. There can also be many witnesses to interview as well as the injured and dead to attend to. Fire and police units responding to the scene need to take great care not to unnecessarily disturb the crash scene if possible (Airport Emergency Plan, 2011 p. 106).

If there are multiple injuries, or passengers involved in general, there will be other notifications that will need to be made. In the case of multiple injuries, there will need to be an area set aside for triage for the patients and people to staff the triage as well. There will also need to be an area set up and staffed in the airport for family members of the passengers on the plane to wait for information on their loved ones. The PIO will begin immediately advising the media outlets of the incident, including information on where to go for family members as well as
delays caused by the incident itself. This will help alleviate some, but unfortunately not all, of the confusion related to this type of incident (Airport Emergency Plan, 2011, p. 82).

The FIDS boards and overhead PA systems can be utilized to relay information to passengers in the airport advising of delays or phone numbers to call for more information. The reader boards from the toll plaza could also be used to notify incoming vehicles of the incident and advise them where to go as well. The social media sites could be utilized to get information out to the public as well, as this area is new there is not a policy written covering this yet for this type of incident.

**Police Incidents**

At the Seattle-Tacoma International Airport, there are many possible police scenarios that would be considered emergencies. Many of these are unusual occurrences, but policies and procedures are written covering them and training is done periodically to be prepared should they occur. This training could involve the police and fire departments as well as TSA and other airport operations employees, depending on the scenario being covered. The Port of Seattle Police department has been instrumental in the national training for response to active shooter incidents. In 2014 they helped made a video, filmed at Sea-Tac airport, of an active shooter scenario drill which is used by agencies all over the country to train their first responders (National Safe Skies Alliance, 2014).

**Active shooter.** One of the most dangerous law enforcement related emergencies that can occur at any large facility, including SeaTac, is an active shooter situation. An active shooter can be extremely dangerous, mainly due to the sheer size of the airport property as well as the large amount of people spread out through the airport at any given. A gunman, or gunmen, loose with weapons, and an unknown intent or mental status, can wreak havoc in an airport setting.
including the possibility of a large number of injuries or fatalities. Large groups of people are frequently standing in line at any of the security checkpoints as well as at many of the gates in the concourses themselves. At Sea-Tac there is a large food court area, as there are in most large airports, where there can be hundreds of people ordering food or eating at all hours of the day or night. All of these factors can make an airport a very hard area to control when dealing with an armed suspect or suspects. A subject waving a gun around in a large group of people can cause a panic, and very likely chaos, making a bad situation even harder to control or diffuse.

Communication is key in an active shooter scenario, whether it be between the members of the police department and their dispatchers, or between the airport and its employees and passengers. An effective emergency notification system in place can make the difference in lives lost in a situation like this. As evidenced in the case study of an active shooter at Los Angeles International Airport presented earlier, an interoperable, user friendly emergency notification system can help save lives.

An active shooter situation requires a “a quick and aggressive intervention” (Unusual Occurrence Manual, 2011, p. 44). In general, the first indication of an active shooter will be received via a phone call to the Police/Fire communications Center. This call can originate from a citizen or employee calling 9-1-1, a TSA employee activating a panic alarm phone, or sometimes even a call from the shooter or his associates themselves. Usually there are numerous calls from panicked people in the area of the shooter trying to give, or get, any kind of information. After the first notification the dispatcher will advise all officers on duty of whatever info they have received at this point via the 800 MHz radio system. A command staff page will be sent via Everbridge by a dispatcher as well. Once advised ACC will send out their incident
Emergency Notification Systems

pages via Everbridge as well. Incident Command will be declared by the ranking police officer and a command post determined (Airport Emergency Plan, 2011, p. 9).

Due to the volatility of an active shooter situation information updates will be made immediately to responding officers for their safety as well as that of the citizens at the airport. In the interest of officer safety information might be sent by group email to their department issued cell phones to keep radio traffic to a minimum and help allay the risk of alerting the suspect to officer’s locations. At this point the request may be made by incident command to contact other law enforcement agencies for assistance, this will also be handled by dispatch. Another notification made by dispatch will be for fire and medical units to assume standby positions to be ready to assist the wounded once the scene is clear or shooter is in custody (Airport Emergency Plan, 2011, p. 14).

The first priority in an active shooter incident is to determine the location of the suspect and make contact as quickly as possible (Unusual Incident Manual, 2011, p. 45). This can be time consuming because of all of the varying information being called in by different people. Some information will be incomplete and other information may just be erroneous due to the callers panicked state and confusion. Once the suspect has been located and taken into custody, or neutralized in some other way, authorities can begin to determine if he was working alone or might have accomplices within the airport. Responding officers will then be able to begin the process of accessing injuries and damages from the incident.

Some things to consider during an active shooter or even a hostage situation, is the possible use of other emergency notification systems here at Sea-Tac. The use of the overhead PA system or the MES fire system would not generally be used in the area of the airport where the shooter is, because info broadcast could be heard by the suspect as well. The systems could
be used in the other concourse areas, those not near the actual shooter, though to give out evacuation or shelter in place information. The FIDS boards could be used as well to give visual instructions to employees and passengers without an audible alert to the suspects.

After an initial assessment for injured subjects and those needing immediate medical attention, officers will begin a systematic clearing of the buildings and areas within the airport property. This check will be not only for additional suspects, but for any possible incendiary devices that may have been planted etc. Officers will also be dispatched to preserve the crime scene, which in the case of an active shooter can be extensive. Periodic pages will be sent by dispatch to the command staff advising of any change in the situation or any other pertinent information (Airport Emergency Plan, 2011, p. 46).

**Terrorist activity.** With the escalation in terrorist activities all over the world, airport police as well as other employees need to be very aware of any suspicious activity. This can include suspicious behavior as well as unattended suitcases, vehicles or other items in or around the airport. Other forms of terrorist activity at an airport could include hijacking, bombs threats or actual devices, and threats of chemical or other biohazardous release.

The most common form of possible terroristic activity at Sea-Tac are bomb threats. These generally come in via a phone line, with very little information given. These threats are taken seriously and every attempt is made to follow up on any information given. The Port of Seattle Police Department has a bomb detection unit (BDU) with several trained bomb sniffing dogs. In the case of a suspicious item left in the airport, the information is given by dispatch to responding officers. Once the officer arrive they may ask for further assistance, resulting in the response of a BDU K9 for further investigation (Unusual Occurrence Manual, 2011, p. 60).
Other than the notification to the K9 officer and the on duty supervisor, unless the item is thought to be an actual explosive device, no other notifications are made. If the device does appear to be real, the area will be evacuated immediately and command staff advised by page. More BDU officers and equipment will respond to assist in detonating the device safely. Procedures are in place in case of an actual explosion, like the ones that recently occurred in the airports other international airports (Unusual Occurrence Manual, 2011, p. 61). At this point evacuations could be handled using the PA overheads, the MES systems as well as the FIDS reader boards depending on the size and scope of the incident. Notifications to the fire department personnel as far as injuries, and any other additional resources would be made by dispatch as well. As with any crime scene, the utmost care must be made with any activity that might involve terrorism.

A hijacking situation would be handled following the same basic procedures as used with an active shooter. In this case the suspects location is already known, so the negotiations can begin more quickly. As with any other incident like these all the command staff notifications would be sent by dispatch, and officers dispatched as well. Again with a hijacking the primary concerns are protecting lives, containment of the scene, and apprehension of the suspect as quickly and safely as possible (Unusual Incident Manual, 2011, p. 47). Depending on the location, again the PA, MES and reader board systems could be utilized to evacuate areas that needed to be secured.

In the case of a chemical or other biohazardous threat, any information will be immediately followed up on and investigated. In the case of an actual chemical release of some kind, the primary concern would be to evacuate the areas affected to save lives. This could be done using the PA and MES systems to get the messages out to as many people as quickly as
possible. The FIDS reader boards could also be used for visual notification for those with hearing disabilities. The usual notifications would be made to command staff and fire department personnel would respond as well. Police officers would be utilized for crowd and traffic control, using the toll plaza reader boards to help direct people away from the airport (Unusual Incident Manual, 2011, p. 42).

**TSA and security breaches.** A security breach occurring at the airport is usually called in by a TSA agent or they TSA Coordination Center located at the airport. These breaches can be called in over a regular phone line by ACC or the Police/Fire Dispatch Center may get an alarm indicating the breach has occurred. If the call is made to dispatch by ACC they will give the location of the breach, any description they have as well as the location of the breach suspect currently if known. ACC will also send an email to dispatch with a photo of the actual breach, which will be forwarded on to the responding officers. If the breach indication is received in dispatch via an alarm, officers are sent to the scene with virtually no information on the incident or the suspect. Dispatch will try and make phone contact with someone at the breach point to check their welfare as well as get any info on the breach itself and any suspects involved. Other than notification to the responding officers and a sergeant, no other emergency notification will need to be made until officers arrive and evaluate the scene. If the breach is determined to have been accidental or there is no threat to the airport, the breached alarm will be reset and the incident closed (ACC Director, personal communication, July 8, 2016).

If the breach is determined to be a threat to the airport in any way an immediate investigation is begun, Officers will attempt to locate the suspect, or suspects involved, as well as determine what secure area of the airport they may have gotten into. The breached area will be secured and searched thoroughly for any type of damage or unusual articles that may have been
placed there during the breach. The use of the CCTV cameras will be accessed to help with this search, for suspects as well as any unusual activity or articles. Depending on the area involved, there may be an evacuation that occurs as well. If the area of breach leads to the airfield or any aircraft a thorough search will need to be made of them. These breaches are taken very seriously as they can be a way for terrorists to place an explosive device, or for an armed person to gain access to a secure area. Once a breach is determined to be a threat there will be command staff pages sent by dispatch to advise of the breach itself as well as the possible delays in service at the airport due to any extensive search of terminals or aircraft involved (Airport Emergency Plan, 2011, p. 36).

Civil disturbances. Many groups like to use the airport terminal, and arrivals and departures areas, for their demonstration or protest activities. The reason for this is the large amount of traffic coming in and out of the airport at any given time. Most demonstrators within the airport are respectful, although a bit loud sometimes and just want to get their message out to as many people as possible (Public Information Officer, personal communication, July 14, 2016). In this case, officers will just observe the activity and monitor their progress off airport property. In the case where a protest turns into a civil disturbance, things can escalate quickly. The potential for violence and injury to innocent bystanders can be great, so the situation must be addressed quickly. This may involve the callout for mutual aid, depending on the size of the group and extent of unruliness involved. The usual command pages will be sent by dispatch and the PIO will be informed of the particulars as the media outlets usually arrive very quickly in these situations (Airport Emergency Plan, 2011, p. 151).

Missing children or endangered persons. The Police department at Sea-Tac receives hundreds of calls of missing persons within the airport every year (Compass, 2016). Many times
the call is related to a juvenile who has walked away from a parent, or a mentally challenged adult who has become separated from their travel companion. Units dispatched will meet with the reporting party to get descriptions and other info, many times they are also able to obtain an actual photograph which is emailed to all officers on duty. Dispatch and ACC are then able to use the extensive CCTV cameras to try and look for the subject remotely while the officers conduct their search in foot. The overhead PA systems and FIDS boards will be used to page the subject to call 9-1-1 if they are of an age or have the ability to do so. In most cases the parties will reunite in a short amount of time and go on about their travel (POSPD Training Manual, 2014, p. 35).

Fire Department Responses

The Port of Seattle has its own fire department located on the property of Sea-Tac International Airport. They are available 24 hours a day, every day of the year, for the passengers and employees of the airport. They respond to various calls for service as well as testing and maintaining the fire prevention equipment on the property. Along with the airplane emergencies cited earlier, the following calls require the use of the emergency notification systems located at Sea-Tac.

Fires. The Port of Seattle Fire Department responds to any reports of fire or smoke on or off of the airfield. This includes aircraft fires, traffic accidents, and many types of fire alarms. In the case of a fire on the airfield a full response of all units on duty is required and will be sent out by the Police/Fire Dispatch Center. The battalion chief will take incident command for the incidents duration. The command staff will be notified by using the Everbridge system. Should an aircraft need to be evacuated because of fire or smoke, the police will assist with the evacuation and transportation of the passengers and crew off of the airfield. If there are multiple
injured subjects, incident command will make the request for radio to make the notification for mutual aid to respond. ACC will make the notifications needed to get any nearby aircraft that may be in the immediate area of the fire to be moved as well, much of this will be done via the 800MHz radio system (POSFD Manual, 2014, p. 45).

In the case of a fire in the terminal, again incident command will be established and evacuation procedures will commence. The MES system and overhead PA systems will be used if the area of evacuation is large enough to need them. Command staff will be advised, and if necessary the request for mutual aid made as well. Depending on the location and size of the fire, a request may be made to contact the boiler room to have the ac systems shut down to prevent the circulation of smoke to other areas of the airport. Also if the fire is anywhere near the satellite train stations within the airport a request will be made by dispatch to ACC to shut down the trains until the scene is secure. Necessary measures will be taken to extinguish the fire and treat any associated injured parties (POSFD Manual, 2014, p. 42).

**CDC or possible infectious disease calls.** The Port of Seattle Fire department aid teams respond to thousands of aid calls in the airport every year(Compass, 2016). Many of these calls are from travelers who have been traveling on long flights from foreign countries. If these patients have arrived at Sea-Tac from abroad, and are experiencing flu like symptoms, the possibility of an exposure to a contagious disease is present. Aid teams will be advised by radio of the symptoms presented and the possible need for personal protective equipment(PPE)to be worn before contact. The dispatcher will also advise the caller to try and separate the ill person from other travelers until he can be checked out and cleared. If the aid team determines that there is a possible infectious disease present, the CDC will be advised and they will respond as well. At this point the fire command staff page will be sent as well as a notification made to the King
County Department of Health and any other requested agencies. Any passengers or employees who have had contact with the subject may also be quarantined until medically cleared (POSFD Manual, 2014, p. 15).

**Environmental hazards.** There are various types of environmental hazards that the fire department might need to respond on at Sea-Tac. The most common response is for fuel spills, most of which occur during the refueling of aircraft. The specific amount of fuel spilled, as well as the amount of water expended needs to be recorded and reported. The battalion chief will advise fire dispatch of the amounts, who will pass the information on to ACC for further disbursement. Any kind of foam or any other fire suppression chemical used by the fire department must also be reported to ACC for proper emergency notifications (POSFD Manual, 2014, p. 55).

**Other Emergency Notification Situations**

There are other situations that might occur at the airport that require the emergency notification pages to be sent out automatically by dispatch and/or ACC. This includes any time that CPR is performed on a call, whether by the aid team or an officer. Any requests made for mutual aid to come to the airport or for any off site response by our fire or police units requires a command staff notification as well. ACC will also send a page to their incident staff with various weather related emergencies, including lighting strikes and excessive snow or fog. A command page will also be sent out in the event of a massive employee shortage for whatever reason be it weather or illness related, as this is considered a staffing and safety emergency (POSFD Manual, 2014, p. 21).
Results of Research

The findings involved were determined after extensive research conducted into striving to answer the original research question about the use and effectiveness of the current emergency notification systems at Seattle-Tacoma International Airport. The findings were compiled with information gleaned from interviews with users and managers of the systems, extensive research of current literature on the subject, as well as the current procedure used for emergency notification in various types of emergency situations at Sea-Tac. The number of emergency notifications systems available to those who might need them at Sea-Tac, at first look, would seem to be sufficient as well as effective. For any type of unusual or emergency incident there are many different ways to notify managers, employees and passengers who may be involved or need information of some kind. However, research conducted shows the need for some revisions to make the emergency notification systems more effective and user friendly.

The observation made most by the users of the current emergency notification systems at Sea-Tac is regarding the large amount of inaccurate, incomplete and redundant information that is disseminated during an incident. Many times different pages are sent by different divisions to duplicate or overlapping command or incident groups. Because these messages come from areas who many times have access to different information, the information can be confusing and sometimes even contradictory. This is especially difficult for those whose job it is to be a liaison of some sort with other agencies or even the media outlets (Public Information Officer, personal communication, July 14, 2016). Dissemination of bad or incomplete information can result to the subjects reporting it as well as the agency that they represent.

Another problem identified involving the various divisions who might be involved with sending out notifications, in particular the use of the Everbridge notification
system, is the different levels of security clearance or training the employees or users might have. In many situations pages sent out by ACC employees are not complete because they do not have the security clearance to access much of the information in an event. This is especially true involving many police and fire/medical incidents that could occur. The dispatchers in the Police/Fire Communications Center have security clearances that allow them to be able to obtain criminal, personal and medical information. This security clearance, for a dispatcher, involves an extensive background and criminal history check as well as polygraph, psychological and drug tests. They also have the training to be able to determine which of these types of information can be disseminated, in what situations and to whom. Because of the access to this information as well as first-hand information from officers, firefighter and medical personnel, the Everbridge information pages sent out by dispatch are generally more complete, accurate and timely (Port of Seattle Emergency Management Director, personal communication, July 1, 2016).

The research conducted, and most of the literature accessed, also emphasized the need for a multilayered and cohesive system, because of the variety of emergency scenarios that might occur at any given time at Sea-Tac. The large number of people, whether employees or passengers, that come in and out of the airport facilities also require a system that can be modified at a moment’s notice depending on the detail of the situation at hand. These are just a few of the variables that require a large multi-use facility, like Sea-Tac, to have an adaptable and dependable emergency notification system available.

The various training and operations manuals, as well as the general airport emergency plans seem to be complete and easy to understand. While it would be impossible to have the manuals cover every possible emergency situation, the scenarios covered are varied and detailed enough that they could be adapted to fit most situations. Some users did advise that they felt that
there should be more training on the correct usage of the notification systems, possible refresher courses to cover any changes or updates, to make usage uniform across the board (ACC Director, personal communication, July 8, 2016). The research also determined that users, and the receivers, of the emergency notification messages sometimes felt confused by the information to be sent or the information that they had received. This information, in critical incidents especially, can be what is used to make important timely decisions related to evacuations, callouts or further emergency notifications. The importance of users understanding the correct usage of the systems, as well as what information is needed and who should be receiving it, is a crucial component to effective emergency management.

Research through all of those interviewed did determine that the various systems had experienced glitches, or failures at various times. None of the failures were reported to be for any extensive amount of time, and they didn’t appear to occur very often. Many of the incidents of down time were reported to be due to scheduled maintenance or updates. There were also some reports of problem with passwords or signing into systems at critical times, but those seemed to be unusual and appeared to be resolved quickly.

Some of the systems studied seemed to have similar possible uses or applications, making the probability of their being used congruently small. However, the possibly of having one of the redundant systems as a backup in the case of a catastrophic occurrence, like an earthquake of large plane crash, would make still make the redundant systems a valuable emergency notification tool. The availability of a backup Police/Fire Communication Center which would be accessed if the main center was disabled or even destroyed is another step to continuing radio and phone communication in the event of an emergency. Should both communications centers, the main and the backup, become unusable or inaccessible, there is a plan in place to move Port
of Seattle police and fire operation to a nearby King County Dispatch Center. There are also Mobile Command Post Vehicles available as well as other forms of temporary sites for needed command posts or other operational needs during a disaster (Port of Seattle Emergency Management Director, personal communication, July 1, 2016).

**Recommendations**

This research explored the current emergency notification systems available at the Seattle Tacoma International Airport in Seattle, Washington. The systems in use were studied in detail to determine their effectiveness in general, as well as to check for any deficiencies that their users may have been experiencing. By conducting interviews with various users and administrators of the current emergency notification systems this researcher was able to obtain information of how the systems are being used in practical everyday situations as well as in unusual or emergency scenarios.

In depth research was conducted by referencing the many training and operations manuals pertaining to the systems uses and applications. The Sea-Tac Airport Emergency Plan and Unusual Occurrence Manual were reviewed to determine policies and procedures set out for the many different types of emergencies that could occur here at the airport. The Port of Seattle Airport Emergency Plan as well as the national FAA guidelines were studied to determine if there were any issues with compliance there. The National Incident Management System (NIMS) and the Incident Command System (ICS) specifications were also accessed to compare with the actual procedures being followed at Sea-Tac in emergency situations. All procedures that were accessed and studied were in compliance with the guidelines and rules set out by these documents.
The current emergency notification systems at Sea-Tac all appear to have valuable components that can be utilized in various emergency situations. Due to the varying types and severity of the emergencies that can occur at Sea-Tac, many of the systems might not be used on a regular basis. However, all of the current systems have the possibility of being a critical component to an effective emergency notification at any time. There are some redundancies in some of the systems. The overhead PA systems, FIDS reader boards and MES evacuation systems all have the ability to get emergency messages out to the people at the airport. Even though they all have this feature, they are different in various ways and can be used at different times. The FIDS reader boards can be used to send out a visual message for those who are hearing impaired or in situations where messages can’t or shouldn’t be broadcast audibly. The MES Evacuation System can be used to send prerecorded or free form audible messages or just an audible alarm tone to several areas of the airport or to just one. This could be important when evacuation instructions or shelter in place messages need to be given out only in areas where a suspect might not be able to hear them and react. The overhead PA system can send customized audible notifications throughout the airport. This works well when trying to find a missing person audibly, or even when trying to get a particular emergent message out to the whole airport quickly. The reader boards run by the toll plaza are also a very effective tool to get information regarding an emergency or even a traffic situation to those trying to get into or out of the airport.

The ability to use the CCTV camera system is a great asset to the Seattle Tacoma airport. Whether being used to help look for injuries subjects, missing persons, unattended suspicious items, or outstanding suspect, the system is a valuable tool. The only recommendation to be given in this area would be a review of placement of the current cameras, as well as the possible
purchase of more cameras in general. These systems all work well and seem to be used for the reasons they were designed to be.

The 800 MHz radio system seems to work well for all situations, whether they might be routine or emergencies. The fact that the public safety agencies who work at the airport, as well as those working in airport operations and any incoming mutual aid agencies can use them to communicate effectively saves time and thus lives.

The breach and panic alarms systems are effective systems to get urgent information or notification to the Police/Fire dispatch center almost immediately. The system allows for the location of the occurrence to be seen immediately and a picture of the breach suspect to be sent in a timely fashion to assist with locating them quickly. The only recommendation for this area would be to do periodic training on the system and its prescribed use for all of those involved. This would be especially true for TSA employees as they are many times the first contact when a security breach occurs. Running drills and testing the alarms on a daily basis, while rotating those employees participating from public safety as well as TSA, would allow for more participants and a better overall understanding for more employees as to how the system works. This will help alleviate the possible confusion and panic experienced by many employees as evidenced in the case study reference the TSA shooting at Los Angeles International Airport.

The Everbridge emergency notification system appears to be the most used system at Sea-Tac. This system is used for many different types of notifications by various divisions in the airport. Two of these users, ACC and the Police/Fire Communications Center, are the most frequent users of Everbridge. These two divisions have different command and incident groups that they send notifications to frequently. The problem seems to be that the members of the groups can overlap causing redundancy and confusion. The recommendation here would be a
review of the different groups and their members needs for specific information in particular situations. If it is possible the groups might be restructured to eliminate duplication and confusing information being sent out. Another review could be done of the types of pages that are being sent by each division to determine if they can be restructured as well, eliminating the cross notification that seems to be occurring. It would also be worth looking into possible upgrades in the actual Everbridge system, which occur frequently, to see if these problems can be addressed by programming or other changes.

The use of social media for notifications to the public is new at Sea-Tac. The social media representative has begun to use Twitter and Facebook to put out important information. The recommendation in this area would be to continue to expand this practice as social media is a very effective way to reach a large amount of people in a very short time. This would include people at the airport, as well as those enroute to the airport.

The original question being researched for this document was that of the effectiveness of the emergency notification as well as the possibility of using a centrally located, one stop shop as it were, for the emergency notification systems at Sea-Tac. The research has proven that the current systems are effective, but can be improved with possible minor modifications and extensive training for those who use the system, whether they are sending or receiving the notifications.

The question of having a centrally located emergency notification hub, doesn’t seem to be a practical one at this time at Sea-Tac. This conclusion was reached by looking at the many different emergencies possible the different emergency notification procedures involved with them. The fact that, in particular ACC and Police/Fire Dispatch use the systems so frequently for different notifications is one of the problems. ACC makes many notifications for a large amount
of situations that the police and fire department have anything to do with. ACC also monitors many of the CCTV cameras on a regular basis as well as dealing with maintenance issues and other activities around the airport and on the airfield. ACC employees don’t have the security clearance to obtain, review and disseminate all of the sensitive information that the police and fire dispatchers have to. Because of this, ACC couldn’t be the designated central hub for emergency notifications. On the other hand, the Police/Fire Communications center doesn’t have access to all of the cameras and PA systems that ACC does, nor would they have time to monitor it closely or to send out frequent necessary announcements over the PA. The dispatcher has to work the emergency situations while sending command pages and making other notifications. They also monitor the fire alarm system and the MES evacuation system. These duties would make it impossible for the dispatcher’s center to be a good place for a centralized emergency notification hub as well.

The recommendations as far as implementing one centralized emergency notification hub is that it wouldn’t be effective or feasible at this time for Sea-Tac. Further research might be suggested into the possibility of increasing the security clearance of ACC employees to allow them access to more sensitive, but sometimes pertinent information.

At this time the original research question has to be divided into two parts to be answered. The answer to the question of the effectiveness of the emergency notifications systems at Sea-Tac is, yes the systems are effective. The answer to the question of the possibility of having a centralized emergency notification hub somewhere within the airport is, at this time, no. The research conducted does not show this to be a feasible alternative at this time.
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Appendices

Appendix A: IRB Approval

Institutional Review Board (IRB)

Application Number: 5-2016-47
Application Title: Building a Comprehensive Emergency Notification System in a large multi-use facility

June 9, 2016

Dear Tammi Zufall:

The APUS IRB has reviewed and approved the above application.

Date of IRB approval: 6/27/2016
Date of IRB approval expiration: 6/26/2017

The approval is valid for one calendar year from the date of approval. Should your research using human subjects extend beyond the time covered by this approval, you will need to submit an extension request form to the IRB.

Changes in the research (e.g., recruitment process, advertisements) or informed consent process must be approved by the IRB before they are implemented. Please submit a protocol amendment form to do so.

It is the responsibility of the investigators to report to the IRB any serious, unexpected, and related adverse events and potential unanticipated problems related to risks to subjects and others using the unanticipated problems notification.

Please direct any question to apus-irb@apus.edu. The forms mentioned above are available at http://www.apus.edu/community-scholars/institutional-review-board/apply.htm.

Sincerely,

[Signature]

Jennifer Douglas, PhD
IRB Chair
Appendix B: Research Instrument

Research Instrument for Master’s Thesis  Tammi Zufall

What is your job title?

How long have you been working in this job classification?

What emergency notification systems do you use in your work at the Port of Seattle?

How often do you use this system(s) and for what type of situations?

Do you know what populations that systems use was originally intended to reach?

What problems, if any, have you encountered while using the system?

What changes or modifications, if any, would you like to the current system?
Appendix C: Informed Consent Form

Consent form for Research Regarding Emergency Notifications Systems at the Seattle-Tacoma International Airport

Welcome to “Research regarding the Emergency Notification Systems at the Seattle Tacoma International Airport,” a look at the current systems available, how they work, and possible improvements. Before taking part in this study, please read the information below and sign at the bottom of the page that you understand the statements and freely consent to participate in the study.

This study involves research related to the current emergency notification systems at the Seattle-Tacoma International Airport. The study will look into the current systems, how they operate and possibly future needs. The study is being conducted by Tammi Zufall and overseen by Faculty Advisor, Deborah Laufersweiler-Dwyer and it has been approved by APUS Institutional Review Board. No deception is involved, and the study involves no more than minimal risk to participants (i.e., the level of risk encountered in daily life).

Participation in the study typically takes approximately 60 minutes and is strictly confidential. Participants will begin by answering a series of questions related to their particular job and their use of Emergency Notification Systems at the Seattle-Tacoma International Airport.

All responses are treated as confidential and in no case will responses from individual participants be identified by name, only job title or description.

Participation in this study should be enjoyable, and no adverse reactions have been reported thus far. Participants in this interview process have the opportunity to help contribute to the research that could help improve the emergency notification systems that they themselves use.

Participation is voluntary, refusal to take part in the study involves no penalty or loss of benefits to which participants are otherwise entitled, and participants may withdraw from the study at any time without penalty or loss of benefits to which they are otherwise entitled. Participants have the ability to skip any questions in the survey.

If you have further questions or concerns about your rights as a participant in this study, contact the American Public University System, IRB Chair at apus-IRB@apus.edu.

By signing below I verify that I am 18 years of age or older, understand the statements above, and freely consent to participate in the study.

_________________________________________  __________________________
Signature                                                Date
Appendix D: Letter of Permissions

Port of Seattle

P.O. Box 6927
Seattle, WA 98101
Tel: (206) 787-3400 Fax: (206) 787-4068
www.portseattle.org

June 10, 2016

To Whom it May Concern:

Tammi Zufall has my permission to interview Port of Seattle employees about the various emergency notification systems in use at the Seattle-Tacoma International Airport.

Sincerely,

Kathy Baskin
Police / Fire Communications Center Manager ~ Technology Liaison
Port of Seattle Police Department
p: (206) 787-4457
c: (206) 437-6914
e: Baskin.k@portseattle.org

Port of Seattle