Risk Assessment

Security and Risk Analysis

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I. Introduction

In this risk assessment report, different risk scenarios will be outlined that can be involved in a Carnival Cruise Line lifeboat evacuation plan. There are many important pieces that need to go together in order to have a successful lifeboat evacuation plan. This risk assessment will look into five major risk scenarios that are believed to the most hazardous, if they happen.

Evacuation from a cruise ship is hazardous, especially when the evacuating passengers do not take the practice procedures seriously. That being said, it is very important to look at the risk scenarios laid out. As a "Carnival Maintenance and Inspection Team" employee there are many moving parts that need to be addressed. Boat availability, launch system, and having a well prepared crew are just a few of the important parts of the evacuation process that needs to be mastered and hazard proof to ensure the safety of passengers. This report will continue to discuss many of the other parts included in the evacuation plan and the possible complications that cause a domino effect preventing a safe evacuation. In addition, how to avoid pitfalls and allow a safe and successful evacuation is what will be presented.

In the risk assessment approach there will be details, research, and risk controls that will be looked at for creating a successful evacuation of a cruise vessel. This assessment looks that the purpose of why this risk assessment is needed, and the scope of the assessment. The assessment will go deeper into the hazard identification process that was laid out in this assessment and includes a risk matrix introducing the levels of risk and how the risk rating was determined. The included scenario ratings are expressed in the text along with corresponding diagrams with the recommended risk controls in a given situation. The threat statement section explains the potential threats in the risk assessment. The following sections elaborates in detail about the appropriate risk controls and which scenarios take priority.

The main part of this assessment is to also look at possible controls that can be implemented to make sure none of these scenarios happen, and looks at the possible vulnerabilities of these scenarios. With the five major scenarios laid out, the current risk controls that are in place for each will also be discussed, showing where some faults are, and where and how each scenario can happen. Then the final section of the report goes into the what controls should be in place, what the likelihood of each scenario is, and the impacts discussion and evaluation.

A) Purpose

Conducting a risk assessment plays a very important and extremely crucial role because risk assessments are an important part of maintaining good health and safety, and for maintaining that no hazards happen. Also when conducting a proper risk assessment, the assessment could save many lives in this case, or could save valuable assets in other cases. The purpose of this risk assessment is to look into, identify, compare, and prevent any risks that are involved in Carnival Cruise Lines evacuation plan. Since there are many, many risk that can go on within the evacuation plan, this assessment will focus mainly on the lifeboat aspect, and will dive deeper into five main scenarios.

Risk assessment plays an important role in Lifeboat Services on a Carnival Cruise Ship. When organizing lifeboats for evacuation and striving for a maximum risk of survival the crew

has to think of many properties (Also noted in **Appendix A**). Confirming enough boat availability for passengers along with a smooth launch system and crew, communication, navigation, drop zone, survival equipment, and knowing how to get help if stranded on a lifeboat (Aktiengesellschaft, 2016). The risk assessment will be from the protector view of the Carnival Maintenance and Inspection Team Supervisor. This role was chosen because people that follow the evacuation plan rather than manage it. This will give the assessment a good perspective and selling point for Carnival Cruise line, if the maintenance crew has a working and secure plan if an incident occurs when everyone would need to get on a lifeboat.

B) Scope of the Risk Assessment

The scope of our risk assessment is to evaluate all the risks that are involved with Carnival Cruises lifeboat evacuation plan. As seen in **Figure 1,** the risk assessment will look at the most important risks that involved with the plan, which include what would happen if the lifeboat pulley system were to fail, if someone tampers with the lifeboat drop mechanism, lifeboat open/close hatchet failure, a passenger falling overboard during the evacuation drill while trying to go aboard a lifeboat and what were to happen if the lifeboat are is inaccessible.

Referring to **Figure 1**, is a chart for total firm risk, where there are many inputs that can be looked at which involve different risks, and what could happen via each risk. For this risk assessment, operational risk is what will be focused on.

The risk assessment scope doesn't include the parts of the lifeboat evacuation plan that are reliant on the guest aboard. This risk assessment is aimed to mainly look at the risks from a maintenance crew point of view. Some assessments that wouldn't include, are not limited to, what guests are supposed to do during an evacuation plan, the crowd control of the evacuation plan, and anything else along those lines.

Figure 1: Total Firm Risk Chart
(http://www.personal.psu.edu/ejg8/class/sra311/Wk01_AssessmentRiskTypes.jpg)

II. Risk Assessment Approach

A. Student Biographies

Ed Quinn and Ajay Kapur conducted this risk assessment. Both students are juniors in the College of Information Sciences and Technologies at The Pennsylvania State University.

Ed Quinn is currently studying as a Security and Risk Analysis major working to obtain an IST minor. Ed is working towards the Information & Cyber Security (ICS) option in SRA. Ed is a team player who is motivated and hardworking as well as experienced in the IT field. Ed has worked for over a year with the Penn State Help Desk team and worked over the summer with New Pig as an IT Intern.

Ajay Kapur is also studying Security and Risk Analysis with a Information Science and Technology minor. This past summer Ajay had an internship at Nutrisystem at Fort Washington PA, under the role of Securities Intern. Someday Ajay hopes to build a career at Google, Inc. and live in California. Ajay works great on a team, giving any input that he believes would be beneficial.

B. Hazard Identification Approach

For the risk assessment there was a three-part hazard identification process that was used. This approach involved a literature review, structured analytics, and a photographic investigation. The articles and topics investigated show how to identify hazards before occurring. For example: inspecting the lifeboats each year and checking each survival kits expiration dates and replacing those that are expired lessens the possibility of a defective survival tool (Bianchi & Cecchi, 1).

First, in the literature review phase of the three-part hazard identification process as a helpful tool for reviewing findings based on the current knowledge of each contribution in the Input-Output-Diagram. This diagram helps Analysts productively review and identify hazards in each input phase of the diagram. Please also refer to **Appendix A** for the further review of the literature evidence used in this assessment.

Next, the structured analytics contributed to developing the risk factors involved with the Carnival Cruise line. It is important to note the key factors and statistics that could contribute to identifying hazards. This step in the approach will allow the group to brainstorm ideas on how to diverge these potential or present hazards in a later phase. Please refer to **Appendix B** for the two part steps used for the structure analytics. The first step divergence, is idea generating, without any criticism or constraints, next is convergence, where the ideas are grouped and ranked. Then generating a report prioritizes the risk factors that need to be looked at first and separate the ones that don't pose a threat to the project and can wait.

The final process is a virtual site visit, in which the analyzation of photos is done. The analyzation was done on **Figure 2** which shows an updated version of cruise ships lifeboats and how these could reduce risk with easier installation, and less maintenance than the normal industry lifeboats. With these updates to the lifeboats, the size of the lifeboat can save more people, and with less maintenance time, these lifeboats would reduce the risk and the likelihood of a risk.

Figure 2: Solutions for lifeboats (Bianchi and Cecchi, 2016)

C. Risk Matrix

Figure 3 is the risk matrix that will be used to evaluate each risk's impacts and their likelihoods. The X axis represents the probable impacts rated from one (being a low impact) to three (being a high impact), and the Y axis represents the likelihood, also rated from one (low likelihood) to three (high likelihood). Each cell multiplies the impact rating and the likelihood rating to come up with a number that'll then represent if there's a low, medium or high likelihood of happening.

The green cells that are represented show low risk events, and has a numerical value of 1 to 2. An example for a low likelihood the lifeboat entrance/exit hatchet is broken, where the passenger is no longer able to enter or exit the lifeboat. This would be rated as a low impact, and

a low likelihood situation. The next color yellow, represents medium impact events and medium likelihood of happening and is represented by numerical values 3 to 4. Some example of medium likelihood and medium risk would be a lifeboat pulley system failure, or a passenger tampering with the lifeboat mechanism. These two incidences would each have a medium impact level but different likelihoods.

Another part of the yellow is rare likelihood and high impact. These are numerically represented by the numbers 6 to 9, and an example of this would be if a passenger fall overboard while trying to enter a lifeboat, or if the lifeboat area, or the lifeboat itself, is inaccessible. In this case, the likelihood of this happening is very rare, but in the event of this happening lives could be lost, and panic could increase which would make the situation worse. For risks like this, the authors think that some form of mitigation to be taken place, so that this situation would never happen.

Finally the red indicates very likely and a very high impact. An example of this would be a the lifeboats fuel being past its expiration date. This is very likely if lifeboat service does not inspect the lifeboats properly, and since that fuel does not last forever, it could go bad. In a case like this it would have high impact because then the passengers would have no way to get to safely, other than letting the oceans natural current take them. The authors believe that risk mitigation is also recommended for events with high likelihood and impact to reduce the likelihood of such disasters happening.

Figure 3: (Kapur, 2016)

III. System Characterization

This risk assessment focal point is on the passengers safely boarding the lifeboats, exiting the vessel into the water, and subsequently getting rescued to get home safely. The input for this system is the in-flow of passengers loading into lifeboats. The process is composed the steps taken to effectively get passengers into the lifeboats. This includes following directions such as lining up in your designated area, properly fastening lifejackets, calling for support, deploying into the lifeboat and helping others, and waiting for rescue once all members are safely aboard the lifeboat. The output of this system consists of the passengers arriving safely at shore or home. The procedure can be viewed below in **Figure 4.**

Figure 4: Input output diagram (Quinn, 2016)

IV. Threat Statement

A threat is defined as "any circumstance or event with the potential to adversely impact organizational operations and assets, individuals, other organizations or the Nation through an information system" (*Gaithersburg, 2012).* This definition is defined by NIST Special Publication 800-30 Revision 1. Risk is also set into three different categorizes which include natural threats, human threats, and environmental/system threats. natural threats include anything that happens in nature (natural disasters). These threats can be traced to certain degree, and can only be prepared for to a certain degree. Human threats are events that are done, or enabled by humans, can either be accidental or intentional. Finally, there is environmental/system threats which can include power failures, chemical leaks, and pollutions. In this risk assessment, each type of threat is accounted for, which are summarized in **Appendix C: Threat Analysis.**

There's five different main risks that are looked at in this risk assessment. Each of them fall under the three different categories, natural threat, human threat, and environmental/system threats. The systems threats include lifeboat pulley system fails which can cause many types of risks. If this threat occurs, the lifeboats have potential to drop on its own, or not drop at all when needed to be dropped (Sanders, 2016). Another system threat would be the entrance/exit hatchet on sealed lifeboats are inaccessible. This threat can cause problems when someone is trying to enter the lifeboat when there is an evacuation. The human threats that are involved include someone tampering with lifeboat systems, and a passenger falling overboard when trying to access the lifeboats. If someone tampers with the lifeboat, this can cause many issues during an evacuation drill (Sanders, 2016). A passenger falling overboard can be both human and natural causes and can be a big safety concern. Finally, a natural cause is lifeboat area inaccessible for reasons like a fire can breakout where lifeboats are held, or if a lifeboat gets involved in a hurricane and the winds are powerful enough to break a lifeboat off the boat. Each threat that's stated will be examined and looked at in further detail.

V. Risk Assessment Results

The serious risk factors involved with the lifeboat evacuation plan for Carnival Cruise Line was organized. Each risk that is included are either human, natural or environmental/system threats, that after some planning and extra measures can be avoided (Sanders, 2016). This part of the risk assessment outlines each main risk, and goes in depth about what existing risk controls are in place, the likelihood, the impact if the threat happens, its risk rating and what new treatments can be in place.

A. Lifeboat pulley system failure
B. Passenger tampering with the lifeboat system
C. Passenger falling overboard while entering lifeboat
D. Hatchet failure
E. Lifeboat area inaccessible

A. Vulnerability Analysis

In this risk assessment, the threat is not being able to successfully get the passengers and

crew evacuated safely. Based on the definition of a threat by NIST Special Publication 800-30 Revision 1. The threats stem from various causes, anywhere from human error, to natural causes, and system error. Carnival Cruise Line has a number of scenarios where failure can occur during its evacuation procedure.

Human error, natural causes and system error are all threats that can be prevented. In the first risk involves the lifeboat pulley system. In a crisis situation the lifeboat could fail to drop down, drop down only part of the way to the water, or drop unexpectedly in a non-crisis situation (McComb, 1932). Next, a human threat, is someone tampering with the lifeboat mechanism unintentionally, such as a wandering child tinkering with the system. The third risk is a system threat where the hatchet on the lifeboat failing where passengers cannot adequately get inside or out of the boat (McComb, 1932). The fourth risk is a passenger falling overboard while entering the lifeboat. This is a human and natural threat there needs to be a procedure in place for safely retrieving an overboard passenger specifically during an evacuation. The fifth risk is the lifeboat area being inaccessible entirely (Sanders, 2016). Due to natural causes the lifeboat loading area could be inaccessible due to fire or damage and debris. All of these threats have interferences with the evacuation procedure put in place. Below, in **Appendix D**, it shows the vulnerabilities, sources, and actions that are included in the Carnival Cruise Line evacuation plan. There needs to be a backup scenario where if these threats do occur that a modified procedure is followed based on the threat occurring. These threats can lead to death or injury of a passenger trying to evacuate specifically risk one, two and five where a passenger isn't able to evacuate at all due to complications.

B. Existing Risk Controls

Currently, the risk controls in place for evacuating a cruise ship is a manual option for deploying the lifeboats. For instance, a manual free fall of lifeboats would overcome the complication of the lifeboat pulley system. However, a cost benefit analysis is crucial when determining if it is necessary to utilize a risk control as such. There can be numerous injuries that occur with a free fall but weighing the potential loss of life or inability to evacuate at all it might be in the best interest of survival to do a manual free fall of the lifeboats in order to get passengers off the vessel and safely afloat (McComb, 1932).

In order to minimize the probability of passengers not being able to evacuate successfully there are sufficient safety preventative measures and risk control strategies that can be put into place in addition to the "manual" risk control noted above. A design for a lifeboat pulley system that is both child proof but easy and smooth during evacuation is important. A risk control as simple as a roped off barrier can block children from entry but allow a sufficient adult to cross and assist in the deployment of the lifeboats (McComb, 1932).

C. Risk Scenario Likelihood: Discussion and Evaluation

The likelihood of the threats in **Appendix F,** rates the scenarios on a scale of low, medium, and high. **Appendix F,** was utilized when determining the risk assessment portion of the Carnival Cruise Line evacuation plan. These threats have been evaluated and the fall into the respective category based on the probability of their occurrence.

Specifically, it is unlikely to have a passenger tamper with system equipment with a well

trained staff and crew on board the vessel. In addition, a lifeboat pulley system failure and hatchet failure are passable during an evacuation but not incredibly likely as the lifeboat pulleys are inspected regularly and built for situations as such. Lastly, an overboard passenger and inability to access the lifeboat loading area are crucial threats to an evacuation plan. These are extremely probable threats based on the risk assessment and an entirely new procedure will have to be followed in order to safely evacuate.

D. Risk Scenario Impact: Discussion and Evaluation

Each risk has different likelihoods, either low, medium or high (**Appendix E)**, this section outlines each of the risk impacts. the Impacts for each of the different risk are outlined in **Appendix F** and have different ratings for each risk.

The impact is entirely separate from the likelihood. The risk scenarios received different levels of risk impact based on how much of an impact each threat would have. All of the risk scenarios can have a dramatic impact on the evacuation plan but with the risk controls currently in place the impact varies. For example, the hatchet failure is a medium likelihood of failure during an evacuation, but in terms of the impact it'll have on the overall evacuation is minimal. Passengers were still able to aboard the boat, be lowered into the water, and steered away by motor successfully. Whether or not passengers are able to go to the underside of the boat through the hatch is not much of a concern at this time. With this being said, taking a look at **Appendix F** this risk scenario would get a impact level of one.

The lifeboat pulley system and tampering with the mechanism scenarios were rated differently on likelihood but are both marked as medium for the impact. With the risk controls in place, these are both possible impacts to the evacuation plan where it would need attending to, such as using a manual lever for dropping the lifeboats. Since the lifeboats wouldn't deploy properly because of a defective mechanism or because since the boats were possibly tampered with. This wouldn't take priority as there is an alternate procedure in place for both of these scenarios (Gaithersburg, 2012). Although these scenarios, are low and medium likelihood their impacts levels are both two.

An overboard passenger and inaccessible lifeboat area are both marked as a high risk rating due to their impact on the evacuation plan. Both marked as high likelihood and high probability these are both scenarios that require the utmost attention and care when executing the evacuation plan. There are numerous possibilities as to the temperature of the waters, and how high the passenger is compared to water level. Whereas if the passenger fell, injuries the passenger may possess, marine life may play a role, the passenger can land on debris, or if close enough can be sucked in by the motors (Gaithersburg, 2012). The bottom line is that a trained crew or passenger needs to safely retrieve this person from the water as a priority over any other task. Also, not being able to access the lifeboat area changes the whole plan entirely which concludes that these both have a huge impact on the evacuation plan. These scenarios get a impact level of three, or the highest impact.

E. Risk Rating

The impact the risk scenarios can have on the evacuation plan of Carnival Cruise Line is as follows, low ranked impact is recorded as a level one, medium impact is recorded as a two, and

high impact is recorded as a three. Refer to **Appendix F** for each impact level. Risk likelihood is ranked as follows, low likelihood is a level 1, medium likelihood is a level two, and high likelihood is a level three, refer to **Appendix E** to see the scores there.

The risk ratings are then found using the table in **Appendix G**, by multiplying the risk likelihood by the risk impact, which is shown in **Appendix H.** The risk ratings for tampering with the pulley systems and lifeboat hatchet failure are both rating two . The risk rating for pulley system failure would be a risk rating of four. Finally a passenger falling overboard and the lifeboats being inaccessible would receive a rating of nine. According to **Appendix I,** a rating nine would fall into the High Risk category.

F. Recommended Treatments/Controls

The recommended controls for the Carnival Cruise Line Evacuation Team are related to preventing failures of systems and managing the safe operation of the mechanisms. The most efficient way to control the evacuation plan is to use the risk control, mitigate. For example, in order for the lifeboat to not drop on its own implementing an extra set of locks would ensure that it would hold the lifeboat and prevent it from falling without human intent. This scenario is ideal for minimizing the risk of the lifeboat falling to the ground or water unexpectedly (Gaithersburg, 2012). Mitigation also works for a high risk scenario such as a passenger falling overboard while trying to load the lifeboat is has a high impact on the evacuation effort and the focus will turn to saving the person from the open waters rather than evacuating passengers (Gaithersburg, 2012). Participating in practice drills and following all of the rules discussed will minimize the likelihood that a passenger goes overboard in the evacuation process.

Lastly, following the instructions of the captain and crew is crucial. This is a mitigation strategy to educate passengers in order to be prepared for potential scenarios in a crisis (**Appendix I**). If everyone follows the instructions practiced and were told the risk of failure is minimized drastically. Based on results in studies from (Lambert 2016), following instructions are in place for safety and minimizes the risk of error happening to the user.

VI. Summary

This risk assessment classifies the five different risk scenarios for the purpose of the evacuation plan utilizing lifeboats onboard Carnival Cruise lines. These different scenarios were all looked at in terms of what existing controls were in place already to prevent such scenario from happening, the likelihood of each scenario happening, the impact that the scenario would have, the rating of each scenario, and finally some recommended controls of how to stop the scenario from taking place.

The lifeboat area being inaccessible and an overboard passenger during an evacuation both have a high impact on the success and safety of the passengers. Given the event that one of these occur the attention of the evacuation team and crew members would be required to be directed at these events. This would take away from the efficiency of deploying the lifeboats through the default evacuation plan (McComb, 1932). The evacuation plan would have to be tweaked to each of these scenarios but with adequate preparation of these scenarios especially the high impact ones can help minimize the risk of passenger injury.

The risk scenarios were assigned values and range from low, medium and high relating to the likelihood and impact of these events. The most practical risk control to be used is the mitigation control. Minimizing the risk of high impact events would lessen the risk of failure. After assessing the different risk controls unfortunately there is no way to avoid or transfer the risk on Carnival's Cruise vessel (McComb, 1932). The best way to approach a risk control in an evacuation plan is to minimize all of the risks using the mitigation control.

The risk scenarios were then rated based on the likelihood rating times the impact level, and that number was translated into their risk rating. This risk rating is then compared to the risk matrix and this comparison was used to find recommended controls to prevent each scenario from happening. The different control layout are different for each five scenarios but all have one common goal in mind, and that’s to prevent any risk from breaking out.

Reference List

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Appendix A: Literature Evidence

In order for the cruise ship to leave and be adequately prepared for worst case scenario there's a mandatory "dry run", running through the evacuation procedures without actually performing them so the passengers have an understanding of their role if the situation arises.

- "Lifeboat Embarkation." *The Royal Institution of Naval Architects -RINA*. N.p., n.d. Web. 15 Sept. 2016. http://www.rina.org.uk/lifeboat-embarkation.html

- Bianchi, and Cecchi. "Lifeboat Inspection." *Bcserviceinc*. Bcserviceinc, n.d. Web. 5 Oct. 2016. <http://www.bcserviceinc.com/glossary/lifeboat-inspection>.

Typically, a lifeboat is arranged so that it can be boarded within 10 minutes. Depending on the size of the cruise ship lifeboats will be equipped to carry more or less passengers. Larger ships allow a 150-person capacity in lifeboats. Being able to get 150 people loaded onto a lifeboat in under 10 minutes requires a precise system. The issue most concerned with testing this system is that testing lifeboat mechanism and boarding system is usually tested in daylight in good weather with disciplined volunteers that are healthy and strong. Following lifeboat inspection procedures is necessary to ensure the protection of individuals in a crisis situation. Fuel tanks must be cleaned and refilled, fresh fuel must be inserted. These boats must be thoroughly inspected and repaired as needed each year. Each piece of survival equipment has an expiration date stamped, and during each inspection, equipment close or past the expiration must be replaced. In addition, batteries must be inspected, cleaned and replaced if past the expiration date. These are necessary steps that are taken by a crew that is committed to keeping the lifeboats at their best level of performance in providing safety to passengers aboard carnival cruise line.

Appendix B: Structured Analytic Evidence

Carnival Cruise Evacuation Hazards

Divergent Results

- *Crew not properly handling crowd control*
- *Passengers not following their evacuation instructions*
- *Lifeboats not deploying properly*
- *The hatch getting stuck*
- *Lifeboat not dropping on its own*
- *Lifeboat not dropping at all*
- *Lifeboat area inaccessible due to natural causes*
    - *Fire*
    - *Powerful winds ripping off lifeboats*
    - *Crashed ship and loading area for lifeboats is inaccessible*

Convergent Results

- *Pulley mechanism was tampered with*
- *Crew didn't guard the system strong enough*
- *Passengers and Crew skipping steps*
- *Children tinkers with the system*
- *The reach throw row go method not followed if someone goes overboard*
- *Retrieving an overboard passenger safely in safe conditions*
- *Managing situations in order of priority and overall safety of passengers*
    - *This includes making tough decisions about life and death*
- *Making sure yourself is safe before helping others*
    -

Appendix C: Threat Analysis

Below is **Table 1** which outlines each threat (where the potential harm is coming from), motivation (why the threat is taking place/carried out), and finally the actions (what would happen if the threat is successful). The information in **Table 1**, applies the materials discussed in **IV. Threat Statement.**

Table 1: Threat, Motivation, and Action (Quinn, 2016)

Appendix D: Vulnerability Analysis

Appendix D: Vulnerability Analysis

Table 2 demonstrates the vulnerabilities, sources, and actions that can occur during the Carnival Cruise Line evacuation plan. The different scenarios are related to the result of the weakness that requires a different approach all with the same goal of evacuating the vessel safely.

Table 2: Vulnerability, Source, and Action (Quinn, 2016)

Appendix E: Risk Scenario Likelihood Scorecard

Below is **Table 3** which outlines each threat (where the potential harm is coming from), motivation (why the threat is taking place/carried out), and finally the actions (what would happen if the threat is successful).

Table 3: Risk likelihood of each scenario

Appendix F: Risk Scenario Impact Scorecard

Table 4 assess the threat and impact level for each given risk scenario on a Carnival Cruise lines. Each impact level is rated from 1 (low), 2 (medium) or 3 (high). These impact levels shows how big of a impact each scenario would have, if the scenario were to happen.

Table 4: Risk impact level

Appendix G: Risk Matrix

Table 5 is the risk matrix that is the process of determining the overall risk of each threat. The

Table 5 is the risk matrix that is the process of determining the overall risk of each threat. The impacts and likelihood were each assigned a number rating of one, two or three, corresponding to low, medium, or high. However, an event can have a high likelihood with a low impact as well as a high impact but a low likelihood, etc. This diagram is crucial when determining the risk rating values of the scenarios .

Table 5: Risk Matrix

Table 6: Risk Matrix Value Interpretation

Appendix H: Risk Rating

Table 6 shows the final risk rating of each of the threat scenarios. The rating is organized

by row multiplying the likelihood by the impact to determine the total risk rating value. The values being used in this calculation are associated with the values provided in in **Appendix G.**

Table 7: Risk Scenario Rating of Likelihood of Impact

Appendix I: Safeguard Implementation Plan

Table 7 shows the safeguard implementation plan, which includes the risk scenario, risk

rating, the recommended controls, the action priority, required resources for each scenario, the responsible party, and finally the maintenance requirement. The responsible party is important to who will take ownership of a failure that is controlled by the crew. It is best that since the crew is monitoring the behavior of individuals and how well crowd control reflects the success of the evacuation. The crew will be the party taking responsibility of the success or failure of the evacuation due to being in charge of the flow of the routine.

Table 8: safeguard implementation plan

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knowledge and APA citations. Write <u>specific</u> comments into student's paper.

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