

Running head: RESPONDING TO AN AIRCRAFT CRASH

Responding to an Aircraft Crash – Are we ready?

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CERTIFICATION OF STATEMENT

I hereby certify that this paper constitutes my own product; that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions or writings of another.

Signed \_\_\_\_\_

### **Abstract**

This research paper seeks to identify requirements for the St Lucia Fire Service to effectively provide aircraft fire and emergency service at the Hewanorra International Airport, which has been granted Category 9 status by the International Civil Aviation Organization (ICAO). The methodology used for this descriptive research paper involved a literature review of the various standards and regulations and guidelines that speak to aircraft rescue and firefighting, books, periodicals and internet searches. Correspondingly, a questionnaire and personal communication were also used to assist in answering the ensuing research questions:

- (1) What are the skills and competencies required to be an effective Aerodrome Fighter?
- (2) What is the staffing requirement for a category 9 airport and how is it maintained?
- (3) What are the prescribed quantities of extinguishing agents for the maintenance of category 9 status?
- (4) Will the used bunker gear being issued to airport firefighters provide adequate protection to officers in the event of an aircraft crash?

The results reveal a frightening gap between what is required for effective and efficient mitigation of aircraft emergencies and what currently exist. The researcher recommends that the St Lucia fire department adopt the NFPA standards as the legal standard governing the fire and emergency services. Also, there should be a more comprehensive and diverse approach to aircraft firefighting training, especially at the recruit academy. An incremental approach to outfitting firefighters with the appropriate PPE was also recommended.

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## Introduction

Responding to an aircraft crash may likely be one of the most challenging, dangerous and physiologically impacting experience a firefighter may encounter during his career. According to the Coalition for Airport and Airplane Passenger Safety (CAAPS), the potential for disasters have increased significantly in recent years because currently planes are carrying larger numbers of passengers, often flying to and from facilities not equipped or staffed to handle this increase in traffic. More specifically, these facilities are all prepared to respond to aviation accidents because they are operating under outdated regulations designed when fewer travelers were flying in smaller aircrafts handling far less traffic than is the case today.

The St. Lucia Fire Service (SLFS) is mandated to provide fire and emergency protection services to the Hewanorra International Airport to enable it to operate at category 9 as stipulated by the International Civil Aviation Authority. The problem is that the St. Lucia Fire Service does not have the required resources and capabilities to respond to a major aircraft fire or serious emergency at the airport.

The purpose of this research is to identify what is required for the St. Lucia Fire Service to effectively and efficiently provide aircraft fire and emergency services at a category 9 airport. Descriptive research will be employed to answer the following questions:

- (1) What are the skills and competencies required to be an effective Aerodrome Fighter?
- (2) What is the staffing requirement for a category 9 airport and how is it maintained?
- (3) What are the prescribed quantities of extinguishing agents for the maintenance of category 9 status?

- (4) Will the used bunker gear being issued to airport firefighters provide adequate protection to officers in the event of an aircraft crash?

### **Background and Significance**

Often referred to as the Helen of the West, St. Lucia is located between the islands of Martinique and St. Vincent and northwest of Barbados. Prior to 1995, the island's main economic activity was agriculture, with banana production contributing ninety-five percent (95%) of the revenue earned from this sector. However, due to increased competition from Latin American bananas and the landmark ruling by the World Trade Organization that the preferential treatment enjoyed by the Windward Island bananas from Europe contravenes fair trade practices; the island has been forced to seek alternative economic activity for survival. As a result, tourism has now emerged as the leading contributor to St. Lucia Gross Domestic Product for the island. According to the economic and social review for the first half of 2010, estimated visitor expenditure amounted to three hundred and five point eight (305.8) million dollars with most of the tourist originating from the United States, Canada and the United Kingdom.

Hewanorra International Airport serves as the main port of entry for visitors into the island. The United States Army Air Force completed the construction of the airport on 15<sup>th</sup> November 1942, naming it Beanfield Air Field. In their book, "A History of St. Lucia," Harrison, Ellis and Devaux (2012) reported that, "the base consisted of 350 buildings, two 5,000 ft. concreted runways, with taxiways, hardstands, revetments, two nose hangers and other air corps maintenance buildings". In March 1943, Beanfield was activated with a mission to defend St. Lucia against enemy attacks and to be used as a training ground for the United States Air Force. In April, 1971, the base was refurbished and transformed into a commercial airport

under the new name, Hewanorra International Airport with a steady increase in the airport traffic over the years. Since its transformation from an aircraft base to a commercial airport, there has not been any major loss of life due to an aircraft crash. The most famous crash on record was on 19<sup>th</sup> February, 1979 when Quebec Air flight 714 caught a wind shear on landing, which caused it to slam into the runway from a height of 6 meters. The Boeing 747 bounced twice, causing the nose gear to collapse. The aircraft was damaged beyond repair; however, there were no casualties amongst the one hundred and sixty two (162) passengers and nine (9) crew members.

According to the St. Lucia Air and Seaport Authority's (SLASPA) Statistical Digest for 2009/2010, there were thirteen thousand five hundred and eleven (13,511) aircraft movements for 2010, five hundred and forty six thousand and thirty five (546,035) passengers navigated through the corridors of the airport, with 1,435,137 kg of cargo handled. The airport has been granted fire category nine status by the International Civil Aviation Authority (ICAO) capable of handling Boeing 747, Airbus A330, 340 and Boeing 777. As the sole emergency response agency on the island of St. Lucia, the St. Lucia Fire and Emergency Service has been mandated to provide fire and emergency service coverage to the airport to ensure it maintains its category nine status. This has proved to be a challenge for the department because it does not have the necessary resources and competencies to effectively maintain this requirement.

This research project will identify the required level of skills and competencies necessary to be an effective airport firefighter. It will also investigate the required staffing levels and extinguishing agents required to maintain a category nine status. Furthermore, it will investigate whether the personnel protective clothing being issued to airport firefighters provides adequate protection in the event of an aircraft crash. This applied research project directly relates to the Executive Fire Officer course, Executive Analysis of Fire Service Operations in Emergency

Management as it will assist in the identification of critical resources needed to respond to a large-scale emergency incident in St. Lucia, hereby ensuring that the St. Lucia Fire and Emergency Services fulfill its mission statement which states, “to provide efficient and effective coverage throughout the island for the protection and preservation of life and property from fire, accidents, floods, dangerous chemicals and other disasters”. In addition, it relates to and supports the four strategic goals of the United States Fire Administration (USFA) namely:

- Reduce risk at the local level through prevention and mitigation.
- Improve local planning and preparedness.
- Improve the fire and emergency services’ capability for response to and recovery from all hazards.
- Improve the fire and emergency services’ professional status.

### **Literature Review**

Research on the various topic areas examined in this Applied Research began at Learning Resource Center, National Fire Academy in Emmitsburg, Maryland. Various books, past executive fire officer papers, journals and magazines were examined. The Federal Aviation Administration regulations and Advisory circulars, International Civil Aviation Authority (ICAO) and the National Fire Prevention Association (NFPA) codes provide valuable insight into the research areas. Additionally, information was extracted from various books, journals and magazines at the Airport Fire Station Library in St. Lucia. The internet and the city central library also provided valuable information towards this research.



**Skills and Competencies required to be an Effective Aerodrome Fighter?**

In almost every industry, training and education is necessary at some or all levels of operation if a job is to be safely and effectively accomplished. The level of training or education required to perform a given set of tasks varies with the organization's commitment to excellence, high quality of service or product, and safety (Compton & Granito, 2009). Aircraft Rescue Firefighting (ARFF) training has evolved greatly over the past sixty years. Early in its evolution, airport crash crew training consisted of basic aircraft familiarization and forcible entry procedures using basic hand tools. The training consisted of pouring aviation fuel on the ground or water covered gravel pit, lighting it off and fighting the ensuing blaze in asbestos protective clothing using either protein foam or high pressure water fog. Major changes in both aircraft size and capacity have occurred since then and today's airport firefighters face many new challenges. Air travel has reached record levels worldwide and will continue to do so. What has not changed however are the precious few minutes in which to affect rapid fire knockdown and rescue of aircraft occupants during an aircraft crash. Training is key. (Mulcahey (2007)

Training is the backbone of any fire department. Training produces a well-prepared force that through repetition can increase the speed of an operation and enhance proper execution while reducing injuries. A firefighter who arrives at an emergency unprepared can be faced with life-and-death situations, putting himself or herself under extreme stress to perform the necessary duties (Smith, 2008).

Salka (2012) espoused that if you are a career fire officer and you are not conducting some type of training every time you work a shift in the fire house, then you are not doing your job. This is not up for discussion or debate. Training is the most important activity firefighters

can be involved in. It is the activity that most directly and most effectively improves the performance and safety of firefighters working in the field.

It is mandated by law in many states that the local fire department be responsible for mitigating most types of emergency incidents that involve threat to life and property. Generally however, structural fire departments have not been trained to handle an accident or incident involving aircraft that can occur on aircraft property. The lack of specific skills, knowledge and ability to handle an aircraft-related accident may not reduce the legal or civil liability of a structural fire department and its personnel. On the contrary, when the accident occurs, the lack of preparation may increase the chance of legal or civil action being taken against the department (Tackett, 2000).

Bill Savage, writing in the *International Firefighter* magazine opined that the most important factors bearing on effective rescue in a survival aircraft accident are: the training received the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and firefighting can be put into use. The International Civil Aviation Organization (ICAO) which was established to provide standards and principles for the safe, efficient and orderly operation of international air transport states:

All rescue and firefighting personnel shall be properly trained to perform their duties in an efficient manner and shall participate in live fire drills commensurate with the type of aircraft and type of rescue and firefighting equipment in use at the aerodrome including pressure fed fuel fires (Annex 14, 9.9.30).

ICAO has also mandated in section 9.2.31 that:

During flight operations, sufficiently trained personnel should be established and be readily available to ride the rescue and firefighting vehicles and to operate the equipment at maximum capacity. These trained personnel should be deployed in a way that ensures a minimum response time can be achieved and that continuous agent application at the appropriate rate can be fully maintained. Consideration should be given for personnel to use hand lines, ladders and other fire rescue and firefighting equipment normally associated with aircraft rescue and firefighting operations.

ICAO has highlighted the following areas of instructions for airport firefighters in section 16.2 of Annex Attachment:

- Airport familiarization;
- Aircraft familiarization;
- Rescue and firefighting personnel safety;
- Emergency communications systems to aerodrome, including aircraft fire related alarms;
- Use of the fire hoses, nozzles, turrets and other appliance required;
- Application of the types of extinguishing agents required;
- Emergency aircraft evacuation assistance;
- Firefighting operations;
- Adaptation and use of structural rescue and firefighting equipment for aircraft rescue and firefighting;
- Dangerous goods;
- Familiarization with firefighters duties under the aerodrome emergency plan; and
- Protective clothing and respiratory protection.

According to the International Fire Service Training Association (IFSTA):

A comprehensive training program for ARFF personnel – whether assigned to an airport or other type of station that supports ARFF operations, including mutual aid agreements – is critically important to a firefighter’s effectiveness in dealing with aircraft emergencies. Only through incident training can firefighters reduce the likelihood of making costly mistakes during aircraft accidents or incidents. High quality, continuing education and training enables ARFF personnel to acquire and maintain the knowledge, skills and abilities essential for them to fulfill their mission safely. (IFSTA 2010)

The National Fire Protection Association (NFPA): *Standard for Airport Firefighter Professional Qualification* (2010) provides the minimum job performance requirements for the airport firefighters who are responsible for aircraft rescue and firefighting. NFPA 402, *Standard for Aircraft Rescue and Firefighting Operations* (2008), has promulgated in Section (4.3.2) that a comprehensive continuous in-service training in accordance with NFPA 405, *Standard for the Recurring Proficiency of Airport Firefighters* (2010), should be provided to maintain each firefighter’s proficiency. Section 4.3.3 states that “the complexity of modern aircraft and the variety of types in-service make it difficult to train ARFF personnel in all the important design features of each model. However, personnel should become as familiar as possible with each type of aircraft that normally uses the airport.”

In an article entitled “Aircraft Rescue Fire Fighting Training – Then and Now”, Mulcahey (2007) is of the view that modern training for ARFF is yet to be implemented. As he wrote, “updating international ARFF training standards mandating training in advance aircraft incidents, incident command training, terrorism awareness, hazardous material, Emergency

Medical Service and Chemical, Biological, Radiological and Nuclear (CBRN) training and a host of other subjects which should be required by today's modern airport firefighters as standardize training, has to be implemented” .

According to Alexander, Station Officer in charge of the Airport Fire Station (personnel communication, May 12, 2012), the most challenging aspect of the ARFF service at Hewanorra Airport is the adequate financial resources allocated to the department to ensure the implementation of an ongoing and sustained ARFF training program at the airport; also, the financial drought has hampered the department's ability to purchase the necessary equipment for effective mitigation of emergency when and if they come to visit our doorstep. Alexander asserts that to be effective in this dangerous and challenging aspect of firefighting, constant and recurrent training should be a top priority. The officer is of the view that more comprehensive curriculum should be developed at the recruit academy as it relates to ARFF. The practice of training recruits as structural firefighters with very little emphasis on ARFF and deployment to the airport expecting them to learn the trade through on the job coaching should be reviewed.

### **Staffing Requirement for a Category 9 Airport and How is it Maintained**

Federal Aviation Administration (FAA) does not provide clear guidance on the staffing needs of airports. Title 14 CFR, Part 139.319 states: “Sufficient rescue and firefighting personnel are available during all air carrier operations to operate the vehicle, meet the response times, and meet the minimum agent discharge rates required by this part.” The Coalition for Airport and Airplane Passenger Safety (CAAPS), has severely criticized that the FAA lacks direction. In “Surviving the Crash”, CAAPS noted that nowhere in Part 139 does the FAA address the minimum number of ARFF personnel that must be on duty during airport operations

for the proper staffing of fire apparatus. CAAPS went on to state that because Part 139 lacks this, airport authorities assume the FAA requires only enough rescue and firefighting personnel to be available during all air carrier operations to operate the vehicles and to meet the response times and the minimum firefighting agent discharge rates. CAAPS is of the opinion that without the FAA's objection, airports have interpreted Part 139 to mean that a single firefighter in a fire truck can do the job of a whole ARFF department; drive the apparatus to the scene and then conduct enough firefighting to provide an escape path.

The National Fire Protection Association (NFPA) 403, *Standard for Aircraft Rescue and Firefighting at Airports* states, "During flight operations, sufficiently trained personnel shall be readily available to staff the rescue and firefighting vehicles and to perform firefighting and rescue operations" (NFPA 403 Chapter 6). NFPA 1500, *Standards on Fire Department Occupational Safety and Health Program* (2007), provide further guidance on staffing requirements by stating, "The fire department shall provide an adequate number of personnel to safely conduct emergency scene operations. Operations shall be limited to those that can be safely performed by the personnel available at the scene."

Annex 141 of the ICAO Aerodrome Standards asserted that:

During flight operations, sufficient trained personnel shall be detailed and be readily available to ride the rescue and firefighting vehicles and operate the equipment at maximum capacity. These trained personnel shall be deployed in a way that ensures that minimum response time can be achieved and that continuous agent application at the appropriate rate can be fully maintained. Consideration shall also be given for personnel

to use land lines, ladders and other rescue and firefighting equipment normally associated with aircraft rescue and firefighting operations. (ICAO; Personnel; 9.2.32)

Goodbread, Hilderbrand and Hotell (2003) in their Chapter on Aircraft Crash Rescue and Firefighting in the Fire Chief's Handbook affirmed that:

No matter how well-equipped a department is, if an adequate number of human resources are not deployed to an emergency and if the welfare of these human resources is not provided for, they cannot be expected to perform effectively. If the proper numbers of firefighters are deployed and if they are properly trained, equipped and supported, they should be able to provide for the maximum efficiency and effectiveness in support of the mission.

The Civil Aviation Authority in their document, Licensing of Aerodromes: CAP 168, promulgated that, the objective of providing an adequate level of competent personnel is to have available sufficient staff at all responsibility levels to ensure that the RFFS is capable of achieving the principal objectives and that all vehicles and equipment can be operated effectively and safely. Furthermore, the Civil Aviation Authority averred that continuous agent application at the appropriate rate(s) can be fully maintained and sufficient supervisory grades can implement an incident command system and finally, the RFFS elements of the aerodrome emergency plan can be effectively achieved.

The Occupational Safety and Health Administration (OSHA) Inspection Procedures for the Respiratory Protection Standard (1998) specifically addressed the need for the safety of firefighters engaged in interior structural firefighting. Section 1910.134 states;

Once firefighters begin the interior attack on a structural fire, the atmosphere is assumed to be immediately dangerous to life and health and the buddy system must be used inside the structure. Two more firefighters must be outside the structure ready to render immediate assistance to those inside if needed. The two or more firefighters inside the structure must have direct visual and voice contact with each other and must have direct voice or radio contact with firefighters outside the structure. (OSHA 1910.134)

The OSHA Standard is also cited in NFPA 1500; Section 8.5.7, which states;

In the initial stages of an incident where only one crew is operating in the hazardous area at a working structure fire, a total of 4 individuals shall be required, consisting of two individuals working as a crew in the hazardous area, and two individuals present outside this hazardous area available for assistance or rescue at emergency operations where entry into the danger area is required (NFPA 1500, 2007).

According to the National Fire Protection Handbook, “Staffing fire apparatus at level below minimum requirements can result in a less effective and unsafe firefighting performance and calling for additional assistance should not be relied upon to replace adequately the required staffing and equipment needed immediately at the scene for initial attack and rescue.

McManis Associates and John T. O’Hagan and Associates in ‘Dallas Fire Department Staffing Level Study’ (June, 1984) indicates that a direct correlation existing between staffing level and performance quality. According to their findings:

Staffing reductions beyond the level that is necessary to accomplish the most critical tasks within a limited timeframe dictated by a rapid developing fire can be counterproductive. As a general rule, our study indicates that staffing below a crew size



of four can overtax the operating force and lead to higher losses. This does not suggest that there were no assignments in the simulations that were not carried out acceptably by three-person crews, nor does it ignore the demonstrated ability of the three-person crew in controlling the test fire. We also recognize that in some of the strategies employed during these simulations a four-person crew was taxed beyond its limit and that a five-person crew would have been more appropriate. These cases are the exception to the rule, however. It would be difficult to program a fire company to arrive at precisely the time and with the exact crew size necessary. Simulations demonstrated inadequate staffing results in the following problems: delays in the performance of critical tasks, increased risk to the victims because of the length of delays are increased, the likelihood of survival decreases, loss of critical functions, a cumulative effect created by combined delays and lost functions on the part of each crew resulting in an even greater loss of overall effectiveness, increased physiological stress on firefighters as they try to compensate for the lower staffing level, and increased risk to the firefighter when aggressive procedures are undertaken without the support necessary to complete them safely.

Wilson (2009) in his article entitled *Fire Department Staffing: A Need, Not a Want*, in *Fire Engineering Magazine*, has pointed out that the NFPA and the National Institute for Occupational Safety and Health (NIOSH) has reported that fire departments across the nation lack adequate staffing, which have contributed to millions of dollars in time-lost injuries, thousands of on-the-job injuries, and dozens of line-of-duty deaths (LODDs) each year. Unfortunately, several firefighters will pay with their lives before the staffing issue will be brought up again for serious discussion.

Wilson went on to state that:

In 1990, the Providence (RI) Fire Department conducted a study which showed that the only nationally recognized staffing standard at that time was from the NFPA.

It recommended a minimum of four firefighters responding on or with each apparatus.

The NFPA reported at that time a 71-percent decrease in time lost because of injury using four-person staffing when compared with three-person staffing. Even though the study is more than 18 years old, it shows that the staffing level today throughout the United States is still an unresolved issue. Labour boards and at least one court have found that a minimum staffing agreement or ordinance is reasonable for ensuring the protection of the public and personnel. However, many fire departments in the past made no provisions in their staffing rosters for covering scheduled absences; fire companies were allowed to run short-handed, seriously compromising their operating efficiency and firefighter safety

**(3) What are the prescribed quantities of extinguishing agents for the maintenance of category 9 status?**

An airport firefighter may come into contact with fires involving many types of combustible materials: seat coverings inside the passenger compartment, exotic materials in engine assemblies, the aircraft's hydrocarbon fuels and onboard oxygen systems and others. Depending on the material burning and the size and location of the fire, different situations may require different types of extinguishing agents, application techniques, devices and equipment (IFSTA, 2008). For every type of fire, there is an appropriate type (or best choice) of fire extinguishing agent to use for maximum effectiveness. One must know what agents he/she has for the class of

fire he/she is dealing with and the variable conditions associated with that fire (Anderson, Hawkins and Gill, 2008)

According to the International Fire Service Training Association:

Airport rescue and fire fighting (ARFF) personnel could encounter Class A, B, C, and/or D fires in any one incident. To be effective, ARFF personnel must have a thorough understanding of fire behavior and extinguishing principles, and the effective use of extinguishing agents. Most airports maintain various types of extinguishing agents, each having a specific use and application. The aircraft fuels, synthetic/composite materials, combustible metals, and other new material that are constantly being developed and incorporated into modern aircrafts, all have specific burning characteristics. Fires involving these materials require the use of specialized extinguishing agents and application techniques. Firefighters must be familiar with new and existing agents and their proper application (IFSTA, 2010).

Within each category of airport there is a requirement to provide sufficient quantities of both principal and complementary extinguishing media. The principal extinguishing agents should be:

- Protein foam; or
- Fluoroprotein foam; or
- Film forming fluoroprotein foam (FFFP); or
- Aqueous film forming foam (AFFF); or
- A combination of any of these media.

The above media are referred to as principal extinguishing agents, primarily intended to provide an air-excluding blanket preventing volatile flammable vapours from mixing with air. The capability of sustained production provides fire control and suppression for several minutes. The complementary extinguishing agents are so labeled because they have rapid fire and flame knock down/suppression qualities. The amounts of both principal and complementary extinguishing agents that should be provided and available at an airport for immediate discharge from firefighting vehicles are dependent upon the category of the airport or aerodrome (Docherty, 1999).

The FAA in CFR 139 noted that primary aircraft fire extinguishing agents includes Aqueous Film Foaming Foam (AFFF), Fluoroprotein foam (FP), film forming fluoroprotein (FFFP) foam and protein foam supplementary agent which are used to handle unique firefighting requirements most common to airport firefighting use. This class of agent includes, dry chemical, halotron and carbon dioxide. The Advisory Circular further states that for operating and training purposes, airports should also provide: (1) twice the quantity of agents carried on each truck available in the fire station and (2) a supply of agents to be used for training. Also, 139.317 (1) states that each required vehicle carries AFFF in an appropriate amount to mix with twice the water required to be transported by the vehicle.

CAAPS has contended that the quantities of extinguishing agents required by CFR 139 are inadequate to extinguish a modern aircraft heavy with fuel. According to CAAPS:

A study by Dallas Fire Department ARFF officer contains evidence that part 139 is outdated. The study suggested that the FAA recommended quantities are lower than the actual amounts of water used at recorded accidents. Additionally, the FAAs minimum

discharge rates are designed so that firefighters can provide only an “escape path for evacuating passengers and crew. Consequently, the FAA fails to specify adequate extinguishing agent quantities to extinguish either aircraft interior or exterior fires.

Richardson (2003) proffered that whilst the statistics indicate that the recommended quantities of extinguishing agents are not adequate, they do not indicate the amount that is needed to create survivability conditions that would aid in evacuation. This makes it difficult to ensure that the intervention method adequately reflects the degree of risk associated with the level of aircraft movements.

NFPA 403, *Standard for Aircraft Rescue and Firefighting Services at Airports*, Chapter 5, (5.11) reported that “One or more of the following types of primary agents shall be used for aircraft firefighting involving hydrocarbon fuel: (1) Aqueous film-forming foam (AFFF), (2) Fluoroprotein foam (FP) or film forming fluoroprotein foam (FFFP), (3) protein foam (P)”. Section 5.1.2.3 further indicated that “All ARFF vehicles responding shall carry either one or both of the following categories of supplementary agents: (1) Potassium bicarbonate or potassium bicarbonate dry chemical, (2) Halogenated agent”.

The Civil Aviation Authority in their Document *Licensing of Aerodromes*, Chapter 8, Section 12.1-13.1 affirmed:

The objective of an extinguishing agent is to extinguish/suppress a fire on which it is applied. Principal agents are provided for permanent control, that is, for a period of several minutes or longer. Complementary agents may provide rapid-fire suppression but generally only offer a transient control, which is available during application. The ICAO Critical Area Concept is not intended to ensure extinguishment of the entire fire; it seeks

to control only the area of fire adjacent to the fuselage. The objective is to safeguard the integrity of the fuselage and maintain tolerable conditions for its occupants. Both principal and complementary agents should normally be provided at an aerodrome”.

According to the CAA, the principal extinguishing agent should be foam, meeting the minimum performance level A; or, foam, meeting the minimum performance level B; or, a combination of these agents. Section 14 continues by stating, “The complementary extinguishing agent should be a dry chemical powder suitable for extinguishing hydrocarbon fires, or a gaseous agent or a combination of both”. It is recommended in section 15 that a 200% reserve of foam concentrate and 100% of complementary agents shall be available at the aerodrome.

**(4) Will the used bunker gear being issued to airport firefighters provide adequate protection to officers in the event of an aircraft crash?**

Firefighting protective clothing is a general term which includes coats, pants, coveralls, gloves, helmets, foot wear and interface components. The performance of each layer of a firefighter’s protective clothing has a significant influence on the level of protection provided. In general, the protection offered by firefighters’ protective clothing are expected to deteriorate over time, but it is still uncertain how destructive different exposures are and how long a piece of firefighter’s protective clothing can continue to protect a firefighter to an acceptable level (Rezazadeh and Tori, 2010).

Rezazadeh and Tori (2010) defined useful life of protective clothing as the period of time during which the firefighter’s protective clothing provides acceptable protection. According to these authors, “Useful life of firefighters’ protective clothing depends on a number of factors

including the type of materials from which they are constructed, the number, duration, and intensity of destructive exposures which the clothing have faced, the amount of abrasion and wear, and the maintenance and storage procedures used”.

Rezazadeh and Tori continued their discourse stating that:

Some manufacturers suggest a normal useful life of three to five years for firefighters’ protective clothing, which may decrease to two to three years in an active fire department. Manufacturers suggest that the useful life is seldom more than seven years. However, providing a definitive number of years of useful life for firefighters’ protective clothing is problematic. Different firefighters, even in the same department, have different roles in firefighting and their protective clothing are exposed to different conditions over the same period. In addition, fire departments in different areas may encounter different types and sizes of fire. For example, a fire department in a large metropolitan area may not be comparable with a fire department in a rural area in terms of number and size of fires and type of firefighting operations.

The exposures created through the hazardous activities involved in firefighting create great risks to those involved. Regulatory agencies such as the Occupational Safety and Health Act (OSHA) and the NFPA have created rules and guidelines that address many of the hazards associated with firefighting. While all risks can’t be eliminated, our base of knowledge in the area of fire science based on these two agencies as well as accident investigations has equipped us with the ability to effectively reduce the hazards firefighters face. A crucial component of firefighter safety is Personal Protective Equipment (PPE), which creates a barrier between the firefighter and the hazardous condition (Oliver 2009).

NFPA 1851, *Standard on Selection, Care, Maintenance of Protective Ensembles for Structural Firefighting* (2008), has specified that, “Structural firefighting ensembles, ensemble elements shall be retired no more than 10 years from the date the ensembles or ensemble elements were manufactured”. Furthermore, Section 10.2.1 highlighted that:

Retired structural firefighting ensembles and ensemble elements and proximity firefighting elements shall be destroyed or disposed of in a manner ensuring that they will not be used in any firefighting or emergency activities, including live fire training. Firefighters require the best personal protective clothing and equipment available because of the hostile environments in which they perform their duties.

According to Lopez (2012):

This standard can be enforced through the Occupational Safety and Health Administration (OSHA) even if you are not in an OSHA state. It is mandated by federal OSHA, which applies to all states that haven’t adopted their own OSHA program. Beyond that, if your departments were to become involved in litigation and the condition of PPE was a factor in an injury or death, NFPA 1851 would be upheld as an industry best practice. OSHA can be understanding of a department’s budget or lack of resources, provided the department can demonstrate it is willing to comply with a plan of action.

NFPA 1500, *Standard For Fire Department Occupational Safety and Health Program* (2007), requires Fire departments to provide each member with protective clothing and protective equipment that is designed to provide the protection for the hazards to which the member is likely to be exposed and is suitable for the tasks that the member is expected to perform (NFPA 1500 7.1.1) (2007).



Section 7.1.2 further states that protective clothing and protective equipment shall be used whenever the member is exposed or potentially exposed to the hazard for which it is provided. Section 7.19.3 has promulgated that member PPE shall be taken out of service after 15 years from the date of manufacture, regardless of testing or inspection procedures.

Fighting fires, performing rescues, and delivering other emergency services are inherently dangerous activities. Even when fire departments provide the best protective clothing and equipment and their firefighters use it properly, firefighter safety is not guaranteed. Nonetheless, many firefighter injuries and illnesses can be prevented or their severity reduced if protective clothing and equipment are used conscientiously (IFSTA, 2008).

Firefighters assigned to ARFF response may need to utilize proximity suits, depending on fire conditions such as fuel load, radiant heat expose, and rescue considerations. Proximity gear consists of aluminized ensembles that provide superior radiant and thermal heat protection. The flame resistant, strength, and weight of the material are critical to the clothing's usefulness at aircraft incidents; however, firefighters must understand the shielding capabilities and limitations of their personal protective clothing. Participating in live fire training exercises is an effective way to achieve a full understanding of the limitations of protective gear (IFSTA 2008).

Whether a structure, vehicle or bush fire, motor vehicular accident (MVA), medical call or any call for help a firefighter receives each and every day, when worn correctly, the PPE offers the best protection against harm from the forces and elements surrounding the firefighter. Smoke, fire, heat, blood, sharp objects and hazardous materials can cause injury or death if the firefighter does not respect and shield himself/herself from them (Fire Engineering, 2009).

## **Procedures**

The procedure used in this descriptive research project included an extensive literature review at the National Fire Academy Learning Resource Center. A myriad of information sources were examined, including NFPA, FAA, ICAO, and OSHA standards and regulations. Also, various ARFF books, regulatory documents, periodicals, internet searches and manuals were perused to obtain a holistic insight into the various research questions.

A questionnaire was developed and sent via email to airport fire station chiefs of seven Caribbean countries, which provide ARFF protection to a category 9 airport. The questionnaire sought to obtain an insight into various questions being investigated in this applied research paper. In addition, the researcher had a personal conversation with the officer in charge of the airport fire station at the Hewanorra International Airport on May 12, 2012.

## **Results**

### **Research Question 1**

#### **What are the skills and competencies required to be an effective Aerodrome Fighter?**

There are several established standards that govern the training requirement of airport fire-fighters as it relates to the required skills and competencies essential for efficient and effective mitigation of an aircraft crash. The foundation of that competence is spelled out in NFPA 1003: *Airport Firefighter Professional Qualification* (2010). This standard identifies the minimum job performance requirement for the airport firefighter who is responsible for aircraft rescue and firefighting.

Theoretically, NFPA 405: *Standard for the Recurring Proficiency of Airport Firefighters* (2010) has identified the following areas of competence for an airport Firefighter: Airport Familiarization, Personnel Safety, Personnel Protective Equipment, Aircraft Cargo Hazards, Emergency Communication Systems, ARFF vehicles and equipment, Extinguishing agents, Emergency Aircraft Evaluation Assistance and Rescue and Fire Fighting Operations.

In addition, the Standard prescribes that an ARFF personnel should have the knowledge and skills necessary to operate in an emergency environment until additional medical resources become available. Practically, NFPA 405 stated that ARFF personnel shall regularly demonstrate individually or as a team, their ability to control or extinguish fires associated with aircraft accidents.

The Federal Aviation Administration's program for Training of Aircraft Rescue and Firefighting Personnel has highlighted the following areas of instruction for new or relief employees and also for recurrent training to employees to enable them to maintain a satisfactory level of proficiency. The areas of instructions are: Airport Familiarization, Aircraft Familiarization, Rescue and Fire Fighting Personnel Safety, Emergency communication systems at the Airport, use of fire hoses, nozzles turrets, and other appliances, adapting and using structural rescue and firefighting equipment for aircraft rescue and firefighting, aircraft cargo hazards and familiarization with Firefighters' duties under the airport emergency plan.

Practically, the FAA mandated that all rescue and Fire Fighting personnel must participate in at least one live fire drill every 12 months. This drill must include a pit fire, with an aircraft mock-up or similar device, using enough fuel to provide fire intensity that stimulates realistic fire fighting conditions.

The Civil Aviation Authority (CAA) in their licensing of Aerodrome manual has indicated that RFFS personnel should receive appropriate initial and regular comprehensive recurrent training appropriate to their role and task to maintain the skills necessary to ensure that RFFS equipment can be put to use effectively. Training according to the CAA shall be done in accordance with CAP 699 Standards for the competence of Rescue and Firefighting Services (RFFS) Personnel. RFFS Personnel shall also participate in live fire drills commensurate with the type of Aircraft type of rescue and firefighting equipment used at the aerodrome, including pressure-feed fuel fires.

ICAO manual on Aerodrome Standard: Section 2 highlights similar recurrent and initial training curriculum prescribed by the FAA. The International Fire Service Training Association (2008) recommended that aircraft rescue and firefighting personnel must meet the requirements of Firefighter II as defined in NFPA 1001. They must also meet the requirements of first responder operational level as defined in NFPA 472 and the job performance requirements of NFPA 1003. The requirements contained in NFPA 1003 are divided into three major duties: response, fire suppression and rescue.

## **Research Question 2**

### **What is the staffing requirement for a category nine airport and how is it maintained?**

NFPA 403: *Aircraft Rescue and Firefighting services at airports* are clear on the issue of staffing requirements for a category 9 airport. Annex 8.01.12 states that the minimum total number of trained personnel responding should be based on the equivalent of 3 per ARFF vehicle. Additionally, an incident commander and two trained personnel for rapid intervention should be provided.

The standard advises that no fewer than 15 ARFF personnel should staff a category 9 airport. It goes on to warn further that “under no circumstances shall the minimum requirement staffing be less than those values appearing in table 8.1.2.1.”

Table A1: Minimum Required ARFF Personnel at Airports (NFPA)

Airport Category	ARFF Personnel
1	2
2	2
3	2
4	3
5	6
6	9
7	12
8	15
9	15
10	15

Source: NFPA 403: Aircraft Rescue and firefighting Services at Airport (2009) Pg. 9

Unfortunately, the FAA does not provide clear guidance as to the number of fire personnel to be assigned to the various categories of airports. It is a shortcoming that the CAAPS has severely criticized. The Department of Defense Instructions Number GO55.6 (E7) (1994) has highlighted the following staff positions for Fire Apparatus:

Table A2: Minimum Required ARFF Personnel at Airports (DOD)

Fire Apparatus	Position per apparatus
ARFF Fire Fighting Apparatus	3
ARFF Rescue Apparatus	3
ARFF Tanker and/ or Resupply Apparatus	2
ARFF Twinned Agent Fire Fighting Apparatus	2

Aerial Ladder	4
Structural Pumpers	4

Source: Department of Defense Instruction No. G055.6 (E7) (1994) Pg. 22

An analysis of the questionnaire reveals that eighty percent (80%) of Caribbean Airport Fire Stations operate below the required staffing levels prescribed by the NFPA and the DOD.

### **Research Question 3**

**What are the prescribed quantities of extinguishing agents for the maintenance of category 9 status?**

FAA Part 139 and 139.317 dictate that a category nine airport be equipped with three vehicles. One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quality of ARFF to total 100 gallons for simultaneous dry chemical and ARFF application.

The other two vehicles are required to carry the commensurate quantity of water for foam production carried by all three vehicles is at least 4000 gallons. FAA also specifies that part 139 takes precedence over NFPA 403: *Standard for Aircraft Rescue and Fire Fighting Service at Airports*. However, in some cases NFPA 403 may exceed part 139 requirements. Moreover, for operating and training purposes, airports should provide: (1) Twice the quantity of agents carried on each truck and available in the fire station and (2) A supply of agent to be used for training. Table A1 and A2 indicates the required level of extinguishing agent prescribed by the NFPA 403 and ICAO respectively.

Table A3: Required level of extinguishing agents prescribed by NFPA 403

Airport Category	AFFF	Fluoroprotein of FFFP	Protein Foam	Complementary Agents*
	Required Water (L)	Required Water (L)	Required Water (L)	Quantity (kg)
<b>9</b>	9, 907	13, 722	15, 259	410
	16, 843	23, 328	25, 941	
	9, 450	9, 450	9, 450	
<b>Total</b>	<b>36, 200</b>	<b>46, 500</b>	<b>50, 650</b>	

TableA4: Required level of extinguishing agents prescribed by ICAO

Aerodrome category	Foam meeting performance level A	Foam meeting performance level B	Complementary agents
	Water <sup>(1)</sup> (L)	Water <sup>(1)</sup> (L)	Dry <sup>(2)</sup> Chemical powders (kg)
<b>9</b>	36, 400	24, 300	450

It must be noted that all responders to the question indicated that they carry the required level of extinguishing media in storage as prescribed by their regulatory agency. However, only thirteen percent (13%) indicated that they carry foam media specifically for training purposes.

#### **Research Question 4**

**Will the used bunker gear being issued to airport firefighters provide adequate protection to officers in the event of an aircraft crash?**

It is clear based on the literature review that issuing Airport Firefighters with donated used bunker gear for proximity firefighting presents a serious health and safety issue to firefighters. As indicated in the literature review, manufacturers suggest a normal useful life of three to five years for protective clothing. NFPA 1851: *Standard on Selection, care and manufacture of protective clothing ensembles for Structural Firefighting and Proximity Firefighting* (2008), has suggested a retirement age of no more than 10 years from the date of manufacture.

Unfortunately, eighty percent (80%) of respondents to the questionnaire are recipients of donated used bunker suits/proximity gears which subject their firefighters to a high level of health and safety risk.

#### **Discussion**

The crash of a Caribbean Airlines Boeing 737-800 Jet whilst landing at the Cheddi Jagan International Airport in Guyana on July 30<sup>th</sup> 2011, should have triggered a warning signal to the people of the Caribbean, that the region is not immune to major aircraft disasters. Although none of the 163 passengers onboard the aircraft were killed, the extensive damage that the fuselage sustained provided an opportunity for those entrusted with ensuring the safety of passengers to reflect on the priority given to guarantee an effective emergency response.



Aircraft Fire Fighting is arguably one of the world's most dangerous and demanding professions. In order to be effective in this field, there must be total commitment to provide effective and ongoing training to firefighters, proper equipment and adequate staffing. Honig (2005) describes an airplane crash as "not simply a big automobile accident. The combination of a massive, three-dimensional liquid hydrocarbon fire, a widespread trauma and burn MCI, and a high profile media event makes this an extremely difficult situation to prepare for".

Whilst developing countries like the Caribbean have and continue to grapple with limited financial resources, elected officials have to make the choice between bolstering the fire department and directing resources elsewhere. As Savage (2004) succinctly puts it:

It is manifested that in developing countries there will be pressing demands on limited resources, which focus the attention of government ministers and those responsible for the interest of the nation. In terms of a developing country's ability to meet its national and international commitments, RFFS at airports together with the associated resources needed, will be amongst the issues liable to be ignored whilst more pressing matters are addressed. This prospective generally sees the RFFS at the airport lacking resources and more importantly, lacking the expertise and understanding to use what limited resources and equipment are available to the best effect. The latter point is crucial for although resources and equipment may be limited, well trained personnel who can utilize what is available to maximum effect may have a positive chance of being successful at the scene of an aircraft incident/accident.

The literature review, questionnaire and interview have revealed a frightening gap between what is supposed to be as it relates to the St. Lucia Fire Department's readiness to

respond to an aircraft crash and what now obtains. Alexander (Personal Communication, May 2012) has indicated that inadequate training of Airport Firefighters presents the greatest challenge for him. The questionnaires revealed that 100% of respondents are not satisfied with the competence level of their officers. Another notable revelation from the questionnaire is that departments do not have the necessary facilities to simulate the various conditions that firefighters are expected to experience in the event of an aircraft crash/ emergency.

IFSTA (2010) noted that “Today’s Aircraft Firefighters must be knowledgeable in many facets of aircraft rescue and firefighting. In addition to basic firefighting knowledge, skills and experience, airport firefighters must learn to use specialized techniques, tools and equipment in order to mitigate airport emergencies”. Eighty percent (80%) of respondents adhere to the ICAO and NFPA standards as it relates to training. However, ninety percent (90%) do not have an academy dedicated to ARFF training and do not have the props necessary for simulation as indicated earlier. Such situation revolves around budgetary issues. The deficiency or lack of training facilities is discussed by Savage (2004) in his article entitled, “International Training Standards”. As he wrote:

In most developed countries aircraft rescue and fire-fighting personnel are trained to international standards and hold certificates of competence at various levels. Normally, in these countries, RFFS personnel are not being allowed to “ride” – form part of the rescue and fire-fighting crew at an aerodrome, without a certificate of competence. In developing countries this is generally not the case where the emphasis is normally on localized training for RFFS personnel. It is usually officers from such countries, who receive training to international standards, predominantly at overseas locations. These officers will then become responsible for the training of RFFS personnel. They will have little or no practical training experience, with

very limited access to facilities, particularly practical facilities, aircraft simulators, pressure fed fuel fires, a breathing apparatus chamber, fire screen and so on. There is an indisputable gap in the approach to RFFS training and the levels of competence of RFFS in developed and developing countries, which predominantly goes unnoticed. It is only when an aircraft accident occurs and the attention of the entire world is drawn to the accident site and searching questions are asked during the subsequent investigation; that prevailing standards of rescue and fire-fighting provisions at an airport, together with all other aspects of safety, become exposed.

The issue of adequate staffing seems to be another factor that is of grave concern to the respondents of the questionnaire. This situation seems to be compounded by the lack of guidance on ARFF staffing requirements by the two primary ARFF regulators, FAA and ICAO. The importance of adequate staffing for effective mitigation is also echoed by Goodbread et al. (2003) who stated, “Without question, the most important resources that any fire department has are its members. No matter how well equipped a department is, if an adequate number of Human Resources are not deployed to an emergency and if the welfare of these human resources are not provided for, they cannot be expected to perform effectively”. According to *Surviving the Crash*, “The lack of adequate FAA staffing requirements at civil airports is perhaps the greatest factor limiting the ability of ARFF teams to save lives. Because a single firefighter is unlikely to create an exterior escape path, it completely ignores the need for an aggressive interior attack to rescue passengers and crews”.

Alexander (Personnel Communication, May 2012), lamented that the staffing situation is so serious, when two persons call in sick, he has two choices, ask for a downgrade of the airport category or request a fire officer from the structural division who most times has no clue as to the operations of ARFF. Alexander continues by stating that downgrading the airport category

usually cost the airport authority millions of dollars as incoming flights have to be diverted to neighboring islands and accommodations have to be made for grounded flights.

There seems to be a total compliance as it relates to the required level and quantity of extinguishing agents required to maintain a category level of nine. One hundred percent (100%) of respondents revealed that they house the required extinguishing agent as prescribed by the regulatory agent which they follow. Twenty-five percent (25%) of respondents indicated that they did not have the required storage extinguishing agents, with only thirteen percent (13%) revealing that they carry additional extinguishing agents for training purposes as specified by the FAA. It must be noted that whilst most of the category nine airports in the Caribbean are bound by the ICAO as their primary regulatory agent, the questionnaire reveals that both the NFPA and FAA regulations are also adhered to in conjunction with the ICAO.

Over the past decade we have seen firefighters being confronted with a myriad of threats other than fires and the need for ironclad protection from the hostile environments that they face on a daily basis cannot be over emphasized. NFPA 1500: *Standard For Fire Department Occupational Safety and Health Programme* (2007), is clear when it states “Members whose primary responsibility is proximity firefighting operations and members who participate in proximity firefighting training shall be provided with and shall use proximity firefighting protective ensembles that are compliant with NFPA 1971: *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* (2007).

PPE is expensive and due to the meager budgetary allocations handed to fire departments in the Caribbean, receiving donated gears is a welcome gesture to any department. Ninety percent (90%) of respondents issue used bunker/proximity suits to firefighters. The same

percentage indicated that they use the same gears as their counterparts in structural firefighting. This situation is revealing because it indicates that a significant number of airport firefighters are not properly outfitted for their assigned duties. NFPA 1851 mandate that the outer shell of aircraft firefighters' gear must be retired after five years and the liners, after ten years. Retired gear can only be used for non-live fire training.

Whilst the St. Lucia Fire Department continues to grapple with budgetary cuts, it has to take a strategic sustainable approach to ensure that fire personnel are protected from the hazards associated with their assigned duties. Although it is understandable that every one cannot be outfitted with the new PPE at once, an incremental approach must be adopted. This view is consistent with Cleaveland (2008) who quoted Nile Howard, Division Chief of Administration for the Mc Kinney Fire Department. According to Howard:

A department has to start small. If you have a lot of old gear, it will be more cost-effective to replace your gear than to have it tested and repaired. If you have a small department with, say, 60 members, 20 sets of gear are going to be hard to start off with financially. You might have to start out with five or 10 and build yourself up. You might do five every year on a five-year replacement.... and even a small department should be able to budget to put toward gear. It might take five years to get to everyone in the department, but it still keeps them in compliance and it is a small piece of the pie. Take it in small steps. It is like life; we do not always get to live in big houses or drive the fancy cars when we are young, you have to wait till later in life to afford them. You have to crawl before you walk.

Failure to implement such a program will only plunge the department into an abyss of human resource problems. Moreover, the litigious environment in which we now operate should be a determining factor as to what choices departments make as it relates to the health and safety of fire officers. Costo (2009) opined that:

Given such a litigious operating environment, it should come as no shock that fire departments throughout the country are increasingly finding themselves embroiled in litigation. In fact, the only real surprise should be that it is taken as long as it has for such cases to become routine to the fire service.... Fire Service Leaders must consider and address legal aspects, such as potential civil liability exposure, as part of the department's continuous PPE planning, selection care and maintenance process.

The St. Lucia Fire department is the sole agency tasked with the responsibility to respond to fire and emergency situations on the Island of St. Lucia. The absence of the necessary resources and capabilities to ensure the effective mitigation of aircraft emergencies can have serious implications for the organization and by extension, the country.

The issue of firefighters not being adequately trained to perform their assigned duties is a serious violation of all conventions governing the general regulation of Aircraft Fire Fighting. NFPA, ICAO, FAA have all promulgated basic training required for Aircraft Firefighters; exposing firefighters that have not been initiated in such can have a serious and detrimental impact on their lives and safety; it also positions the organization as a target for lawsuits.

The lack of adequate PPE is another area that can have a negative implication to the organization's health and safety. This is now emerging as one of the most important and sort after issues in management/union relations. Having officers operate in outfits that do not provide

the necessary protection from the various hazards that might confront them is a grave violation of all the various conventions, laws and policies governing workplace health and safety.

### **Recommendation**

The research conducted in the applied research paper clearly indicates the need for the St Lucia fire department to legally adopt NFPA as the national standard. Such will provide a legal basis for negotiations on such areas as training equipment and staffing. It will also provide clear guidance on areas not adequately addressed by the ICAO and FAA. Secondly, there needs to be more emphasis on aircraft fire fighting at the recruit academy. The research indicates that very little emphasis is placed on this aspect of firefighting at the academy, with firefighters expected to learn through on-the-job coaching. A comprehensive curriculum needs to be developed to complement the guidelines provided by ICAO, FAA or NFPA. Thirdly, if NFPA is legally adopted, then the researcher recommends staffing guidelines as prescribed by NFPA 403: *Aircraft Rescue and Firefighting Service at Airports* are used as a guide to adequately staff the ARFF service.

Fourthly, the fire department needs to take an incremental approach to outfitting its members with the proper PPE. PPE is expensive and the budgetary allocation of the fire department is wholly inadequate to outfit all members in one year. However, an incremental and sustainable approach must be designed to ensure such is adhered to in the shortest period possible.

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Fire & Emergency Services

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Dear Fire Comrades

I am a third year student of the National Fire Academy's Executive Fire Officer programme. I am currently conducting a research paper for the course Executive Analysis of Fire Service Operations in emergency management.

My research seeks to examine my country's response capabilities as in the event of an aircraft incident at our main airport. The result of this research will better assist the fire department in making the necessary adjustment as it relates to effectively mitigating any aircraft emergency. Also, it will assist the fire department in making a more informed presentation to elected officials on the funding of equipment and human resources.

Thank you in advance for sparing your valuable time to complete this questionnaire. Do not hesitate to contact me for any clarification.

Yours Respectfully,

Ditney Ian Downes.

**Questionnaire**

1. Name of Airport/Country \_\_\_\_\_
  
2. Category of Airport \_\_\_\_\_
  
3. How many shifts do you have? \_\_\_\_\_
  
4. Number of persons per shift \_\_\_\_\_
  
5. Are you satisfied with the number of staff available to you for emergency response?  
Yes       No
  
6. Where do you do most of your training?  
Locally       Overseas
  
7. What training standards does your department currently follow  
NFPA       ICAO       FAA       FAR 139       OTHER  \_\_\_\_\_
  
8. Do you have a local training academy dedicated for ARFF training?  
Yes       No

9. Does ARFF form part of your recruit training programme. If yes, how long is the programme?

Yes           No

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10. Are you satisfied with the level of training received by your ARFF?

Yes           No

11. How many airport fire appliances do you have in operation?

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12. Does your department have the necessary training aid for ARFF simulation?

Yes           No

13. What is your total foam capacity on

(a) appliances \_\_\_\_\_ (b) in storage \_\_\_\_\_

14. What is your water capacity in your appliances?

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15. What other supplementary agents do you carry on your aircraft firefighting appliances?

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16. What type of bunker gear does your company issue to firefighters?

New  Used

17. How often do you issue bunker gear to your firefighters? \_\_\_\_\_

18. Does your station use the same bunker gear as their counterparts in structural firefighting?

Yes  No

19. What guidelines does your department use to retire bunker gears?

Manufacture specification  NFPA  Departmental  Other  \_\_\_\_\_

## PERSONAL COMMUNICATION QUESTIONNAIRE

1. How long have you been in charge of the Hewanorra Airport Fire Station?
2. What are the critical challenges you face on a daily basis that affects your ability to effectively manage this station?
3. What changes you wish to see done to the Aircraft Fire Fighting Station?
4. Are you comfortable with the present staffing that you work with?
5. How many ARFF appliances are assigned to you?
6. How many firefighters in your opinion that should be detailed on the various appliances?
7. Are you satisfied with the present level of training and competence of your staff?
8. What plans do you have to ensure that your staff receives adequate training?
9. What are your views on the used bunker suits being issued to your staff?
10. Do you have adequate extinguishing media at your station?