



Houston Fire Department

Southwest Inn Recovery Committee

Final Report and Recommendations

September 1, 2014

Southwest Inn Hotel Fire

6855 Southwest Freeway

May 31, 2013

Incident Number 1305310305

Forward

The first printing of this document was on August 1, 2014. During that same week, Fire Chief Terry Garrison presented this document to the families of Captain Matthew Renaud, Engineer Operator Robert Bebee, Firefighter Robert Garner and Probationary Firefighter Anne Sullivan. Also present that day were Captain William “Iron Bill” Dowling and his family, Firefighter Robert Yarbrough and his family as well as the crew members of Fire Station 51 and Station 68 A-Shift.

On September 1, 2014 a second printing was conducted in order to provide the members of the Houston Fire Department with an opportunity to learn from this tragedy. During this printing, Appendices were added for administrative purposes. The goal is to help track the progress made by our department concerning the recommendations made by the Southwest Inn Recovery Committee. All recommendations were cataloged in to four primary areas:

- A. Fireground Operations
- B. Training needs
- C. Personnel and Administrative issues
- D. Equipment needs

The following corrections were made to the document since the first printing:

Section 1 - Engineer Operator Robert Bebee is listed as being assigned to drive Ladder 51. This is incorrect. Robert drove Engine 51. (*The Recovery Committee would like to extend its sincere apologies to the Bebee Family and the members of District 68 for this mistake.*)

Page numbers - when the appendices were added, page numbers were altered in order to reflect these changes and prepare it for commercial printing.

Table of Contents – the Table of Contents was adjusted in order to reflect the change in the page numbers.

Note: No other content has been modified, added or altered as a result of these corrections.

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Section 1

Dedication

The Houston Fire Department would like to sincerely dedicate this report to those that proved their courage, commitment, and compassion on May 31, 2013, at the Southwest Inn fire. First and foremost we recognize those that made the ultimate sacrifice for their calling and profession – Firefighters Anne Sullivan and Robert Garner, Engineer Operator Robert Bebee, and Senior Captain Matthew Renaud. There can be no question of their bravery, dedication, resolve, and personal incentive to carry out the duties and responsibilities they so solemnly swore to perform. They will never be forgotten and their heroism and true spirit of love will stand forever as an ideal for which all others should strive. We also recognize the great sacrifice made by the families, friends, and loved ones of our sister and brothers. Though we have lost them, they will not have died in vain, for all members of the Houston Fire Department will positively resolve to apply any lessons learned from this tragedy to the safety and welfare of future generations. We also pledge to stand by these families and friends – now special members of our own family forever – and we are ready to serve when called upon.

We the members of the Houston Fire Department would also like to dedicate this report to the Firefighters and family members whose lives have been changed forever by the events of May 31, 2013. Captain William Dowling has matched a monumental challenge with an equally unwavering firmness of character, as has every member of his precious family, and our pride in his compelling story knows no bounds. Rescue Firefighters Robert Yarbrough, Foster Santos, and Tony Livesay have also demonstrated the resolute will of “Houston’s bravest” in their long-term recoveries from injuries sustained in their own heroic efforts.

This report is further dedicated to all the members of the Houston Fire Department as a firm commitment to their future safety and wellbeing. This promise must be made by one and all to each other, regardless of rank, position or any other element.

Last, but not least, this report is dedicated to the citizens of the City of Houston, to whom we have sworn our undying devotion. In our time of need, they rose to the occasion and came to our aid in so many ways and it did not go unappreciated. We promise to be there when they need us the most, when they are experiencing the worst of times of their lives. Our sister Anne and our brothers, Robert, “Bebee”, and Matt, have dutifully and selflessly demonstrated our level of commitment and we will forever honor their memory.

The Members of District 68 A - Shift



**Senior Captain Matthew Renaud – Fire Station 51
(Assigned as Captain on Engine 51)**

Captain Matthew Renaud was born on July 2, 1977 joined the Houston Fire Department in October of 2001. He was assigned to Station 51 upon graduation from the Val Jahnke Training Facility. During his 12 years and 7 months of service in the Houston Fire Department, Captain Renaud promoted from the rank of Firefighter up to Captain working at Stations 10, 39, 83, 73, 37, 35 and then back to Station 51. Matthew had taken the promotional test for Senior Captain and was in line to be promoted prior to his untimely death at the age of 35 years old. Captain Renaud was promoted to the rank of Senior Captain posthumously and will be forever remembered by all those who knew and loved him as Senior Captain Matthew Renaud.



**Engineer Operator Robert Bebee - Fire Station 51
(Assigned as Firefighter - B on Engine 51)**

Engineer Operator Robert Ryan Bebee was born in Corpus Christi, Texas on January 14, 1972. Robert began his fire department career in August of 2001 at the Val Jahnke Training Facility. Once graduating the Fire Academy, Robert worked at stations 10, 51, 40 and 37 before returning to Station 51 where he was assigned to drive Engine 51. Robert was a well respected and admired firefighter by all his peers. Engineer Operator Bebee was well known for his professionalism, courage and outstanding dedication to the service of others. Engineer Operator Robert Bebee was just 41 years old and had a combined total of 11 years and 9 months of service in the Houston Fire Department.



**Firefighter Robert Garner - Fire Station 68
(Assigned as Firefighter - C on Engine 68)**

Firefighter Robert Garner was born in April of 1984. Once graduating Scarborough High School, Robert chose to first to serve his country in the military. After two full tours of duty in Iraq, Robert was honorably discharged from the United States Air Force. Firefighter Garner was then drawn to the fire service and began serving the citizens of Houston in October of 2010. Once Firefighter Garner graduated the Fire Academy at the Val Jahnke Training Facility, he reported to Fire Station 68 as a Probationary Firefighter. Robert remained at Station 68 after promoting to the full rank of Firefighter. Firefighter Garner continued to work hard and become a respected member of his crew before he died at this fire. Robert was just 29 years old and had completed 2 years and 7 months of service with the Houston Fire Department.



**Prob. Firefighter Anne Sullivan - Fire Station 68
(Assigned as Firefighter - B on Engine 68)**

Probationary Firefighter Anne Sullivan was born in December of 1988. Anne attended Wharton County Junior College Fire Academy in the fall of 2008. Once graduated, she went joined the Community Volunteer Fire Department and then became a member of the Stafford Fire Department in 2010. In January of 2013, Anne had worked hard and earned her place in the Houston Fire Department. Once in, Anne attended the Val Jahnke Training Facility and graduated in April of 2013. On April 30th 2013 Prob. Firefighter Anne Sullivan received her first station assignment to Fire Station 68. One month later she would pay the ultimate sacrifice at just 24 years old. Anne had over 4 years of experience in the fire service including the five short months with the Houston Fire Department.

Section 2

Executive Summary

Shortly after the noon hour on Friday May 31, 2013, the members of the Houston Fire Department were suddenly faced with a harsh reality that one sister and three brother firefighters had been lost at the Southwest Inn Hotel fire. The process of evaluating the events leading up to this loss were not taken lightly and an assertive effort was made to try and understand what had fully happened that day.

Within hours of declaring this event a Line-of-Duty fatality, representatives from the Houston Police Department, the Texas State Fire Marshal's Office, the Texas Commission on Fire Protection and the Alcohol, Tobacco and Firearm Agency (ATF) were on site and ready to assist. In the days that followed, the National Institute of Occupational Safety and Health Administration sent a team of dedicated individuals to research this incident and provide assistance with the goal of sharing the information gained, with the fire service.

Additionally, Fire Chief Terry Garrison decided that the department must do more. He felt that the department should conduct a comprehensive analysis as well. Chief Garrison believed that the knowledge gained would not only help the members develop an understanding of what happened, but help lead the department in finding ways for future improvement.

In a concise and pro-active measure, Chief Garrison established the "Southwest Inn Recovery Committee". This team consisted of a Chairperson and twenty members from all ranks that would work in four specific areas.

1. Fireground Operations
2. Rescue and Safety
3. Communications and Technology
4. Timeline / Process / Procedures

This document is a culmination of the work and information obtained by the various agencies investigating this fire as well as the research gathered by the members of this committee. It is also believed that the effort shared by these men and women, will have a positive influence on the recovery process and a direct impact on the future of the Houston Fire Department. The overall goal is to try and determine what went well and what areas the department can find improvement. The Recovery Committee has also tried to go one step further. Each workgroup was asked to compare the problems our members faced at

the Southwest Inn fire and relate them to ones that have been experienced before. The goal was to discover patterns and then develop solutions that would eliminate common issues.

The first few sections of this report discusses the size and complexity of the department. Describes the organizational structure as well as a brief discussion on the level of service provided. Details are then shared explaining the conditions that the responding companies were faced with on the day of the fire. Weather and traffic conditions can always have a substantial effect on any fire but, on the day of this fire, these factors had a significant impact during the fire. Another section will introduce the building construction, the occupancy type and the investigative report completed by building engineers, who were contracted by the City of Houston to help evaluate the structural components of the wood truss roof.

An abridged timeline will be presented for two key periods. Dispatch to MAYDAY and MAYDAY to Recovery Operation. These sections will provide the actual sequence of events that occurred as well as distinguish specific points during the event that significantly changed the course of action.

Finally, this document provides a detailed look at the Houston Fire Department's "Southwest Inn Recovery Committee". Information is provided on the selection process, the work performed and the workshops that were held. A list of recommendations is also offered, that the committee feels would make a significant impact if the department was faced with this type of incident in the future. It should also be noted that all of this information has been presented to Chief Garrison and his Command Staff in person and several of the recommendations listed have already been implemented or are in the process of being considered.

Section 3

The Houston Fire Department

According to the 2010 U.S. Census, the City of Houston has an estimated land area of over 634 Square miles with an additional 22.3 square miles of water. This makes a total of 656.3 square miles that the Houston Fire Department must protect. Houston has a broad based economy that includes energy, manufacturing, transportation, aeronautics and the Port of Houston just to name a few. Additionally, the Houston Medical Center is well known for its continued advancements each year in the areas of research and care.

In recent years Houston has experienced a continual growth in population and residency. Along with this increase, brings the need for additional Fire and EMS services. The 2010 U. S. Census lists Houston as having a population of 2.1 million with an additional 1 million people that make up the Houston Metropolitan area. The City of Houston is governed through an extensive set of city ordinances. However, despite the vast amount of industry, commercial and residential properties, there are no zoning laws that prohibit land use.

The Houston Fire Department was first established in 1838 with one station – Protection Company No. 1. As of December 31, 2012 and the time of the Southwest Inn tragedy, the Houston Fire Department had a roster of 3,789 classified members and 118 civilian employees.

The Houston Fire Department maintains an ISO rating of 1 and is an Internationally Accredited department through the Commission on Fire Accreditation International. The most recent Accreditation occurred on March 8, 2011.

The HFD Scope of Service - The service provided by the Houston Fire Department has evolved over the years. Early on, a heavy emphasis was placed mainly on protecting citizens from the dangers of structure fires. However, due to the shift in our citizen's needs, a higher prominence has been aimed towards pre-hospital care. The Houston Fire Department has become much more flexible in its ability to meet the challenges that are faced in an ever changing culture. Extensive preparation and resources have been allocated so that the department is prepared to respond to a wider range of incidents including those of hazardous materials, industrial and utility incidents, transportation accidents, weather related events, acts of terrorism and Aircraft Rescue Firefighting at two major airports. [1]

The following is a brief list of services provided by the Houston Fire Department:

1. General Fire Suppression and Investigation
2. Emergency Medical Services
3. Hazardous Material Response
4. Technical Rescue – Above and Below grade
5. Fire Prevention – Inspection, Education, Enforcement and Code Development
6. Special Event Planning and Dignitary Protection
7. Professional Development
8. Public Information - community interaction

Fire Chief Terry Garrison was confirmed as of the 35th Fire Chief of the Houston Fire Department on September 15, 2010. Chief Garrison established four commands which are led by an Executive Assistant Fire Chief or Deputy Director. Under each Command are several divisions that conduct the day to day operations within the department.

1. Finance

Deputy Director Neil DePascal

- a. Finance
- b. Budget
- c. SAP
- d. Procurement
- e. Fixed Assets
- f. Internal Audit
- g. Grant Accounting
- h. Warehouse Operations
- i. Air Pack

2. Planning / Administration

Executive Assistant Chief Rodney West

- a. Office of Emergency Communication (Fire)
- b. Human Resources
- c. IT Liaison
- d. Planning

3. Prevention / Support

Executive Assistant Chief Richard Galvan

- a. Resource Management
- b. Staff Services
- c. Houston Arson Bureau
- d. Life Safety Bureau

4. Emergency Response

Executive Assistant Chief Richard Mann

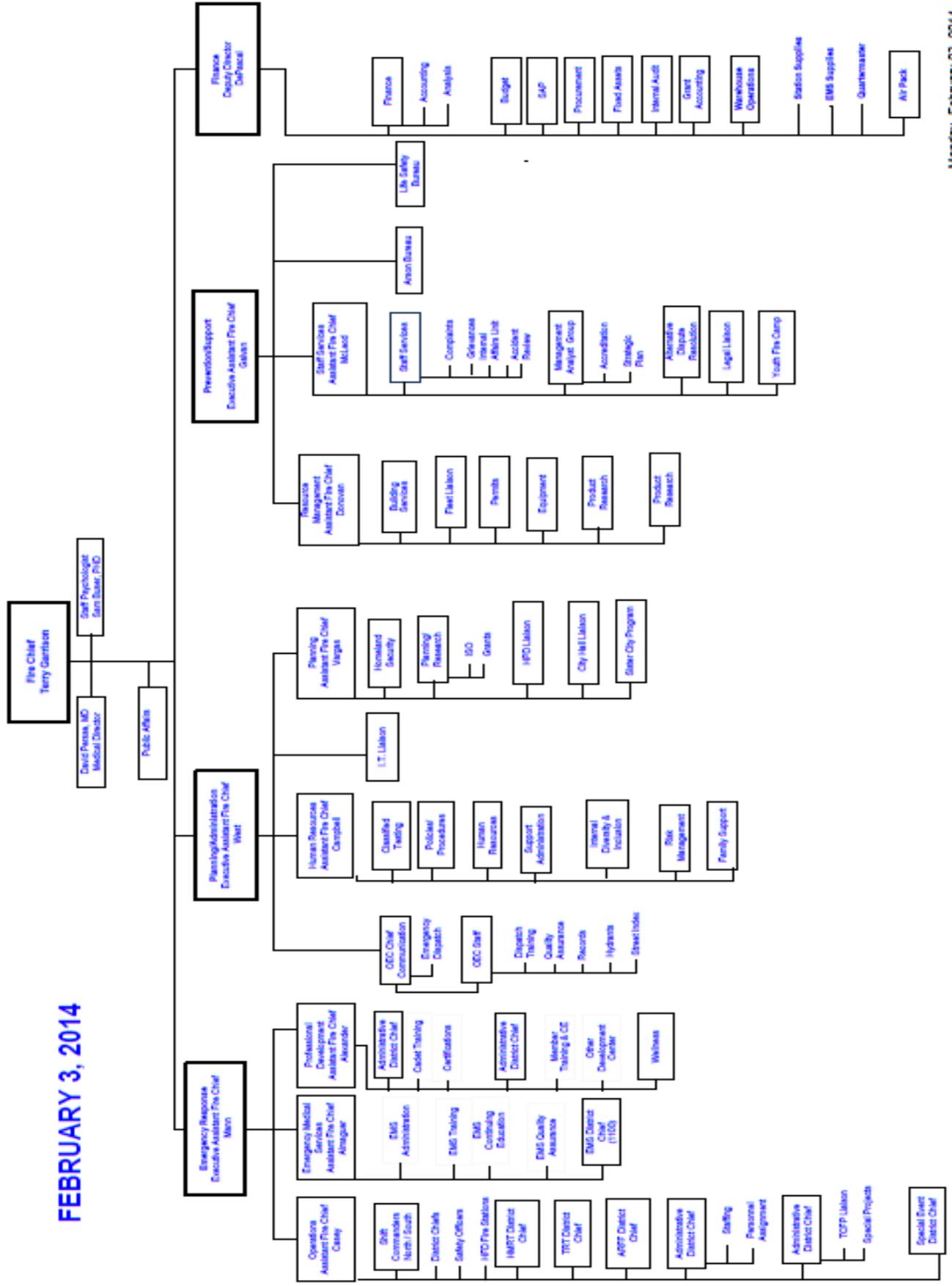
- a. Operations (Fire)
- b. Emergency Medical Services (EMS)
- c. Professional Development (Training)

The Houston Fire Department - Emergency Response Command has the following assets available to respond to both Fire and EMS incidents. These units are dispatched through a Computer Aided Dispatch system that assigns units based on the incident type, location and closest response unit(s) pre-assigned for that type of event.

92	Fire Stations
87	Engines
37	Trucks (Ladder / Tower)
1	Automatic-Aid Truck (Village Fire Department - VL001)
2	Shift Commanders
21	District Chiefs
3	Haz-Mat Units
3	Rescue Units
3	Breathing Air Units
2	Medical Safety units (ARFF)
1	Multiple Patient Transport Unit (AMBUS)
11	Airport Rescue Units (ARFF)
35	ALS Transport Units
56	BLS Transport Units
11	Squads (ALS Medics)
10	EMS Supervisors
11	Boosters
1	Mobile Command Vehicle
3	Safety Units
8	Evacuation Boats
5	Rescue Boats

The members assigned to Suppression, EMS and Office of Emergency Communication work on a 24 hour - shift rotation. The minimum number of classified members needed to staff all emergency response vehicles in the station each day is 832. [2] In addition, the Office of Communication (OEC) has a minimum daily staffing of 16 Communication Officers. From January 1 – December 31, 2013, the Houston Fire Department responded to a total of 299,107 incidents (257,107-EMS and 42,064-Fire). The average response time for EMS events was 5.8 minutes and the average response time for a fire event was 5.6 minutes. [3]

FEBRUARY 3, 2014



Monday, February 03, 2014

Section 4

Conditions at the Time of Alarm

Incident No. 1305310305

- Friday - May 31, 2013
- Southwest Inn Hotel - 6855 Southwest Freeway Houston, Texas
- **12:05:19** the first call was made to the City of Houston 9-1-1 call center reporting the fire (Note: A total of 17 calls were made to 9-1-1 reporting this fire)

Weather Conditions [4] [5]

- Temperature: 86 F. degrees
- Heat Index: 93F. degrees
- Relative Humidity: 65 percent
- Conditions: Scattered Clouds
- Wind Speed: 16
- Gust speed: 23 mph
- Wind direction was from the South

During this investigation both members assigned to the NIOSH team investigating this fire and the members of the Southwest Inn Recovery Committee discovered that a higher than normal wind speed had occurred on this date. A determination was made by both bodies that this was a contributing factor to the spread and difficulties faced by the members at this fire.

The front of the building sat facing to the West. Engine 51 arrived on scene and entered the restaurant through the front door of the restaurant (which was actually on the West side). This entry point would become Division Alpha. It is believed that the wind coming from the South at a constant speed of 17+ mph clearly affected the attack strategy that took place at the beginning of the fire. Another theory is that the high-rise structure (commercial hotel) located to the Southwest of the fire building also created a wind break. This in turn forced high wind patterns to be channeled around both sides of the structure, then funneled down towards the Southwest Inn Hotel directly into Division C.

During the initial attack, and well into the rescue, the direction of these strong winds made Division C the intake side of the structure and placed Division A as the exhaust point. Crews assigned to the fire attack and rescue companies were faced with extreme heat and smoke conditions that would continue to increase and hamper their efforts.

Road Conditions

The Southwest Inn Hotel was located on the feeder road of US 59 (Southwest Freeway). This freeway is known for its heavy traffic and extended delays in travel. At the time of this fire 12:07 pm, travel times on this portion of the highway were reported to be well below the posted speed of 60 mph. [6] This fact, combined with the heavy smoke being generated from the fire and forced across the freeway reduced vehicle speeds to “a crawl”. District 68 anticipated this to be a problem and called for HPD assistance at 12:11:14 even before going on location.

This traffic also complicated matters, when additional units were dispatched and sent on the multiple alarms, almost all responding companies had to travel on this same portion of the Southwest Freeway to reach the scene. Moreover, the companies coming from the north had to work their way down the Southwest Freeway, exit onto the southbound feeder, continue travel for nearly one (1) mile before turning under the freeway and then going back-up the northbound feeder the same distance before reaching the scene. (see; Figure 4.1)

Another challenge faced by Incident Command was establishing an adequate Level II staging area. As stated earlier, the Houston Police Department (HPD) was requested by District 68 early on in the incident. HPD soon arrived and were able to assist responding units with getting through the major intersections in and around the area. However, once these companies began making their way up the northbound feeder, there was not an adequate Level II staging area available. Due to the time of day and congested parking areas, crews were forced to stage their apparatus on the northbound feeder. Once the incident expanded to a 5-11 response, well over 51 pieces of heavy apparatus and an additional 30 plus medium and light duty vehicles were blocked south of the incident on the northbound feeder. In addition News media, Law Enforcement, State and Local officials as well as random spectators all played a role in the traffic problems which continued throughout the afternoon and evening.

Below, Figures 4.1 and 4.2 are photos taken from the Google Map site. These are being provided to help orient this incident in relation to downtown Houston and Fire Station 51. [6]

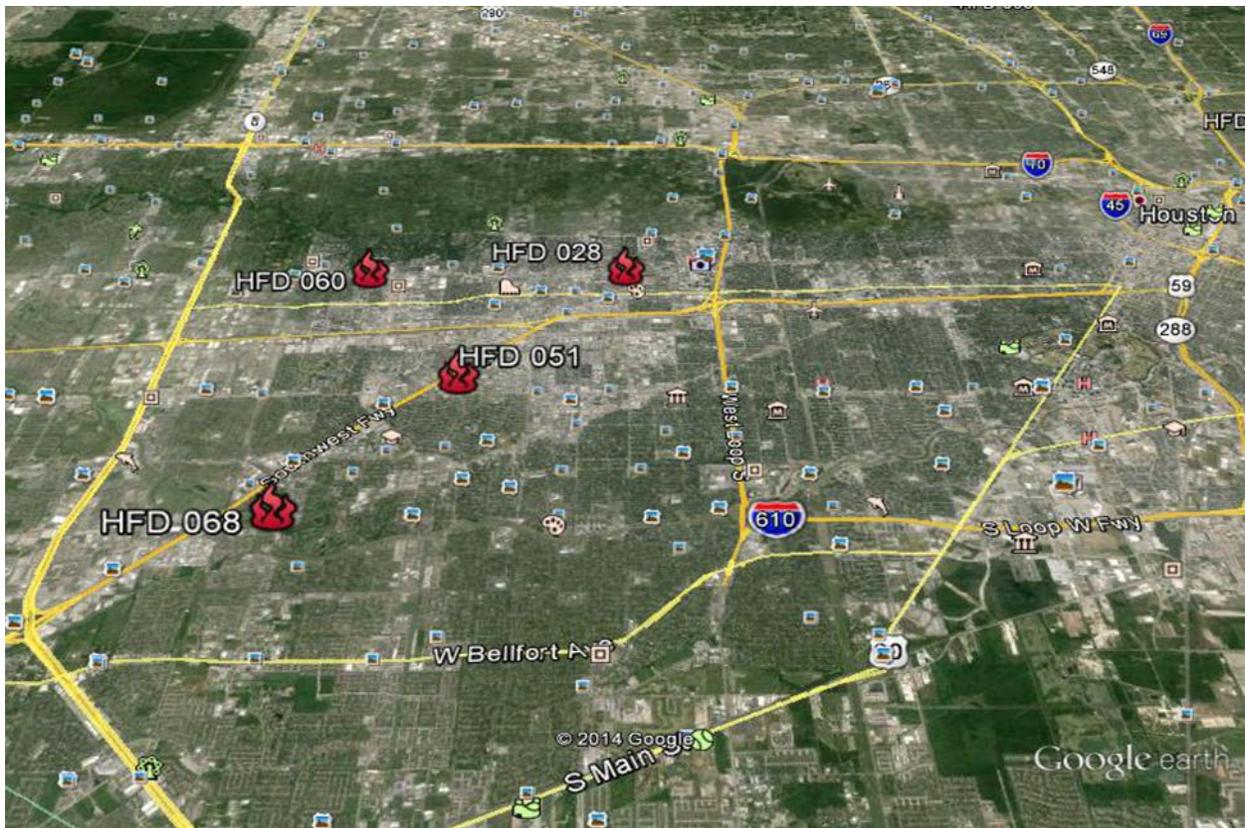


Figure 4.1

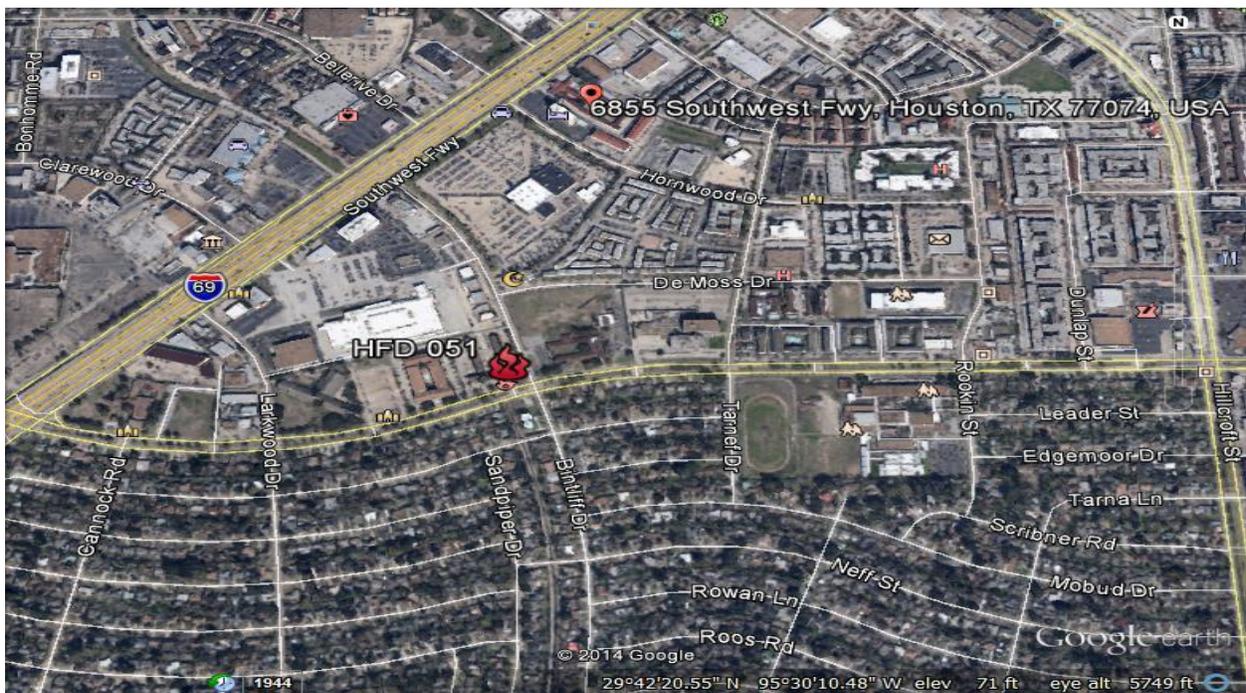


Figure 4.2

Figure 4.3 was discovered on the Houston Chronicle website and the picture was taken by a Houston TranStar camera located at US 59 Southwest Freeway Northbound at Beechnut. [7] Figure 4.4 is a photograph that was also presented on the Houston Chronicle website demonstrating the intense smoke conditions that drivers were faced with on US Highway 59 Northbound as they drove past the fire. [8] Both of these images are being offered to help demonstrate the intense smoke and dangerous traffic conditions that all of the HFD units had to negotiate while responding to this incident.



Figure 4.3



Figure 4.4

Section 5

Building Construction and Occupancy

The property at 6855 Southwest Freeway had a primary use of being a Hotel. There was a Restaurant and Banquet facility (Bhojan Restaurant) located in the front left and center portion of the building. The restaurant was fully operational and open for business during the time of this fire. (see; Figure 5.1)

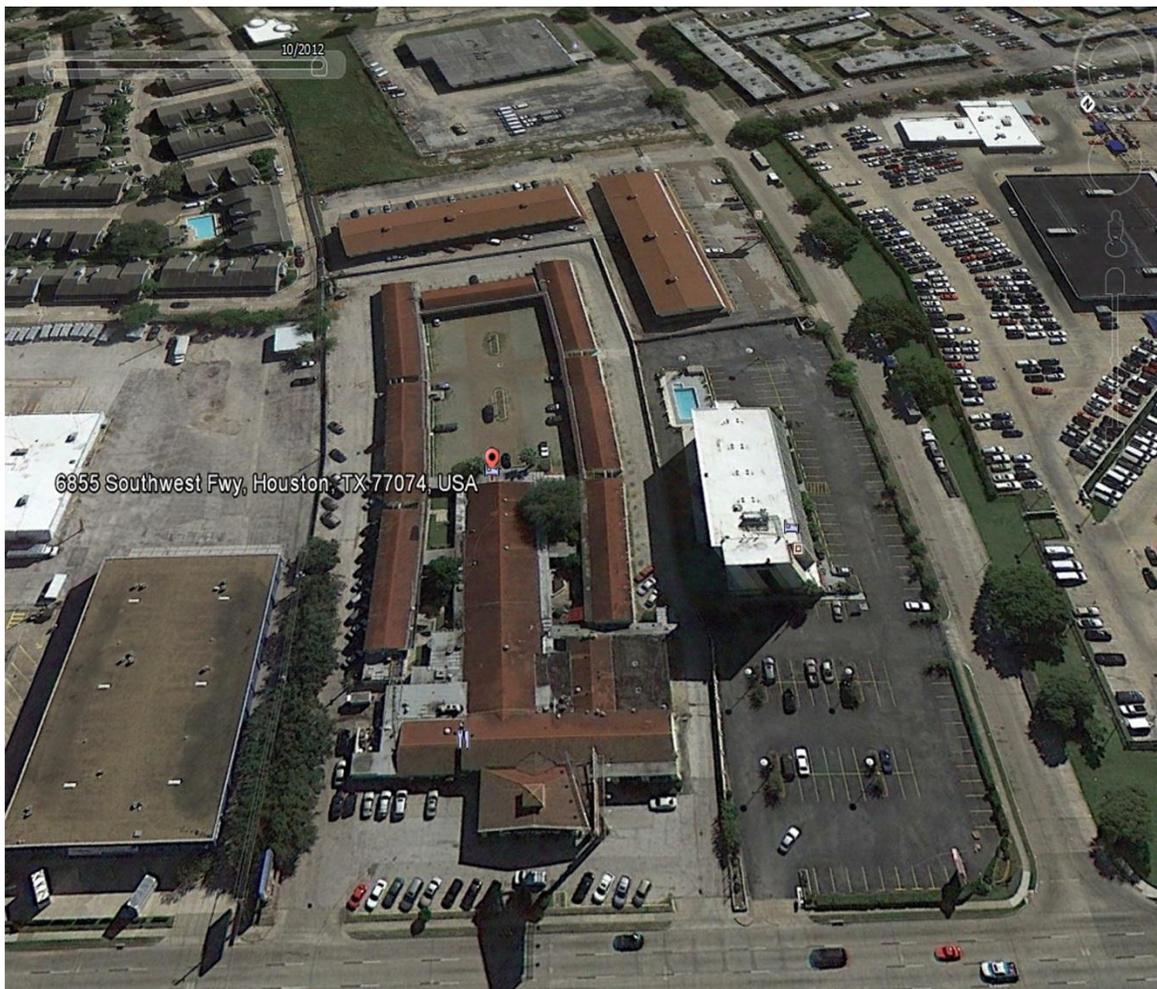


Figure 5.1

The Houston Arson Bureau has been investigating an area located inside the restaurant as the point of origin. (see; Figure 5.2) The restaurant was a single story structure attached to the main building and appeared to have undergone several renovations in past years. The last City of Houston - Alarm Permit was issued by the Houston Fire Marshal's Office on April 07, 2013. The entire building contained over 26,000 square feet of commercial space and mainly functioned as the Hotel office, Restaurant and Banquet space.



Figure 5.2

This property also had seven stand-alone buildings that were two story structures containing multiple guest rooms. These buildings were not attached to the main fire building and were designated as exposure buildings at the time of the fire. (see; Figures 5.3 and 5.4)



Figure 5.3



Figure 5.4

The Texas State Fire Marshal's Office interviewed the City of Houston Public Works and Engineering - Building Permit Department [9]. During this meeting it was disclosed that structures on this property were first constructed starting in 1966 and built under the adopted building codes that were in effect at that time. [10] The building classification was based on its usage and determined to be an **A-2 Assembly occupancy intended for food and drink**. The building department further stated that the restaurant portion of this structure was built on a concrete slab with no sub levels and considered to be a Type-V Wood Frame building in accordance to the NFPA Standard 220. [11]

Additionally, the restaurant itself had appeared to have undergone several renovations over the years. However, due to limited documentation, the City Building Permit Department could not fully verify the dates, modifications or permits that were obtained during these reconstruction projects.

Several areas of building construction came into question early in the investigation. The Houston Arson Bureau made a request for a Structural Engineer to be brought to the scene and assist with the re-creation of the building construction. The City of Houston maintains an "On-Call" Structural Engineer who was directed to report to the site. On Monday June 3, 2013 Huitt-Zollars, Inc. sent a structural engineer who met with Houston Arson members and other agencies investigating the incident. "The purpose of Huitt-Zollars' work was to determine if the roof structure collapsed due to being overloaded or collapsed due to the fire". [12] The determination appeared to have been made from a professional opinion that was based on the observance of post fire structural framing components (i.e. lumber, supports, connections, etc.) as well as additional internal and external construction material that was salvaged from the site.

Over a two day period, the engineer(s) with Huitt-Zollars concluded the following;

1. The building was a wooden structure.
2. The roof structure consisted of wooden built-up trusses spanning 30 feet and spaced at 2 foot (24" centers).
3. The roof truss top chords consisted of 2x6 members and bottom chords consisted of 2x4 members overlapped in the middle by 2 feet. The diagonal members or "web's" were 2x4 as well.(see; Figures 5.5 and 5.6; *Picture No. 15 and 16 from Huitt-Zollars report* [12] and Figures 5.7 [13])
4. The diagonal members were nailed on the vertical face of top and bottom chords with a minimum of three (3) nails. At the ridge of the truss, all members were connected by a ½" thick plywood gusset plate (truss plate). (see; Figure 5.7)



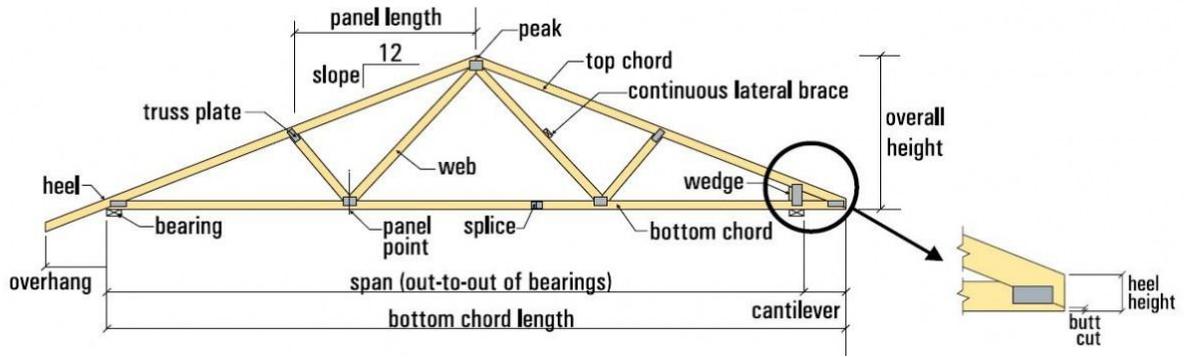
Picture No. 15

Figure 5.5



Picture No. 16

Figure 5.6



General overview of a common truss roof construction and the supporting members [13];

Figure 5.7

5. It appears the wood trusses were constructed of southern yellow pine.
6. It stated that the roofing material consisted of asphaltic shingles throughout the entire structure. The asphaltic shingles were installed over ½" high plywood roof decking which was nailed to the top chords of the trusses. Clay (Cement) tiles were also noted and appeared to be added to the roof at the front of the building. (see; Figure 5.8)



Figure 5.8

7. The walls of the building appeared to be 2x4 studs at 16 inch centers with an exterior brick veneer.
8. The ceiling appeared to be gypsum board.
9. The plywood roof decking was nailed to the top chords of the trusses and ceiling gypsum board nailed to the bottom chords together, this provided a diaphragm supporting the top and bottom chord of trusses.

Huitt-Zollars Final Structural Analysis:

Huitt-Zollars completed a profile of a roof truss based on the information gathered and measurements taken on site using structural software RISA-3D.

The following is a list of standard weights that the structural engineer believes were used during the time of construction of this portion of the building (date unknown).

1. Shiplap	2.30 psf
2. Two layers of tar paper	0.40 psf
3. Plywood	1.00 psf
4. Asphaltic shingles	2.70 psf
5. Clay (Cement) tile	10.80 psf

The engineer from Huitt-Zollars made the final conclusion as stated in the evaluation presented to the Houston Arson Bureau - September 9, 2013. "Based on the analysis of the truss, the results show that the most stressed member was top chord member which was stressed up to 66.5% of its load carrying capacity with full application of dead loads from the roof. Therefore, it is our conclusion that the cause of roof collapse was due to the fire and not due to insufficient structural capacity of the roof truss."

Note: In May 2014, conflicting information was discovered regarding weight values for Clay v. Cement roof tile. Assistant Chief Leocadio Gonzales contacted the Structural Engineers with Huitt-Zollar Inc. to investigate further. The question was raised how and where did Huitt-Zollar find the estimated pounds per square foot (psf) for the Clay (Cement) tile that was used in their calculations. Mike Reyhani PE, LEED AP with Huitt - Zollar responded with the following statement;

"The matter of roof tile, in general we call it clay roof tile. On picture No. 6 (see; Figure 5.9) of our report there is a picture of a complete tile with the name of the manufacture "LIFETILE". We checked the website of the manufacturer and find out the weight of this tile is 10.8 psf. We tried to be very accurate in our calculation, so we used 10.8 psf for the tile. It does not matter what we call it, clay tile or cement tile, the weight of the roof tile in this case is 10.8 psf based on information from the manufacturer."



Picture No. 6

Figure 5.9

Section 6

Abridged Timeline A: Dispatch to MAYDAY

This is the first of two abridged timelines that will be offered to support the operations that took place during the fire at 6855 Southwest Freeway. The order of events below details the actions that took place from the first initial call that was made to the Houston Emergency Communication Center (HECC) reporting a fire at the Southwest Inn Hotel to the first notification by Engine 82 that a MAYDAY situation had occurred.

The data used to re-construct these chain of events came from several sources. Detailed information was obtained by members of the Houston Arson Bureau and the Texas State Fire Marshal's Office while conducting interviews of those members that responded on the initial box alarm assignment. [14] More details were also gathered when NIOSH came to Houston and conducted additional interviews during their research. Finally, the Houston Fire Department Office of Communication's (OEC) has provided audio recordings of the actual telephone conversations and radio transmissions that took place across the following medium.

1. City of Houston 911 - data and recordings
2. OEC - telephone recordings
3. Houston Fire Department - Radio Communications
 - a. DISP CW
 - b. OEC1
 - c. SW TAC 10
 - d. SW TAC 11
 - e. SW TAC 12
 - f. SW TAC 13
 - g. SW TAC 14

12:05:19 First Call reported to the Houston Emergency Communication Center (HECC), reporting that the Southwest Inn Hotel was on fire. (City of Houston 911)

12:07:55 (DISPCW) OEC dispatched the following on DISPCW - [Tone]"Restaurant Fast Food on fire - D068, D028, E051, E068, E060, E082, L068, L069, SF057 M010 Southwest Freeway In-Bound near Sandspoint Dr. Key Map 530H Hotel, Alpha - Bravo 10."

12:08:24 Engine 51 goes en-route from the station

12:09:31 (SW TAC 10) D068 Requested a TAC Channel.

12:09:52 (SW TAC 10) OEC assigned TAC Channel SW TAC 11 as the monitored TAC channel.

12:10:08 (SW TAC 11) E051 reports being on TAC 11.

12:10:12 (SW TAC 11) L068 reports being on TAC 11.

12:10:15 (SW TAC 11) E068 reports being on TAC 11.

12:10:18 (SW TAC 11) E082 reports being on TAC 11.

12:10:22 (SW TAC 11) E051 reports to all units that there is heavy smoke showing.

12:10:22 (SW TAC 11) D068 Acknowledges the message from E051 and requests OEC to upgrade this response to a 1-11.

12:11:04 (SW TAC 11) D068 contacts OEC and requests HPD for traffic control.

12:11:25 (SW TAC 11) E051 arrives on location and provides the following report; *"E051 on location, we got a one story restaurant, we got heavy smoke showing from the attic of the restaurant, we'll be going in making an offensive attack, we'll be pulling a 2 ½."*

12:11:51 (SW TAC 11) OEC makes the following statement on SW TAC 11 "D078 and 83 your 1-11 companies are D059, E078 L059 RE010."

NOTE: During this same time, D078 and D083 were responding to a separate incident at 9850 S. Kirkwood.

12:12:08 (SW TAC 11) D068 acknowledges the 1-11 companies.

12:12:40 (SW TAC 11) D068 confirms with OEC that they will need traffic control on the feeder of the Southwest Freeway In-bound.

12:12:49 (SW TAC 11) OEC acknowledges D068 request for traffic control.

12:13:01 (SW TAC 11) E051 requests that the second in engine company lay a supply-line.

12:13:21 (SW TAC 11) D068 arrives on location and establishes *"Southwest Freeway Command"*.

12:13:26 (SW TAC 11) OEC acknowledges D068 establishing Southwest Freeway Command then advises *"Standby for your 1-11 companies it's gonna be D021, E048 and HR011."*

12:13:33 (DISP CW) OEC dispatched the following on DISPCW – (Tone) *"FFLB11 D021, E048, L033 HR011, page746, page 1-11 Southwest Freeway In-bound near Sandspoint Drive. Key Map 530H Hotel, Alpha –Bravo 11."*

12:13:39 (SW TAC 11) E068 arrives on location and advises that they are trying to locate a hydrant.

12:13:56 (SW TAC 11) E068 advises that a hydrant has been located and that E068 will be laying a supply-line into E051.

12:14:06 (SW TAC 11) D028 arrives on location.

12:14:10 (SW TAC 11) L068 arrives on location.

12:14:17 (SW TAC 11) Command [D068] contacts D028 and states *"Command calling D028 take division Alpha."*

12:14:37 (SW TAC 11) L068 contacts command to advise that they are located in the Delta division and then requests permission to put a *"Vent"* on the side of the building.

12:14:52 (SW TAC 11) Command [D068] acknowledges L068 and states *"What are you wanting to do put a 'Vent' are you talking about a hole in the side of the building?"*

12:14:59 (SW TAC 11) L068 acknowledges *"L068 Yes."*

12:15:04 (SW TAC 11) Command [D068] advises *"No let's don't do that yet, let's find out what we got first."*

12:15:17 (SW TAC 11) E051 begins making entry and reports a Thermal Imaging Camera reading of 184 degrees at the door before entering the structure.

12:15:31 (SW TAC 11) Command [D068] advises *"Southwest Freeway Command we have Grace Accountability in operation."*

12:15:36 (SW TAC 11) OEC acknowledges that Grace is in place.

12:15:37 (SW TAC 11) Command [D068] orders E068 to lay dual lines into E051.

12:15:47 (SW TAC 11) E068 acknowledges D068 and advises that they are currently in the process of *"Skull Dragging"*

12:15:58 (SW TAC 11) D028 contacts command and asks if the ICT on D028 should report to the command post.

12:16:00 (SW TAC 11) Command [D068] acknowledges D028 and orders him to send his ICT to the command post and operate the Grace Accountability System.

12:16:10 (SW TAC 11) OEC advises Command [D068] that L051 has been added to the record.

12:16:11 (SW TAC 11) E060 reports being on location.

12:16:18 (SW TAC 11) Command [D068] acknowledges the report by OEC that L051 has been added to the record and then requests OEC to repeat the 1-11 companies.

12:16:31 (SW TAC 11) OEC tells D068 to stand by.

12:16:39 (SW TAC 11) OEC notifies D068 of the 1-11 companies *"You have D021, E048, L033 and HR011"*.

12:16:55 (SW TAC 11) Command [D068] asks Alpha division [D028] if the building is connected to the hotel.

12:17:03 (SW TAC 11) Alpha division [D028] reports *"Yes"*

12:17:06 (SW TAC 11) Command [D068] orders L068 to ladder the building and try to get between the main building that is on fire and the hotel. D068 also orders that a hole be cut in the roof.

12:17:21 (SW TAC 11) E068 advises command that they have completed their assignment of laying dual lines into Engine 51 and requests another assignment.

12:17:28 (SW TAC 11) Command [D068] asks L068 *"Ladder 68 did you say you have dual lines into E051"*

12:17:34 (SW TAC 11) E068 reports *"E068 we've got dual lines going into E051"*

12:17:42 (SW TAC 11) Command [D068] acknowledges the message from E068 *"Received."*

12:17:45 (SW TAC 11) Command [D068] calls to L068 to confirm the order of getting on the roof and cutting a hole.

12:18:00 (SW TAC 11) OEC advises Southwest Freeway Command that RE010 has been added to the incident.

12:18:05 (SW TAC 11) E082 calls command to request an assignment.

- 12:18:18 (SW TAC 11) Command [D068] orders E060 to be the RIT team
- 12:18:24 (SW TAC 11) The Attack Engine [E051D], calls E068 to request water.
- 12:18:28 (SW TAC 11) E060 acknowledges the orders given by Command [D068] *"Engine 60 received RIT"*
- 12:18:32 (SW TAC 11) E082 attempts to contact command a 2nd time to request an assignment.

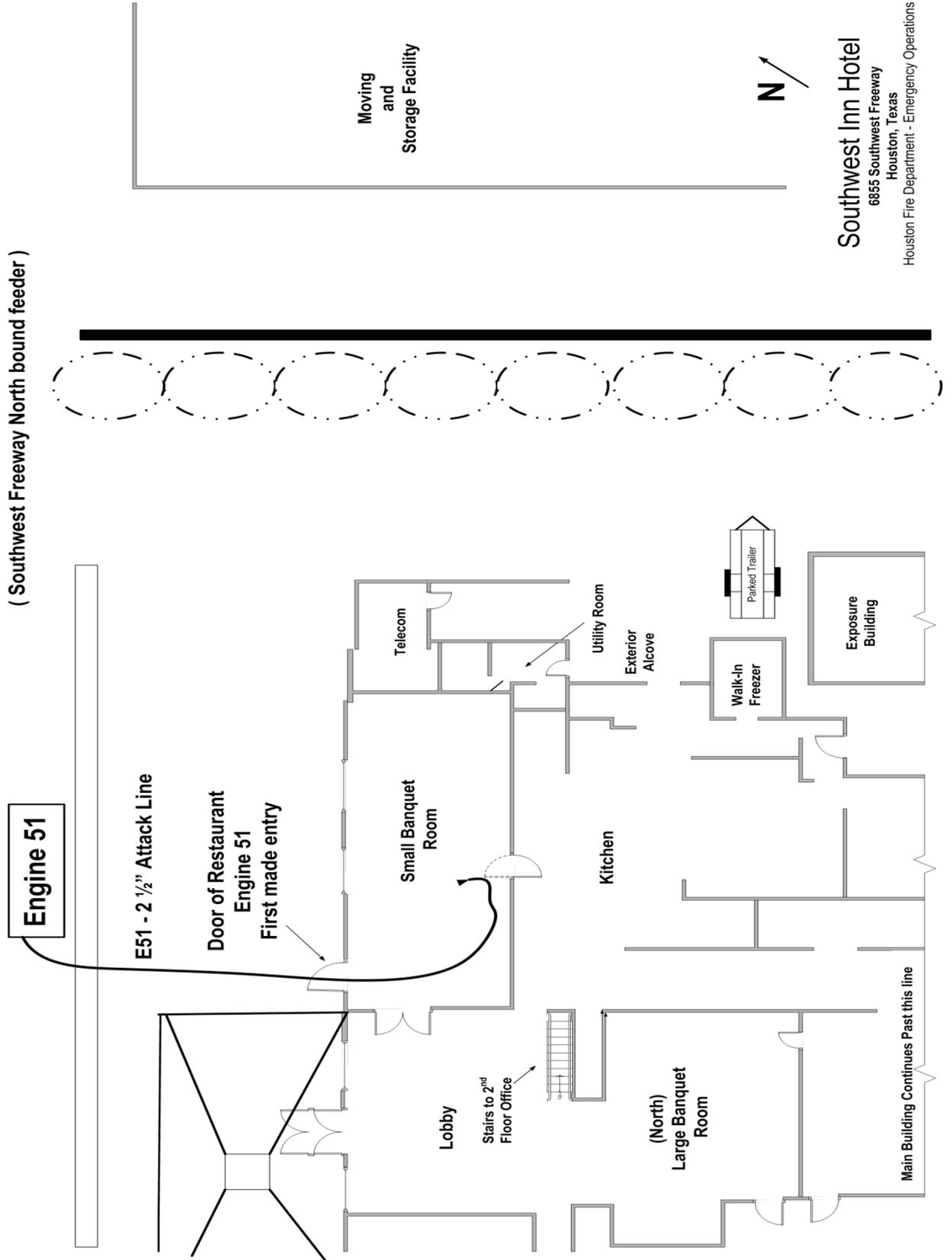
During the interview process, it was reported that E082 was having difficulty contacting command on the radio so the decision was made by the officer to report to the Command Post. Once there, E082 received face to face orders to assist E051 with the fire attack.

- 12:18:38 (SW TAC 11) Command [D068] contacts OEC and requests that a 2-11 be dispatched.
- 12:18:42 (SW TAC 11) OEC acknowledges Command [D068] *"That's received a 2-11."*
- 12:18:43 (SW TAC 11) The Attack Engine [E051D] calls E051 to report that the Engine only has a quarter of a tank of water remaining and that there is not a positive water supply established yet.
- 12:18:52 (SW TAC 11) Command [D068] calls E051 and gives the following order *"Command to E051, back your line out, you do not have a water supply yet, you're still on tank water."*
- 12:18:59 (SW TAC 11) E051 acknowledges Command [D068]
- 12:19:06 (SW TAC 11) The Attack Engine [E051D] calls E068 to advise that the Attack Engine [E051] needs water and to charge at least one line.
- 12:19:13 (SW TAC 11) Command [D068] calls E051 to confirm that they had received the message that E051 was only operating on tank water and that the line should be backed out until a water supply could be established.
- 12:19:22 (SW TAC 11) E051 acknowledges Command's message.
- 12:19:27 (SW TAC 11) Command [D068] contacts L068 to confirm that they received their orders *"L068 did you receive your orders, do not cut a hole in the side of the building, do not put a nozzle in the side of the building, get on the roof, cut a hole in the roof, between the main building and the motel".*

- 12:19:43 (SW TAC 11) L068 acknowledges command *"L068 received main fire building and the hotel."*
- 12:19:46 (DISP CW) [Tone] *"2-11 fire D059 D005, E028, E002, E016, E059, L021, VL001, R042, SF030, CC002, RH017, AS016, SC037, MC008, PG211, PG*)*), PG211A, OEC01, *Southwest Freeway In-Bound near Sandspoint Dr. Key Map 530H Hotel, Alpha-Bravo 11."*
- 12:19:48 (SW TAC 11) Command [D068] acknowledges that the 2-11 has been dispatched
- 12:19:52 (SW TAC 11) E068 attempts to contact command to request an assignment.
- 12:19:58 (SW TAC 11) The Attack Engine [E051D] calls E051 to report that a water supply has now been established.
- 12:20:07 (SW TAC 11) E051 contacts Command [D068] to report that E051 will be going back into the building.
- 12:20:11 (SW TAC 11) Command [D068] acknowledges E051 and advises that E082 will be coming to assist E051.
- 12:20:18 (SW TAC 11) E068 contacts Command [D068] a 2nd time to request an assignment.
- 12:20:23 (SW TAC 11) Command [D068] orders E068 to join E051 and assist on the fire attack.
- 12:20:31 (SW TAC 11) E068 acknowledges Command *"E068 received, join 51 fire attack."*
- 12:20:39 (SW TAC 11) Command [D068] attempts to contact E060 and confirm that they have received the orders to be RIT team.
- 12:20:43 (SW TAC 11) E060 acknowledges Command and reports that E060 has assumed RIT.
- 12:21:18 (SW TAC 11) AS082 reports on location *"AS082 be on location Cyano-Group B-Bravo side."*
- 12:21:31 (SW TAC 11) OEC calls Command and states *"Southwest Freeway Command, let me know when you're ready for your 2-11 companies"*
- 12:21:31 (SW TAC 11) L069 reports being on location.
- 12:21:31 (SW TAC 11) E048 reports being on location.

- 12:21:45 (SW TAC 11) Command [D068] contacts E051 to confirm what side of the structure E051 has made entry from.
- 12:21:52 (SW TAC 11) E051 reports to Command that E051 has entered the building on the Alpha side.
- 12:21:57 (SW TAC 11) Command [D068] acknowledges E051 and orders Alpha division [D028] to remain on the Alpha side of the building.
- 12:22:07 (SW TAC 11) Alpha division [D028] requests for Command to repeat the last message.
- 12:22:08 (SW TAC 11) Command [D068] repeated the order to Alpha division [D028] *"D028 stay in alpha and you do have E082, E051, E068 in alpha."*
- 12:22:19 (SW TAC 11) Alpha division [D028] acknowledges Command, and repeats back *"E068, E082 and E051"* and then advises that there is heavy fire showing on the Bravo side and that entry was made on the Alpha side.
- 12:22:36 (SW TAC 11) OEC contacts SF030 to advise *"Safety 30 you can return to service."*
- 12:22:59 (SW TAC 11) OEC attempts to contact E082 and report that a member has a stuck microphone.
- 12:23:07 (SW TAC 11) Command [D068] attempts to contact E082 and report the stuck microphone and then advises everyone on scene to make sure the *"mic's"* don't get stuck because they are unable to communicate.
- 12:23:24 (SW TAC 11) E082 reports to Command that there has been a roof collapse and there is a MAYDAY with E051 inside**
- 12:23:26 (SW TAC 11) E082 repeats the message *"E082 MAYDAY. MAYDAY"***
- 12:23:30 (SW TAC 11) Command [D068] calls OEC to advise that there has been a MAYDAY and to request a 3-11 assignment. D068 also orders E060 to deploy for the MAYDAY.
- 12:23:40 (SW TAC 11) Alpha division [D028] requests the RIT Team.
- 12:23:42 (SW TAC 11) OEC acknowledges the order by command [D068] to upgrade the incident to a 3-11 assignment for a MAYDAY.

(North Bound U.S Highway 59)



Southwest Inn Hotel
 6855 Southwest Freeway
 Houston, Texas
 Houston Fire Department - Emergency Operations

Figure 6.1

Section 7

“15 minutes and 29 seconds”

On Friday May 31, 2013, four members of the Houston Fire Department were fatally wounded after responding to a report of a restaurant on fire. In just 15 minutes and 29 seconds from the time of dispatch, a catastrophic roof collapse occurred that would forever mark this day as the highest one day total loss of firefighters in the history of the Houston Fire Department.

Dispatch to MAYDAY

12:07:55 hours, the initial dispatch was transmitted. It should be noted that 6855 Southwest Freeway is located approximately $\frac{3}{4}$ of a mile directly behind Fire Station 51. (see; Figure 4.2)

12:08:24 hours, Engine 51 went en-route from the station.

12:10:22 hours, even before going on location, Engine 51 made an announcement on the radio that there was heavy smoke showing. Shortly after, District 68 acknowledged the transmission made by Engine 51 and requested that the Office of Emergency Communication (OEC) dispatch a 1-11 assignment.

12:11:25 hours, just 3 minutes and 30 seconds from the time of dispatch, Engine 51 went on location and provided a size-up that would indicate a one story restaurant with heavy smoke from the attic of a restaurant. Engine 51 also reported that they would be making an offensive attack with a 2 $\frac{1}{2}$ ” hand-line.

12:13:21 hours, D068 arrives on location and establishes the “Southwest Freeway Command”. District 68 was prompt in giving orders as other companies arrived and worked to ensure key benchmarks were met. Initial assignments included ordering Engine 68 to secure a positive water supply. The Rapid Intervention Team (RIT) duties were assigned to Engine 60 and District 28 would be sent to lead Division-Alpha. By 12:13:56 Engine 68 reported being on location and that they would be laying a supply-line into Engine 51.

12:15:31 hours, Engine 51 was in position to begin an offensive attack. Engine 51 followed department guidelines by reporting a Thermal Imaging Camera (TIC) reading of 184 F degrees at the point of entry. (Note: The verbal report of a TIC reading given by the first entry team was created by the Houston Fire Department in the “10 Rules of Survival”. [15] This document was produced after a committee was formed to research the tragic loss of Captain James Harlow and Probationary Firefighter Damion Hobbs in April of 2009. The thermal reading at the point of entry was originally designed to let command know, that the officer entering an Immediate Danger to Life and Health (IDLH) atmosphere has an operating radio, a Thermal Imaging Camera (TIC) and that there is a company beginning to enter the structure.

12:18:38 hours, District 68 requests a 2-11 assignment. During this same time, the Engineer Operator on Engine 51 reported that Engine 51 was down to a quarter of a tank. At 12:18:43, District 68 orders the crew on Engine 51 to back their line out of the building because there is not a positive water supply established to the attack engine. 12:18:59, Engine 51 receives the message and exits the structure.

12:19:43 hours, OEC dispatched a 2-11 assignment to the Southwest Inn Fire. 12:19:58, The Crew of Engine 51 is advised that a water supply has now been established. Engine 51 acknowledges this transmission and reports that Engine 51 would be going back into the structure to resume the offensive attack.

12:20:23 hours, Engine 68 had completed their first assignment of supplying dual lines into E051. D068 acknowledged this report and then sent Engine 68 and Engine 82 to assist Engine 51 with the fire attack.

It was at approximately **12:23:24** when a catastrophic roof collapse occurred trapping five (5) HFD members inside the structure.

- a. 12:07:55 Time of Dispatch
- b. 12:11:25 Engine 51 arrives on location
- c. 12:15:31 Engine 51 makes initial attack
- d. 12:23:24 Catastrophic Collapse / MAYDAY

Total Elapsed time from Dispatch to “MAYDAY” = “15 Minutes and 29 seconds”

12:23:26 hours, Engine 82 reports “**E082 MAYDAY, MAYDAY**”. The officer tries to provide as much detailed information as possible after witnessing this tragic event. Rapid Intervention Teams (RIT) immediately deploy by any means possible, trying to save all those still inside. Over the next hour, dozens of firefighters would continue to rotate through the RIT assignments and work at a relentless pace in an attempt to locate and rescue five of their fellow firefighters.

Section 8

Abridged Timeline B: MAYDAY to Recovery

This is the second of two abridged timelines being offered, to help explain the operations that took place after a MAYDAY had been signaled at 6855 Southwest Freeway. The following information will detail the actions that were taken and the decision made up to the point when the Incident Action Plan was finally declared to be a recovery operation.

The data used to re-construct the sequence of events came from several sources. Detailed information was obtained by members of the Houston Arson Bureau and the Texas State Fire Marshal's Office while conducting interviews of those members that responded on the initial box alarm assignment. [14] More details were also gathered when NIOSH came to Houston and conducted additional interviews during their research. Finally, the Houston Fire Department Office of Communication's (OEC) has provided audio recordings of the actual telephone conversations and radio transmissions that took place across the following medium.

1. City of Houston 911 – data and recordings
2. OEC - telephone conversations
3. Houston Fire Department - Radio Communications
 - a. DISP CW
 - b. OEC1
 - c. SW TAC 10
 - d. SW TAC 11
 - e. SW TAC 12
 - f. SW TAC 13
 - g. SW TAC 14

12:23:57 (DISP CW) [Tone] *3-11 fire D008, D046, E033, E038, E049, E005, L028, L016, SR015, EMSD11, PG211, PG211A, PGOEM, Southwest Freeway In-Bound near Sandspoint Drive Key Map 530H.*

12:24:06 (SW TAC 11) Command [D068] orders all companies to back out of the fire and reports that there is a MAYDAY in progress.

12:24:08 (SW TAC 11) [Tone] OEC announces the following message *"MAYDAY, MAYDAY has been called all units sound your air-horns for 30 seconds."*

12:24:21 (SW TAC 11) Command [D068] attempts to contact E051 *"Command calling E051 can you give me some idea where you're at?"*

- 12:24:36 (SW TAC 11) Command [D068] attempts to contact the MAYDAY companies and provide assistance. *“Command calling the MAYDAY companies, find your hose, get back to your hose and follow the hose out.”*
- 12:24:56 (SWTAC 11) Command [D068] contacts Alpha division [D028] to advise that E048 will be the secondary RIT Team.
- 12:24:57 (SW TAC 11) OEC announces *“All units need an immediate PAR all units need an immediate PAR.”*
- 12:25:08 (SWTAC 11) Command [D068] attempts to contact Alpha division [D028] to see what resources are needed.
- 12:25:22 (SWTAC 11) Command [D068] announces *“Command to all companies, we’re in Rescue Mode. We have a RIT on our location, RIT companies can you give me any information?”*
- 12:25:31 (SW TAC 11) Alpha division [D028] reports to command that E060 is the RIT team and they are going inside the front door. D028 also announces that another RIT crew is needed.
- 12:25:39 (SW TAC 11) Command [D068] acknowledges Alpha division [D028] and assigns E048 as the secondary RIT.
- 12:25:52 (SW TAC 11) AS082 reports *“AS082 Cyano Group Standing-by”*.
- 12:26:25 (SW TAC 11) Command [D068] requests updates from Alpha division [D028] and continues to ask what can be done to help.
- 12:26:22 (SW TAC 11) Alpha division [D028] reports that *“the crews”* are just inside the door and that E060 is inside the structure looking for them.
- 12:26:57 (SW TAC 11) The Accountability officer [an ICT at the Command Post] attempts to contact E068 and advise that they are showing to be in alarm.
- 12:27:04 (SW TAC 11) Command [D068] attempts to contact who he believes to be the MAYDAY crew (E082) to see if any information can be provided as to their location and what their condition is.
- 12:27:16 (SW TAC 11) Alpha division [D028] reports that RIT teams cannot access the area that E051 is believed to be located in and that an attempt will be made by going thru the windows. D028 also requests that another hand-line be charged and brought to the Alpha division.

- 12:27:34 (SW TAC 11) L033 arrives on location and is ordered by Command [D068] to report to Alpha division.
- 12:27:44 (SW TAC 11) E28 reports *"E028 and RE010 are on location"*.
- 12:27:50 (SW TAC 11) Command [D068] orders RE010 to report to the Alpha division and assist with the RIT operation.
- 12:28:04 (SW TAC 11) L051 arrives on location and is ordered by command [D068] to report to the Alpha division.
- 12:28:15 (SW TAC 11) The Accountability officer [an ICT at the Command Post] attempts to contact E051, E060 and E068 crew members by ordering them to *"check PAR"*.
- 12:28:26 (SW TAC 11) Command [D068] requests E051 and E082 to give a progress report and to provide any information that could help crews find them.
- 12:28:52 (SW TAC 11) E082 reports that they are out of the building and not the ones that are trapped. E082 then states that he does not know where E051 is located.
- 12:28:58 (SW TAC 011) Command [D068] receives this transmission and then asks E082 if they know where E051 was last located.
- 12:29:17 (SW TAC 011) E082 reports that E051 is in the Alpha side entrance and to the left.
- 12:29:28 (SW TAC 11) Alpha division [D028] contacts command and makes a request for two more Engine companies. One company is needed to stand-by as an additional RIT and the other to operate an attack line.
- 12:29:52 (SW TAC 11) The Accountability officer [an ICT at the Command Post] attempts to contact the crew members from E068 and E060.
- 12:30:11 (SW TAC 11) Command [D068] makes a general announcement that there has been a roof collapse and that the crew members are going to be under roofing material.
- 12:30:21 (SW TAC 11) SF057 reports being on location and requests the power company to secure the utilities. A suggestion is then made for putting the MAYDAY operation on different channel.

- 12:30:36 (SW TAC 11) Command [D068] reports *“the MAYDAY will stay on the current channel and the Main Command should go to another channel”*. D068 also makes the announcement that D068 will stay on the original Talkgroup (SW TAC 11) with the MAYDAY.
- 12:30:56 (SW TAC 11) Command [D068] calls D021 and gives the order for him to go to another Talkgroup and *“take Command of the fire”*. D068 then states that he would be staying on the original Talkgroup (SW TAC 11) for the MAYDAY.
- Note: The Incident Action Plan should now show that a Rescue Operations Section has been established.
- 12:31:05 (SW TAC 11) OEC advises command that companies can use SW TAC 12 for the incident and that the MAYDAY operation can stay on SW TAC 11.
- 12:31:16 (SW TAC 11) The Rescue Operations Section Chief [D068 - using the designation of *“Command”*] requests a 4-11 assignment.
- 12:31:34 (SW TAC 11) SF057 requests a pumper with a line in the Delta division.
- 12:31:50 (DISP CW) [Tone] *4-11 fire D006, D004, E073, E007, E508, E008, L059, L038, PG211, PG211A, PGOEM, Southwest Freeway In-Bound near Sandspoint Drive Key Map 530H.*
- 12:31:52 (SW TAC 11) Heavy Rescue 11 reports being on location.
- 12:31:55 (SW TAC 11) The Rescue Operations Section Chief [D068 - using the designation of *“Command”*] acknowledges HR011 and gives the order to assist RE010 with the MAYDAY in the Alpha division.
- 12:32:03 (SW TAC 11) E051B Radio keys up with no transmission
- 12:32:28 (SW TAC 11) The Rescue Operations Section Chief [D068 - using the designation of *“Command”*] attempts to contact Alpha division [D028] for a progress report.
- 12:32:51 (SW TAC 11) E048 reports that they have had a member on their crew collapse and that E048 will be coming out of the structure through the window.
- 12:33:35 (SW TAC 11) Alpha division [D028] reports that the RIT teams don't appear to be in the correct location and that crews are coming in with saws to begin cutting through the roofing material. D028 also advises that E060 and E048 are inside (as RIT) and that RE010 is starting to enter the structure.

- 12:34:02 (SW TAC 11) L068 reports to command that the fire is *“running the roof”* and that the apartment complex is going to need to be evacuated. (L068 is referring to the additional unattached two story structures that are part of the hotel complex)
- 12:34:22 (SW TAC 11) E051B Radio keys up with no transmission (1 min 6 sec)
- 12:34:37 (SW TAC 11) OEC attempts to contact E051B but gets no response
- 12:35:36 (SW TAC 11) The Rescue Operations Section Chief [D068 - using the designation of *“Command”*] announces *“Command to all companies go to channel 12 if you’re not involved in the MAYDAY”*.
- 12:36:07 (SW TAC 11) E051B Radio keys up with no transmission (2 sec)
- 12:36:24 (SW TAC 11) E051B Radio keys up with no transmission (3 sec)
- 12:36:27 (SW TAC 11) E051B Radio keys up with no transmission (7 sec)
- 12:36:27 (SW TAC 11) E051B Radio keys up with no transmission (31 sec)
- 12:37:03 (SW TAC 11) Command [D021] makes an announcement to all 3-11 and 4-11 companies to switch over to TAC 12 and stage on the feeder.
- 12:37:43 (SW TAC 11) E060 attempts to contact Alpha division [D028] and request another hand-line.
- 12:38:14 (SW TAC 11) Alpha division [D028] requests *“Command”* to assign additional resources to the Charlie division so that an attempt can be made to gain access to the MAYDAY crews from a different direction.
- 12:38:25 (SW TAC 11) The Rescue Operations Section Chief [D068] acknowledges the transmission made from Alpha division [D028] to command *“That’s received”*.
- 12:38:29 (SW TAC 11) E082 states *“E082 we’re going to the C-side”*
- 12:38:35 (SW TAC 11) Alpha division [D028] calls command to request one more crew for the Alpha division to try and make access from another front door.
- 12:39:12 (SW TAC 11) Alpha division [D028] assigns RIT48 [E048] to work with L069.
- 12:39:21 (SW TAC 11) RE010 makes an attempt to contact Alpha division [D028] by stating *“Emergency Traffic”*.
- 12:39:31 (SW TAC 11) Alpha division [D028] acknowledges RE010 *“Alpha go ahead”*

- 12:39:33 (SW TAC 11) RE010 reports that two MAYDAY firefighters have been located near the window and then provides specific directions on what needs to be done to reach them.
- 12:39:51 (SW TAC 11) Alpha division [D028] acknowledges RE010 and then attempts to advise "*Command*" that an aerial ladder needs to be set up to the roof so that crews can try and gain access from above.
- 12:40:12 (SW TAC 11) The assigned Cascade Truck [CC002] attempts to contact "*Command*" after going on location (on the MAYDAY Talkgroup) and then proceeds to request staging instructions.
- 12:40:37 (SW TAC 11) MC008 reports arriving on location (on the MAYDAY Talkgroup).
- 12:40:56 (SW TAC 11) Alpha division [D028] reports to "*Command*" that E048 is coming out for a bottle change and that Tower 69 would be going inside to replace E048.
- 12:41:11 (SW TAC 11) The Rescue Operations Section Chief [D068] contacts Alpha division [D028] as "*MAYDAY Command*" to ask if they need assistance with extinguishing the fire in the Rescue area.
- 12:42:44 (SW TAC 11) Charlie Division [D059] attempts to contact Command.
- 12:42:44 (SW TAC 11) The Staging Officer [the ICT on District 21] attempts to contact all 3-11 and 4-11 companies and advise them that they need to be on TAC 12 if they are staged.
- 12:43:09 (SW TAC 11) Charlie division [D059] calls "*Command*" to advise that there is a safe advantage point from the Charlie corner and that a hand-line is needed.
- 12:43:20 (SW TAC 11) The Rescue Operations Section Chief [D068] acknowledges the transmission to "*Command*" that is made from Charlie division [D059] then advises that the "*attack*" from the Charlie side should not interfere with the RIT operations.
- 12:43:35 (SW TAC 11) The Rescue Operations Section Chief [D068] orders Charlie division [D059] to go ahead and start setting up the operation that was requested but to be aware that an "*attack*" from the Charlie division could affect the operations on the Alpha side.

- 12:44:35 (SW TAC 11) E051B Radio keys up with no transmission (1 min 6 sec)
- 12:45:08 (SW TAC 11) OEC contacts Southwest Command to advise that E051B's radio continues to key up. (Note: This is approx. 21 min 44 sec since the collapse)
- 12:45:37 (SW TAC 11) The Rescue Operations Section Chief [D068] using the designation of "*Command*") makes an announcement to the RIT crews inside, "*Command to that RIT crew inside, RIT crews, we're trying to knock those flames down to take the radiant heat off of you*".
- 12:45:49 (SW TAC 11) Charlie division [D059] calls "*Command*" to report that the fire is now beginning to spread quickly across the Charlie exposure.
- 12:45:58 (SW TAC 11) The Rescue Operations Section Chief [D068] acknowledges the call to "*Command*" and then asks if Charlie division [D059] has any resources in that division to be able to control the situation.
- 12:46:07 (SW TAC 11) Charlie division [D059] reports that L076 is working to secure a 2 ½ inch hand-line and will be working from the Charlie-Bravo corner.
- 12:46:18 (SW TAC 11) The Rescue Operations Section Chief [D068] attempts to contact Charlie division [D059] and ask "*Did you say you have a ladder over there?*"
- 12:46:22 (SW TAC 11) Charlie division [D059] reports "*I have a ladder company that is trying to appropriate a 2 ½ inch line to bring to this side*".
- 12:46:32 (SW TAC 11) The Rescue Operations Section Chief [D068] acknowledges the report from Charlie division [D059] and states "*Received, we'll try to get you a ladder truck back there*".
- 12:46:37 (SW TAC 11) Charlie division [D059] acknowledges the Rescue Operations Section Chief [D068] and then reports that "*it*" (*the ladder*) needs to be set up on the Bravo side because there are buildings, two sets of motel rooms and meeting rooms that are going to be exposure problems.
- 12:46:56 (SW TAC 11) The Rescue Operations Section Chief [D068] advises that he did not receive all of that message because he is busy with the RIT operations and that "*Command*" will contact Charlie division in a minute.
- 12:47:23 (SW TAC 11) The Rescue Operations Section Chief [D068] attempts to contact Command "*Operations calling Command*"

12:47:23 (SW TAC 11) Command [D021] acknowledges the Rescue Operations Section Chief [D068] "Go ahead"

12:47:40 (SW TAC 11) The Rescue Operations Section Chief [D068] contacts Alpha division [D028] to determine if there will be a secondary collapse problem.

12:47:50 (SW TAC 11) Alpha division [D028] reports back to the Rescue Operations Section Chief [D068] "Yes" and then requests the ladder pipe that is located right above the Rescue operation to begin flowing to the right in order to keep the fire off of the RIT teams. D028 also requests another hand-line to be brought to the Alpha division.

12:48:19 (SW TAC 11) Command [D021] advises L051 that companies are working on the opposite side of their location in the Bravo division and that he wants to check with Bravo division before L051 begins flowing the ladder pipe.

12:48:19 (SW TAC 11) The Attack Engine [E051D] reports that L068 is ready for ladder pipe operations.

12:49:01 (SW TAC 11) RE042 reports being on location.

12:49:24 (SW011) Charlie division [D059] requests an Engine to be brought to the Bravo, Charlie and Delta side so that more hand-lines can be used to stop the forward progress of the fire.

12:49:39 (SW TAC 11) The Rescue Operations Section Chief [D068] advises D059 to stand by because the main focus is on the RIT operations.

12:49:48 (SW TAC 11) E060 attempts to contact Alpha division [D028] and request to be assigned to the order that Charlie division [D059] has requested.

12:49:53 (SW TAC 11) Alpha division [D028] asks E060 to repeat the message.

12:49:57 (SW TAC 11) E060 advises that they are currently in Rehab and are requesting to be assigned to take a hand-line to the Charlie division.

12:50:03 (SW TAC 11) E051B Radio keys up with no transmission (12 sec)

12:50:15 (SW TAC 11) E051B Radio keys up with no transmission (1min 6 sec)

12:51:21 (SW TAC 11) Alpha division [D028] reports that the ladder pipe [Tower 69 operating in a Reserve E-One Ladder Truck] needs to be turned to the right immediately! *"Pronto, Pronto, move the ladder pipe to the right"*

- 12:52:52 (SW TAC 11) Alpha Division [D028] reports to command that one MAYDAY firefighter has been removed from the structure. (Note: The member rescued is the Captain from Engine 68.)**
- 12:53:21 (SW TAC 11) Alpha division [D028] reports that RIT 42 [RE042] is now entering the building.
- 12:54:16 (SW TAC 11) The Rescue Operations Section Chief [D068] attempts to contact Charlie division [D059] to see what resources were requested from earlier and what actions need to be taken to help.
- 12:54:24 (SW TAC 11) Charlie division [D059] requests an aerial to be set up on the Bravo side to help cut off the fire and a pumper is needed on the Delta side in order to place more hand-lines in operation.
- 12:54:56 (SW TAC 11) Charlie division [D059] also requests additional companies so that a primary search can be conducted on the exposure buildings.
- 12:59:11 (SW TAC 11) E508 now reports locating another MAYDAY Firefighter and begins the process of removing the member from the structure.
- 12:59:36 (SW TAC 11) SC037 announces that he will be assuming "*Southwest Freeway Command*" and requests OEC to dispatch a 5-11 assignment to this incident.
- 13:01:49 (SW TAC 11) {DISP CW} Tone....5-11 fire D019, D026, E037, E047, E062, E080, L007, L055, PG211 Southwest Freeway In-Bound near Sandspoint Drive Key Map 530H. Alpha-Bravo 12.
- 13:03:40 (SW TAC 11) Alpha Division [D028] reports that there has been a secondary collapse involving the outside exterior wall.
- Note: Three members from the Rescue Group became trapped under falling debris that resulted from the secondary collapse. These firefighters were quickly removed by other members in the immediate area and then taken to awaiting EMS crews.
- 13: 04:12 (SW TAC 11) Alpha division [D028] now reports that a second MAYDAY Firefighter has been removed from the structure. (Note: This member is the Firefighter from Engine 51)**

A rescue operation had now been in progress for over 40 minutes. Several Houston Fire Department Command Staff members including the Fire Chief and the Executive Assistant Chief of Emergency Response had arrived on scene. In a unified approach, the decision was made to move the Incident Action Plan (IAP) from one of Rescue to that of Recovery.

In the days, and weeks that followed, the Houston Fire Department lead by the HFD Honor Guard began a vigilant watch over the fallen. The highest degree of respect and dignity was provided to all four of these members. Additionally, the twelve firefighters that were also injured during this incident, received the continuous help and support of a grateful department and city.

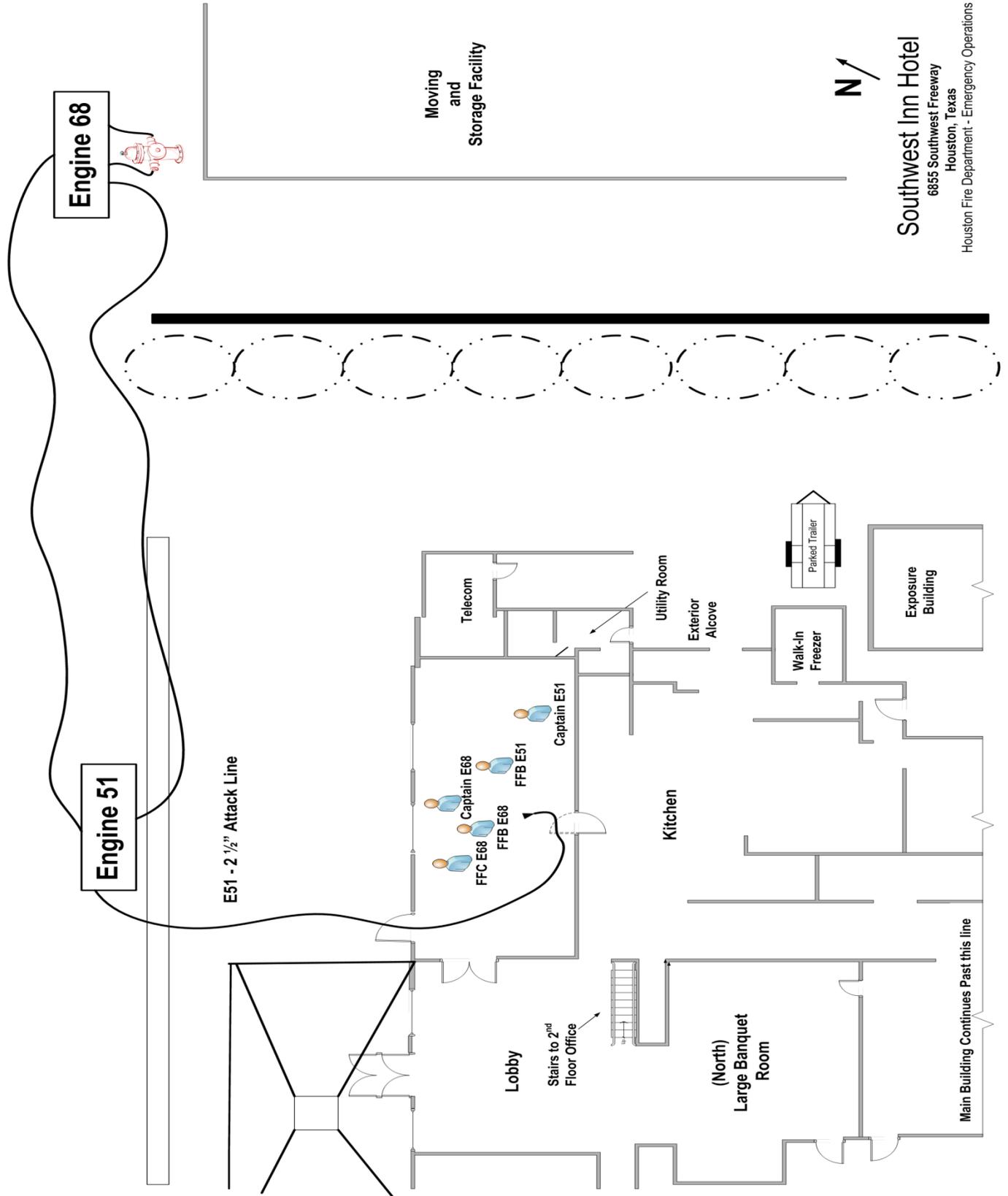


Figure 8.1

Section 9

“the Rescue”

At **12:23:26 hours**, the Incident Action Plan (IAP) was immediately altered from an offensive attack to a Rescue operation.

At **12:23:56 hours**, Command [District 68] contacted the Office of Emergency Communications (OEC) to request that a 3-11 assignment be sent due to the “MAYDAY”. Alpha division [District 28] advised command to send the Rapid Intervention Team (RIT).

At **12:23:57 hours**, the Office of Communication (OEC) dispatched the 3-11 fire and Command [District 68] ordered all companies to back out of the fire and the RIT team was deployed.

Engine 60 was the first company in position as RIT and ordered by Alpha division [District 28] to enter the structure and find the members of the Fire Attack Group. The first member located was a firefighter just inside the door. This member was Firefighter - C from Engine 51 and was found under what appeared to be a lean-to style collapse. The RIT team assisted this member out of the structure and told him to report to District 28. The RIT Team (Engine 60) then returned to the same entry point and tried to enter the void space that had been created when the center section of the roof fell straight down and the remaining expansion came to rest up against the upper portion of the exterior wall. During interviews, members of the search teams stated they could hear the sound of T-Pass signals. The decision was then made to try and go through the two front bay windows located on the Alpha division and / or any openings on the Bravo and Charlie side.

Members from Tower 69, Ladder 33, Ladder 51, Engine 82, Engine 48, Engine 508 and several others were all assigned to assist with these search and rescue efforts. These companies attempted to enter the structure through the windows which first required them to begin cutting away at the underside of the fallen roof section that was leaning up against the wall. Soon after, another MAYDAY firefighter was located but found under large debris. Several attempts were made by the companies working with the rescue, to contact Alpha division [District 28] on the radio. However, due to an excessive number of people trying to transmit messages, company officers were simply unable to communicate on the radio. Engine 60 returned outside, and found Alpha division [District 28]. A report was given face to face that two more of the MAYDAY firefighters had been located. These members were believed to be Firefighter – B and Firefighter – C from Engine 68.

By this time, Rescue 10 had entered the Alpha division and was able to meet up with the initial companies assigned to RIT. The Captain on Rescue 10 was advised of the location and condition of at least (two) of the MAYDAY firefighters and also updated with what equipment may be needed.

A rescue plan was soon developed and efforts were made to begin tunneling through the debris to reach the downed firefighters. Due to extreme heat and smoke conditions, Rescue 10 along with other Rescue Group companies had to first cool the immediate area. This was accomplished by using hand-lines to protect the MAYDAY firefighters from the radiant heat. The next task would be to get fresh breathing air to the fallen member. This would be accomplished by using a Rapid Intervention Team SCBA (RIT-Pack). This piece of equipment includes an SCBA with a regulator and face-piece that is meant to provide a full air-bottle for a downed firefighter. This job was successfully performed by a member of the Rescue group who was able to reach the first MAYDAY firefighter. It should be noted that, this member performed this task without the aid of an SCBA himself. The firefighter had to tunnel through his way through heavy debris in order to reach the downed firefighter and assist him with placing the RIT-Pack SCBA face-piece on.

At this point the members of Heavy Rescue 11 arrived and joined the Rescue Group. The next course of action would be to begin removing this member from the structure. Rescue members knew that this was going to be an extended operation and that they would need to be constantly rotated throughout the operation. It was further complicated by the fact that a secondary collapse (of an exterior wall in the rescue area) would become a likely scenario. A large crack in the face of the brick veneer wall, that was also covered in stucco was beginning to form and continuing to spread. This placed the members of the Rescue group working closest to the "rescue" access point in danger. The commanding officers in the Alpha division continued to monitor the progress of the rescue as well as the stability of the exterior wall. The thought that this exterior wall could fail at any minute was an obvious concern to all.

Soon after, Rescue 42 arrived and was also assigned to the Rescue Group. Commanding Officers continued to monitor the failing wall and tried to come up with viable options that could be used to shore-up the section directly over the Bay windows where the rescue was taking place.

At **12:52:52 hours**, or 28 minutes and 34 seconds after the first call for “MAYDAY”, Alpha division [District 28] was able to report that the one of the first MAYDAY firefighters had been removed from the building. This member was the officer assigned to Engine 68 Captain William Dowling. Captain Dowling, was severely injured and rushed to a waiting ambulance where EMS crews wasted no time in packaging and transporting him to the Houston Medical Center. After Captain Dowling was extricated, the Rescue group continued their fight to reach the remaining MAYDAY firefighters.

Heavy master streams were still needed to cool the area in close proximity of the Rescue. The Risk vs. Gain model was at the highest level but the decision to maintain the IAP as a rescue operation remained unchanged. One of the most significant factors for this decision was the fact that Command was receiving several reports from OEC that the radio assigned to Engine 51B (Engineer Operator Robert Bebee) was continuing to key up. The status of this member was unknown and it was thought that he may have found refuge and was trying to communicate so, the only decision that could be made was to continue the rescue.

Moments later, a large section of wall over the Bay windows began to fail. This segment fell towards the members that were working inside the window. As those outside the collapse zone strained to give notice, a secondary collapse occurred that quickly covered three of the Rescue Group members. Exterior firefighters quickly rushed in and were able to lift the large sections of wall up, freeing those underneath. These members were then transported by ambulance with severe non-life threatening injuries.

At **13:04:02 hours**, Engineer Operator Robert Bebee would be located and also extricated from the building. Robert was transported to Southwest Memorial Hospital but succumb to his injuries. With a heavy heart. The decision had to be made and the Incident Action Plan was finally altered from Rescue to Recovery. (Editor’s Note: It was later determined that the Scott E-Z RadioComm accessory attached to the radio on Engine 51B failed due to radiant heat. The thin casing protecting the wires had melted causing them to touch and inadvertently key the radio an estimated 20 times – see; Communication and Technology Recommendations)

As time passed, the true nature of what had happened would begin to unfold. The actions that took place by fellow firefighters were incredible as they began to tell their stories. One significant fact that must be shared, was the one offered by the team of investigators from the National Institute of Occupational Safety and Health (NIOSH). When NIOSH arrived, they quickly determined that the Houston Fire Department should be credited with having the first successful rescue of a MAYDAY while using a RIT-Pack SCBA. There is no doubt, that this achievement is a true testament of the professional dedication, training and heroic actions that all those involved had demonstrated.

Captain Bill Dowling has since undergone several surgeries and extensive treatment during the months that followed. Once strong enough, Captain Dowling was transferred to a rehabilitation center where he continued to gain strength. On Wednesday November 27, 2013 Captain "Iron Bill" Dowling was officially released from the hospital by his doctors and able to return home riding in the Captains seat of E068. This was the same seat he had occupied just six months earlier on the day of the fire. Captain Dowling has a tremendous network of friends and family all across the country that continue to show their love and support.

Friday May 31, 2013 will forever remain as one of the longest days endured by the members of Houston Fire Department. Four brave firefighters responded to the report of a restaurant on fire at 12:07 pm and were lost just 15 minutes and 29 seconds later. Moreover, twelve other firefighters sustained significant injuries while performing the successful rescue of another firefighter and extinguishing the blaze. In the end, all those involved must take credence in knowing that no civilian casualties had been lost. This fact alone should stake claim that our sister and brother firefighter's lives were not lost in vain. Each one performed their job in a very noble and honorable way and all four will be remembered as heroes.

***Recovery Committee note:** The companies listed above were reported through field interviews and written statements. Any exclusion or omission of companies that assisted with the rescue and or recovery efforts were purely unintentional. Hundreds of Houston firefighters were on scene that day and all performed admirably under some of the most extreme conditions. The committee apologizes if any member or company was not mentioned that may have performed a more active role.*

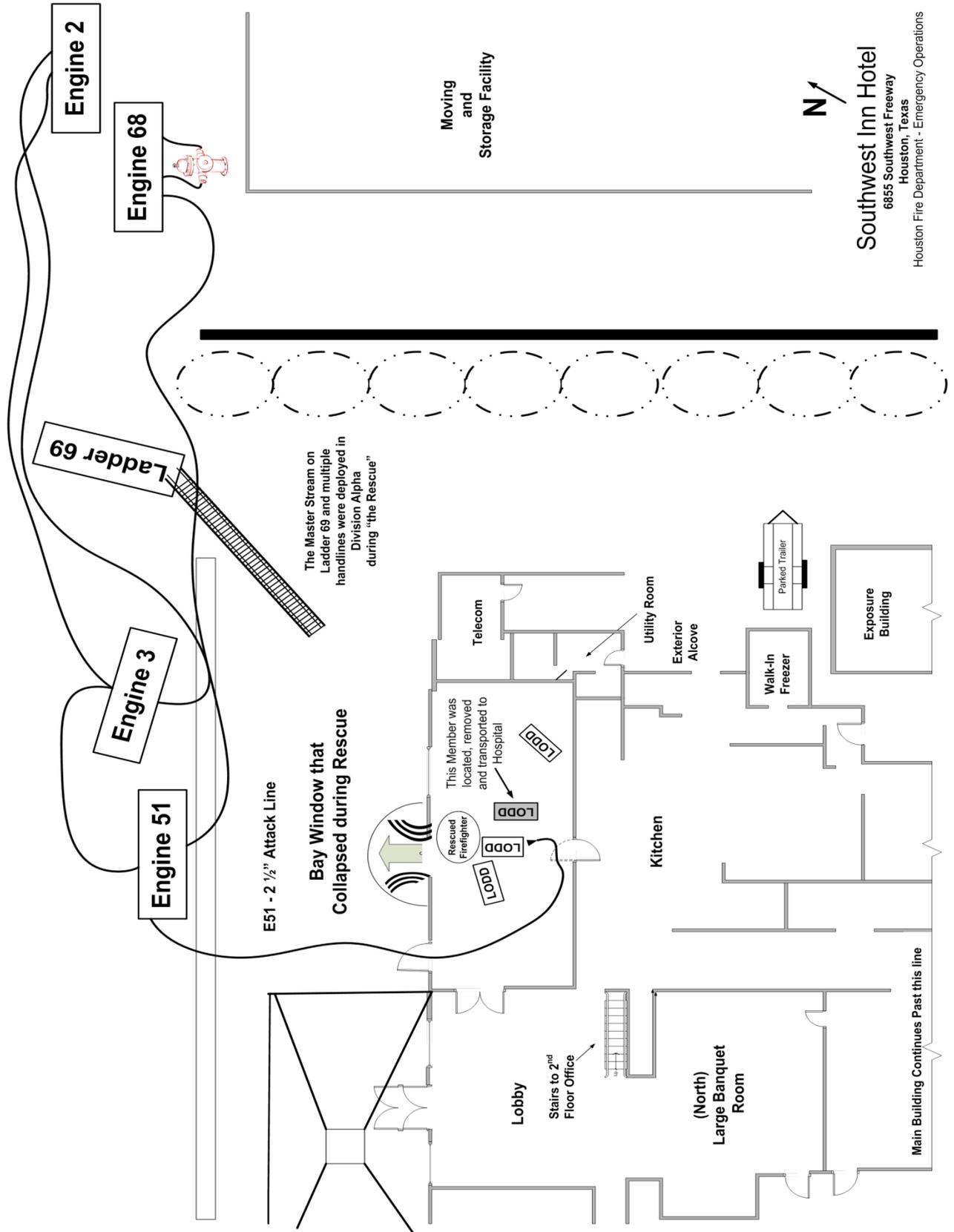


Figure 9.1



Figure 9.2

Section 10

Investigation, Evaluation and Research Agencies

Numerous agencies have assisted the Houston Fire Department throughout the past year to help try and determine the cause and origin of the fire that occurred on May 31, 2013. Several more organizations have studied this incident from a research perspective to help support the department in examining the equipment, procedures and other internal matters associated with the event.

In the end, reports are written and theories are formed. However, the men and women of the Houston Fire Department will forever mourn the loss of the four fallen members. No document will ever be able to truly express the thoughts and actions that our members had to endure that day. Nor, will they ever articulate the story that only those that were lost could tell.

Below, is a list of agencies and committees that have dedicated countless hours in reviewing the vast amount of evidence, documents and interviews that have been collected. The Houston Fire Department would like to thank all those associated in this mission and respect the opinions and/or findings that may or may not be in agreement to those shared by the department.

Houston Arson Bureau (Houston Fire Department Arson Division)

This division is the law enforcement agency of the Houston Fire Department. This unit will respond to events that are incendiary in nature, those that develop into multiple alarms, ones that involve fatalities or relate to bomb, criminal and terroristic activities. The nature of work includes investigation, collection of evidence and forensic photography. These investigators also work with other federal, state and local law enforcement agencies such as the Bureau of Alcohol, Tobacco, Firearms and Explosives, the Texas State Fire Marshal's Office and the Houston Police Department.

Bureau of Alcohol, Tobacco, Firearms and Explosives

The Bureau of Alcohol, Tobacco, Firearms and Explosives is a federal law enforcement organization within the United States Department of Justice. Its responsibilities include the investigation and prevention of federal offenses involving the unlawful use, manufacture and possession of firearms and explosives; acts of arson and bombings; and illegal trafficking of alcohol and tobacco products.

Texas State Fire Marshal Office (SFMO)

The Texas State Fire Marshal's Office (SFMO) is charged with the responsibility of investigating all firefighter fatalities that occur in the State of Texas. When a firefighter dies in the line-of-duty or in the connection of an on-duty incident the SFMO will investigate all of the circumstances surrounding that death. The State Fire Marshal will also complete and make public, a final report concerning the investigation once the inquiry is complete. [16] Several State Investigators and Inspectors have collected evidence, pictures and statements during this investigation to help develop a comprehensive report that will represent the views and opinions of those who work in State Fire Marshal's Office.

Texas Commission on Fire Protection (TCFP)

The Texas Government Code 419.048 (effective September 1, 2009) requires the Texas Commission on Fire Protection (September 2007. TCFP) to evaluate information and to make a report on fire protection personnel injuries. Ultimately, this office is meant to develop recommendations that will work to reduce the amount of injuries sustained by firefighters [17]. During this incident, the TCFP assigned compliance officers to assist the Texas State Fire Marshal's Office in collecting documents associated with the fallen members Personal Protective Equipment (PPE). Another area researched included the four members training records. This office also assigned deputies to assist the State Fire Marshal with evaluating the building construction associated with the Southwest Inn Hotel.

Harris County Institute of Forensic Science (HCIFS)

The mission of the Harris County Institute of Forensic Sciences (HCIFS) is to provide three essential services: Determine the cause and manner of death, to document and preserve the evidence relating to the decedent in accordance to Article 49.25 of the Texas Code of Criminal Procedure, and to provide unbiased expert witness testimony in a court of law. At the time a firefighter fatality occurs, the HCIFS is contacted by the Houston Arson Bureau and works with the HFD Chief Arson Investigator. The HCIFS then follows the procedures and documentation that are outlined in the National Fallen Firefighters Fatality Autopsy document [18]. A determination as to the cause of death is usually resolute after a cause and origin of the fire is provided by the HFD Chief Arson Investigator. Once received, the HCIFS will release their final report.

National Institute of Occupational Safety and Health (NIOSH)

The National Institute of Occupational Safety and Health (NIOSH) is an agency that is assigned to the Centers for Disease Control and Prevention (CDC). Each year on average, 100 firefighters die in the line of duty. In 1988, Congress recognized the need for further efforts to address this problem and funded NIOSH to implement a firefighter safety initiative. The NIOSH Firefighter Fatality Investigation and Prevention Program (FFFIPP) conducts independent investigations of select line-of-duty deaths. The FFFIPP is a public health practice investigation program. Its purpose is not intended to enforce compliance with state or federal job safety and health standards, nor determine the cause and/or point blame toward a department or individual firefighter. The primary goal of this program is to learn as much as possible from a tragic event and attempt to prevent future similar events from occurring again [19].

Houston Police Department – Homicide Division

The Houston Police Department reports to the scene of any firefighter line-of-duty death when it occurs inside the City of Houston. All investigations are coordinated through an HFD Chief Arson Investigator and subsequent findings and reports are provided in relation to the Houston Arson Bureau report.

National Fire Protection Agency (NFPA)

The National Fire Protection Agency (NFPA) collects, analyzes and reports detailed fire experiences. Areas documented include information on fire ignition, growth and development, contributions of building construction including interior finish and furnishings and several other categories directly related to the incident. The HFD Chief Arson Investigator holds the responsibility within the Houston Fire Department to provide this information due to the extent and nature of the data requested. Once complete, NFPA provides a final report that is made public and available on their website. This information is also used to produce an annual statistical style report.

United States Fire Administration (USFA)

The United States Fire Administration (USFA) requested assistance in preparing a report entitled "Firefighter Fatalities in the United States in 2013" This document explores the circumstances involved in the fires that claim the lives of firefighters inside the United States. This report attempts to identify trends and provide detailed information in order to prevent similar tragedies from occurring in the future. The circumstances involved with the Southwest Inn fire will be included in the next report prepared by the USFA.

International Personnel Protection, Inc.

Houston Fire Department requested the services of International Personnel Protection, Inc. This company conducted an independent third party inspection of the Personal Protective Equipment (PPE) that was worn by our four fallen members. Although the integrity and performance of the PPE that is worn by all of our firefighters, did not appear to come into question during the investigation, the Houston Fire Department felt it was important to provide the membership with a complete and accurate report. An important aspect of that includes a comprehensive examination of the Personal Protective Equipment to ensure that it meets all NFPA requirements, industry standards and purchasing specifications that the department has set.

National Personal Protective Technology Laboratory (NPPTL)

As part of the Firefighter Fatality Investigation and Prevention Program (FFFIPP) that the National Institute of Occupational Health and Safety (NIOSH) conducts, the Technology Branch of the CDC agrees to examine and evaluate the Self Contained Breathing Apparatus (SCBA) that are worn by any line-of-duty fatality firefighter. The four SCBA's worn by our fallen members were sent to the National Personal Protective Technology Laboratory (NTPPL) located in Pittsburgh, PA. In February of this year, a representative from the Houston Fire Department and two members of the NIOSH team witnessed an extensive evaluation of two of the four SCBA's. The remaining two SCBA's showed obvious visible signs of damage and deemed unsafe to continue the rigorous testing.

Grace Industries (Grace Accountability Systems)

The Command box that was assigned to District 68 was the initial GRACE box turned on and used by the Accountability Officer (AO) at the Southwest Inn fire. As the scene escalated, the battery naturally ran down. Eventually due to the duration of the incident, the command box turned off and members did not have an opportunity to follow the normal procedures that had to be followed in order to save the data. Subsequently, the information that would have been used from the fire, was not retrievable when the Communication and Technology workgroup began their research. The GRACE Accountability system Command Box from District 68 was sent to GRACE Industries for further evaluation and data collection but unfortunately, no data was obtained.

Houston Police Department – Digital Forensic Laboratory

The Houston Police Department – Digital Forensic Laboratory was contacted by the Communication and Technology workgroup of the Southwest Inn Recovery Committee. This HPD division is well known for having experts in the field of retrieving lost or stolen data from IT equipment. The Recovery Committee workgroup asked members of this HPD Lab to analysis the GRACE Command box and attempt to retrieve any data that may be recovered.

Houston Fire Department – Emergency Response Command - Recovery Committee

On June 20, 2013, the Fire Chief of the Houston Fire Department - Terry Garrison, established the Southwest Inn Recovery Committee. The sole purpose of this group was to learn as much about this fire and evaluate the department's procedures, equipment and operations that took place at the incident. The end goal was to come up with a set of workable solutions for both the common and uncommon problems that our members faced that day. The Recovery Committee consisted of twenty one members from across the department. Additionally, members of the Command Staff would also assist by performing as a support group.

Appreciation for the organizations and agencies listed

The Houston Fire Department owes a great deal of gratitude to the men and women of those organizations that are listed above and would like to thank each one for all of the countless hours that have been spent helping us to recover. Our department will be forever grateful and appreciate the continued support and encouragement that has been shared.

Section 11

Test Results – PPE, Accountability System and SCBA

The documents presented in this section are provided as a demonstration of the extensive tests and evaluations that were performed. Three separate groups were asked to test, inspect or evaluate the Personal Protective Equipment (PPE), GRACE Accountability System and the Self Contained Breathing Apparatus that were used at the Southwest Inn Fire. These measures were taken so that the department could develop a comprehensive report. Full reports and additional documentation relating this research is on file in the administration offices of Emergency Response Command.

Parties conducting tests and evaluations;

1. GRACE Industries
2. Houston Police Department – Digital Forensic Laboratory
3. National Institute of Occupational Safety and Health (NIOSH)
4. National Personal Protective Technology Laboratory (NPPTL)
5. Scott Health and Safety
6. International Personal Protection Inc.

Cook, Jeffrey - HFD

From: Bob Campman <bcampman@graceindustries.com>
Sent: Tuesday, July 02, 2013 3:10 PM
To: Cook, Jeffrey - HFD
Cc: KEVIN LENTZ; Paul Emmett @ Grace; 'Rick Waltemire Sr. Software Engineer'; Tom Shacklock; dsmith@graceindustries.com; Jack Campman Grace Industries
Subject: Computer Findings
Attachments: Houston Panasonic Toughbook CF.doc; 11070001.xls; 11090585.xls; 11090589.xls; 11090590.xls; 11100532.xls; 11100536.xls; 11110504.xls

Dear Chief Cook,

After extensive analysis and research, we were not successful in retrieving a meaningful data-log from the PC that was running the In-Command software during the May 31 incident.

Attached is a Word-file summary report of the steps taken in our attempt to regain the data-log. We regret not being able to retrieve this data for HFD, however the process has led to identifying an update to the system that should minimize the possibility of this occurring in the future. Once this update has been completed, it will be made available to HFD.

Also attached are the xls (spread-sheet) data-log files from the 7 TPASS units. The logs have been placed in two separate pages per file, one being the raw data-log as read from the TPASS, the other a parsed data-log showing the more meaningful change-log activity. The file name corresponds to the TPASS unit's serial number.

The PC and TPASS equipment returned to Grace are ready for return. At your convenience, please indicate where these should be shipped back to, and to whose attention.

Thank you for the opportunity to assist HFD and please let me know if I can be of further assistance on this matter.

Bob Campman, Vice President R&D
Grace Industries Inc.
305 Bend Hill Rd
Fredonia, PA 16124

Office: 724-962-9231 x206
bcampman@graceindustries.com
www.graceindustries.com



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Houston Police Department
Digital Forensic Laboratory
1801 Allen Parkway Houston, Texas 77019

FORENSIC ANALYSIS REPORT

Case Number:

Laboratory Number: 2013-266

On Friday, August 30, 2013, I, Sergeant L. T. White, assigned to the Criminal Intelligence Division, Digital Forensic Laboratory, received a request from Jeff Cook, of the Houston Fire Department, to examine evidence related to an official police investigation regarding a Data Recovery.

EXAMINATION DETAILS

On Saturday, November 2, 2013, the examination of this case was completed by Senior Police Officer D. W. Ertons. A list of submitted evidence, along with comments and findings which resulted from the examination and processing of that evidence follows. All submitted evidence and those findings regarding the submitted evidence that contains relevant information or was specifically requested by the case agent, will be provided to the case agent.

SUBMITTED PROPERTY

Report Item#	Qty	Description	Make	Model	Serial#
CMP1	1	Computer	Panasonic	CF-31	CF-31JAGAX1M

SPECIFIC FINDINGS

I imaged and analyzed the drive using Encase version 6.19.4 along with a Tableau T3458is hardware write block. I searched for any files created on 5/31/2013 and found only system activity nothing related to the Grace system software. I also searched in unallocated (files that are deleted can be found in unallocated space if they are not overwritten by new files) and pagefile.sys (space on the drive that is used as virtual RAM) but found nothing that was timestamped with the requested time frame (5/31/13 between 12:15 and 1300 hrs).

The Grace software is proprietary and I spoke with Jeff Cook with HFD who indicated the drive had already been looked at by the manufacturer of the software who were unable to recover data in that time frame. Mr. Cook said the laptop was on and recording data that was being sent back from sensors attached to firefighters who perished in a fire. Cook said the data is stored in a temporary file and has to be saved by the user or it is deleted. The laptop was not plugged in and ran out of power and when it was turned back on the data was gone.

.....
END OF EXAMINATION

Date prepared 11/1/2013

Page 1 of 2



DEPARTMENT OF HEALTH & HUMAN SERVICES

NIOSH Reference: TN-19199

Centers for Disease Control
and Prevention (CDC)

National Institute for Occupational
Safety and Health (NIOSH)
National Personal Protective
Technology Laboratory (NPPTL)
P.O. Box 18070
Pittsburgh, PA 15236-0070
Phone: 412-386-4000
Fax: 412-386-4051
March 24, 2014

District Chief Edward Llewellyn
Houston Fire Department,
600 Jefferson Street, 7th Floor
Houston, Texas 7702

Dear District Chief Llewellyn:

The National Institute for Occupational Safety and Health (NIOSH) has concluded its investigation conducted under NIOSH Task Number TN-19199. This investigation consisted of the inspection of four Scott Health and Safety AirPak 4.5, 45 minute, 4500 psig, Self Contained Breathing Apparatus (SCBA). The SCBA units in question were contained inside individual cardboard shipping boxes and were delivered to the National Personal Protective Technology Laboratory (NPPTL) NIOSH facility in Bruceton, Pennsylvania, on June 13, 2013. The packages were taken to the NPPTL, Technology Evaluation Branch (TEB) Respirator Equipment Storage Area (building 20) and stored under lock until the time of the examination and evaluation.

SCBA Inspection:

An initial general inspection of the SCBA units was conducted on June 14, 2013. The units were identified as Scott Health and Safety AirPak 4.5 models. In addition, Scott Health and Safety down loaded the data logger from one of the SCBA's with NIOSH personnel present.

A complete visual inspection of the SCBA units was conducted on October 30, 2013, and February 11, 2014. The units were examined, component by component in the condition received, to determine conformance to the NIOSH-approved configuration. The visual inspection process was photographed.

The complete SCBA inspections are summarized in Appendix I of the enclosed Status Investigation Report. The condition of each major component was photographed with a digital camera. Images of the SCBA units are contained in the Appendix III of the report.

The SCBA units in question, Unit #1, Unit #2, Unit #3 and Unit #4 suffered heat damage, but exhibited other signs of wear and tear; and the units were covered lightly with general dirt, grime, foreign particulate material, and soot. The cylinder valves as received on all units were in the opened position. The cylinder gauges that could be read as assembled to the backframe were approximately 0 psig for Units #2 and #3. The other gauges were un-readable.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

NIOSH Reference: TN-19199

Centers for Disease Control
and Prevention (CDC)
National Institute for Occupational
Safety and Health (NIOSH)
National Personal Protective
Technology Laboratory (NPPTL)
P.O. Box 18070
Pittsburgh, PA 15236-0070
Phone: 412-386-4000
Fax: 412-386-4051
May 9, 2014

District Chief Edward Llewellyn
Houston Fire Department,
600 Jefferson Street, 7th Floor
Houston, Texas 7702

Dear District Chief Llewellyn:

As requested by the Houston Fire Department, the National Institute for Occupational Safety and Health (NIOSH) contacted Scott Health and Safety of Monroe, North Carolina, to further evaluate and test the Self Contained Breathing Apparatus (SCBA) identified as Houston Unit #2 in the NIOSH report issued March 24, 2014. Scott agreed to the request and Mr. Murrey Loflin of the NIOSH Division of Safety Research (NIOSH/DSR), and Mr. Tom Pouchot of the NIOSH National Personal Protective Technology Laboratory (NIOSH/NPPTL) hand delivered Unit #2 to Scott on April 1, 2014.

Upon delivery of Unit #2, Scott Health and Safety inspected, evaluated, and tested the SCBA unit.

Attached is a report and figures describing the actions performed by Scott, and the findings of this additional evaluation.

Upon completion of the evaluation by Scott Health and Safety, the Unit #2 SCBA was packaged and hand carried back to the NIOSH facility in Bruceton, Pennsylvania. The unit was then placed back into storage.

From the information obtained during this additional evaluation of the Unit #2 SCBA, NIOSH proposes no further action on its part at this time. The investigation under task number TN-19199 will be considered closed. If you have any questions or require additional information, please contact me at 412-386-4036.

Sincerely yours,

Thomas D. Pouchot
Acting Coordinator
Technology Evaluation Branch
National Personal Protective Technology Laboratory

Enclosures

cc: Ms. Beverly Gullede, Scott Health and Safety
Mr. Murrey Loflin, NIOSH Division of Safety Research



International Personnel
Protection, Inc.™

May 24, 2014

District Chief Edward Llewellyn
Houston Fire Department
600 Jefferson
7th Floor
Houston, TX 77002

Dear Chief Llewellyn:

Enclosed is a hard copy of the LODD report for my examination of the firefighter protective gear for the four firefighters from the May 31, 2013 fire. I have also provided a diskette with both the PDF and Word copies of the report for your use.

Please let me know if there is anything else you need or if you would like to see any changes.

Sincerely,



Jeffrey O. Stull

Enclosures

Jeffrey O. Stull, President and Grace G. Stull, Vice President

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Section 12

The Houston Fire Department Recovery Committee

In the days and weeks that followed the Southwest Inn Hotel fire, the Houston Fire Department performed the arduous task of honoring the fallen. In addition, several other members injured during the rescue also needed help and support. Fire Chief Terry Garrison also knew that there was much more that needed to be done. Chief Garrison had experienced this type of tragedy before as a member of his previous department and he was faced with this hardship again. Once the fallen had received the dignity and honor they had so deservedly earned, the next step was to lead the department through a “Recovery Process”.

On June 20, 2013, Chief Garrison composed a memo “A Message From The Chief”. [20] This document demonstrated his commitment to this plan and set a course of action. The primary goal of the “Recovery Process” would be to research this fire from an operations standpoint and evaluate the department’s procedures. The department would then continue with what worked well and try to find ways to improve in those areas that would make us a safer and stronger department.

The Houston Fire Department has been a leader in the fire service for years. The pain felt from this loss has reached out well beyond the members of the department. Condolences and well wishes have come from all across the nation. Chief Garrison knew that the details learned from this tragedy would be shared amongst those same paths. So, in order to have a meaningful and productive assessment that could be shared with the fire service, a well-balanced and open committee needed to be formed.

To begin organizing the Recovery Committee, Chief Garrison first looked to Executive Assistant Chief Richard Mann – Emergency Response. Chief Mann was asked to assemble a group of individuals, from within the department that would be open and candid as they worked through the process. These members would be asked to assess all aspects of the incident including what the department did in the days and weeks that followed.

Overall, the committee would consist of three main components: A Chairperson, four workgroups and a Support Group.

Chairperson

Chief Mann first selected a Chairperson to help organize and form the committee. District Chief Edward Llewellyn, who was currently assigned to Emergency Operations staff was appointed to this position. The Chair was responsible for coordinating all of the administrative needs of the committee and assisting with various requests made by other agencies such as NIOSH and the SFMO.

Committee Workgroups

The four committee workgroups were selected from an extensive list of individuals. Twenty members were chosen based on experience, knowledge, leadership and professional reputation. These members were initially asked to participate and then assigned accordingly. (Note: the rank and station assignment listed below is what each member held when the committee was first formed).

Fireground Operations Workgroup:

District Chief Ronnie Martin	Emergency Operations - Station 26D
District Chief Michael Phillips	Emergency Operations - Station 19D
Senior Captain James Campbell	Emergency Operations - Station 20A
Senior Captain Roland Hobbs	Emergency Operations - Station 74C
Engineer Operator Celeste Fatheree	Emergency Operations - Station 08B

Rescue and Safety:

District Chief Troy Koterak	Emergency Operations - Station 30B
District Chief Curtis Williams	Emergency Operations - Station 83B
Senior Captain Don Alexander	Emergency Operations - Station 11C
Senior Captain Wesley Hurst	Emergency Operations - Station 34A
Firefighter Kenneth Wright	Emergency Operations - Station 10A

Communications and Technology:

District Chief Jeff Cook	Emergency Operations - Special Projects
District Chief Valerie Seymour	Emergency Operations - Station 26B
Senior Captain Brad Hawthorne	Emergency Operations - Station 18C
Senior Captain Eddie Havlice	Emergency Operations - Station 26C
Captain John Franco	Emergency Operations - Station 05C

Timeline / Process / Procedure:

District Chief Christopher Chavez	Emergency Operations - Station 26C
Senior Captain Kevin Alexander	Professional Development - VJTF
Senior Captain Juliet Higgins	Emergency Operations/EMS-Station 33B
Firefighter Trevin Nelms	Emergency Operations-HMRT Station 22A
Senior Captain John Kerr*	Emergency Operations – Station 04B
Senior Investigator Robert Carnes	Fire Marshal's Office – Arson

(* – Member withdrew from Recovery Committee)

Support Group

The Support Group consisted of the Fire Chief and three members of the Command Staff. These members worked as sponsors of the committee and provided guidance and assistance from the administration as needed.

Fire Chief Terry Garrison	
Executive Assistant Chief Richard Mann	Emergency Response Command
Assistant Chief Michael Casey	Emergency Response Command
Deputy Chief Rodney West	Office of Emergency Communications

The Committee Process

Once the committee was formed, a Special Bulletin was sent to the department introducing the goals, objectives and timeline that this panel would be working towards. [21] This was also notice to all members that the committee would not be working in a vacuum and that input from the members in the field would be welcomed. During the next few weeks informational meetings were held and the workgroups were organized. Audio recordings, pictures and other documents collected during the initial phase of the investigation were presented and a briefing was held to update each member.

Workgroups then began meeting on their own and assigning tasks to various members. These workgroups reached out to members in the field and spoke to the firefighters that responded to the incident. Workgroup members read through hundreds of pages of supporting documents and listened to the audio transmissions that were provided by the Office of Communication (OEC). After two full months of study, the first of three planned workshops was held.

On September 11, 2013 representatives from all four workgroups and the Support Group came together. Each workgroup was given an opportunity to share their overall findings and any details that they felt would need to be reported. Afterward, Chief Garrison challenged each workgroup to form sound recommendations in the scope of their area. These improvements were to be based on the three fundamental levels of fire ground operations: Strategic, tactical and Task level assignments.

By October 2013, a Recovery Committee update was provided to the members of the department. Special Bulletin No. 148 [22] expressed the progress that the recovery committee had made and outlined a list of changes that had already taken place. These changes came as a direct result of the recovery process. Chief Garrison had said early on, the main focus of this committee was to learn what went well at the fire and to develop solutions for the problems that were faced. These changes demonstrated the commitment made by the administration to study what happened on May 31, 2013 and improve in areas that would make us a safer department.

On December 16, 2013 the full Recovery Committee met once again for the 2nd of three planned workshops. This time, each workgroup provided a list of recommendations that Chief Garrison had asked for. Committee members were then asked to begin work on forming a draft document and prioritizing their recommendations.

In January, a draft report was started and scheduled to be completed by the end of March. The full committee would have an opportunity to review the draft and provide suggestions. The final document was written after 11 months of work and almost one year to the date of the fire. Chief Garrison and Chief Mann had one final goal for this committee. The last order of business was to develop a district level training program that was based on the information gained through this extensive process. Prior to this document being released, the Chairperson was directed to formalize the training and to schedule select members from the committee to go out and instruct these classes.

Section 13

Recovery Committee Evaluations and Recommendations

This section will present the overall evaluations and recommendations that were reached by the Southwest Inn recovery members. Each workgroup was given a flexible timeline to follow and were instructed to evaluate how we as a department respond to all incidents not just the Southwest Inn fire. In order to have an open process, workgroups also considered other incidents that have taken place where members have experienced similar problems.

During a six month period, the members of these four workgroups scheduled meetings with several of the firefighters, Engineer Operators and Officers that actually made the Southwest Inn fire. Committee members worked with outside agencies that were involved with the investigation as well as department vendors that had equipment actually used during the incident. These committee members conducted personal evaluations, received input from other members in the field, reviewed policies and procedures from other similar sized departments and spent long hours reviewing all of the documents and audio recordings that were available from the fire. Additionally, workshops were held which allowed the committee to come together and share what had been learned.

In the end, there had to be closure. The following recommendations that have been prepared are not all inclusive and there will always be room for improvement. Our profession is forever evolving and technology continues to play a leading role in our future. Our department is enriched with some of the most modern advancements in the fire service today, but we must also remember that any change made should be based basic on good fundamental practices and basic firefighting techniques.

Fireground Operations:

Below are the evaluations and recommendations that have been presented to Chief Garrison and his Command Staff by the Fireground Operations workgroup. These findings have been organized in the Strategic, Tactical and Task level assignments as they relate to fireground operations. Some items were approved and implemented prior to the completion of this report. Others may be delayed and or modified due to limitations in technology, scheduling conflicts or cost and budgetary constraints.

Strategic Level Evaluations and Recommendations:

Radio Communications

1. OEC
 1. OEC should fulfill a Support role for Emergency Operations and not give direction or orders during the incident.
 2. OEC should relay pertinent information to units **by voice** rather than transmitting data on the Mobile Data Computers (MDC's). (i.e. OEC is receiving multiple calls vs. caller states the fire is trash in the back yard.)
 3. Communication Captains need to apply correct guidelines and procedures to the incidents. (i.e. during the MAYDAY, OEC advised all engineers to sound air-horns)
 4. OEC should automatically assign a monitored TAC-channel (Talkgroup) on all Box alarms dispatched as a structure fire.

2. Emergency Operations
 1. Members should be trained to provide CAN reports (Conditions-Actions and Needs)
 2. The department needs to provide training on proper radio discipline. Members should transmit specific information and not use the radio to conduct conversations that would be more appropriate face to face.
 3. The National Incident Command System (NIMS) is not used consistently throughout the department.
 - i. Classroom training should be developed that provide officers with an opportunity to learn how to build from a routine type incident (no signs of fire) to a more advanced scenario (Multiple alarms, MAYDAY etc.)
 - ii. Classroom lesson plans should pre-empt all Chief Officer Development Classes (CODC) prior to actual simulations.

- iii. Simulation should be performed at a slower pace and focus on building a correct Incident Command model.
 - iv. Instruction needs to be developed that includes “Forecasting” how an incident might build and requesting additional Support Talkgroups.
 - v. Instruction needs to be developed that includes the use of multiple or alternative communication devices. (i.e. communicating with OEC using Cell phones and Mobile Data Transmitters [MDT’s] would help reduce non-emergency radio transmissions).
 - vi. Simulation should stop whenever a learning point can be shared and then continue once corrected.
- c. The first arriving officer should assume command and communicate directly with all responding companies that are assigned to an incident, rather than transmitting a message to OEC and have it repeated. (i.e. Main Street Command to all responding units, continue non-emergency.)
 - d. When an Incident Commander makes the determination to upgrade a Box Alarm assignment, the Incident Commander (IC) should establish a Level II staging area and request an “un-monitored” “**Support Talkgroup**”. This Support Talkgroup will be used to communicate with the staged and or responding companies. The Staged and responding companies should then listen to both the “**monitored**” operations Talkgroup and the “un-monitored” Support Talkgroup while waiting to be given an assignment.
 - e. When a MAYDAY situation occurs, the Incident Commander should make a statement that declares “**Emergency Traffic Only**”.
 - i. All non-emergency communications should be made face to face to a division or group leader.
 - f. Only the Incident Commander should answer radio transmissions as “**Command**”. All other operational assignments should use their division or functional area to identify their transmissions.

Incident Command

1. Supporting the Incident Command System

- a. Additional District Chief’s should be requested early in an event to assist with the Incident Command structure.
- b. The Command Staff and administrative members that self-respond to incidents should function in a support role.
 - i. The NIMS system should be adhered to and these members should always seek opportunity to provide assistance to the Incident Command Structure.

- ii. These members should have clear defined roles once on scene, especially after a catastrophic incident occurs that requires higher level planning.
 - iii. Roles for all staff members should be updated and defined in HFD guidelines. (refer; HFD Guideline - Incident Management; Volume II Reference No. II-06, Sec. 6.06F)
- 2. The command staff position of “Accountability Officer” (AO) should only be re-assigned to another member **once** after the initial assignment has been given. This assignment is best filled by a trained Incident Command Technician (ICT).
 - a. There should be a standard method in place to report pertinent information when this assignment has been passed to another member.
 - b. All Chief vehicles are equipped with three (3) “Priority” radios. The person assigned to be the “Accountability Officer” (AO) should always use one of these “Priority” radios.
 - c. When an incident escalates, the Incident Commander (IC) should consider assigning an “Accountability Group” to assist the “Accountability Officer” (AO) in maintaining situation awareness and helping to expand this important function at every fire.
 - d. Any member (Engineer Operator or Firefighter) that performs in the ICT position should be qualified.
 - i. To be considered qualified, a member should complete an official ICT course and participate in regular training with Chief Officer’s and other trained ICT’s.
- 3. Incident Commanders should use the Grace System to perform “Electronic PAR’s” for routine PAR checks so that each member on the fireground is contacted individually. It is believed that this procedure would also improve communications by reducing radio traffic.
- 4. All support functions at an incident, should be located in one designated area to help manage and assist crews. (example; Rehab, Cascade, Radio support etc.)
- 5. Mobile Command 8 (MC008) should be dispatched on 3rd alarm fires.
- 6. Communication Captains should remain at OEC and not respond to multiple alarm incidents in OEC1. It is believed that these members can be better utilized by monitoring additional Talkgroups at the Houston Emergency Communications Center (HECC) during large scaled events.

On-Scene apparatus management program (Apparatus Placement – Level I staging)

1. When developing an Incident Action Plan, the Incident Commander should **“Forecast”** the incident to determine if there is potential for being a complex or long term event that may require additional apparatus. Incident Commanders can then “Plan” rather than “React” to sudden changes that occur at an incident.
2. Apparatus placement is a key component of **“Forecasting”**. The intended use for each apparatus must be considered before it is spotted and placed into operation.
3. If an incident is forecasted to be a complex or long term event, consideration for an adequate Level II staging area needs to be addressed.
 - a. The location and assignment of a Staging Officer needs to become a priority and all companies assigned to staging should be instructed where and how to park their apparatus so that they can be easily deployed when needed.
4. Maintain a **“Clear Access Lane”** - If an incident is forecasted to be a complex or long term event, a “Clear Access Lane” must remain open to the scene so that specialized units can be ordered and positioned for maximum use. (i.e. Rescue trucks, Towers)
5. If an incident is forecasted to be a complex or long term event, consideration for a formal REHAB group needs to be addressed. The location of this group should be large enough to accommodate all support units (i.e. Rehab truck, Cascade etc.)

General Observations

1. Chief Officer Development Classes (CODC) need to be more in-depth and include the following classroom topics.
 - a. Building Construction
 - i. Clay Tile roofs
 - ii. Structures with large roof spans
 - iii. Expanding incidents - National Incident Management System (NIMS)
 - iv. Utilizing multiple radio Talkgroups at a single incident
 - v. Organizing a call for “MAYDAY”
 - b. Fire incidents that involve Content vs. Structures
 - c. A course developed on the dynamics of modern day fuel loads. (i.e. more Plastics, less Cotton and wood)

- d. New firefighting techniques should be established to address higher fuel loads in structures.

Tactical Level Evaluations and Recommendations:

Risk Management

1. The use of Electronic - Personal Accountability Reports (PAR'S) should be used for routine and non-emergent accountability procedures.
 - a. The incident commander would announce over the radio that an "Electronic PAR" will be conducted and that all members are to acknowledge the Accountability Officer (AO) and then "clear" the signal from their T-Pass.
2. The Incident Commander (IC) must always make a verbal announcement when a change of strategy or the Incident Action Plan (IAP) is altered.
3. If changing from an Offensive to a Defensive attack, the IC should only give one (1) apparatus (i.e. the Attack Pumper) the order to sound the air-horn for 10 seconds.
 - a. Reasoning: This will control the amount and duration of sound that is being generated during a critical period of the incident.
 - b. These changes must be made in all HFD Guidelines (i.e. II-03 Electronic Accountability, 6.09 C. - page 12)
 - c. The department should consider adding an air-horn button to all pump panels.
4. When an Emergency Evacuation is declared, OEC should limit the length of the verbal message that is stated after the 5 second tone is transmitted.

Example; ([5 sec. tone] "The Incident Commander has ordered an Emergency Evacuation")

5. All members in the department need to understand that REHAB is an assignment.
 - a. Accountability of all members assigned to REHAB needs to be performed and personnel need to be evaluated.
 - b. Members need to remember that even though they are assigned to REHAB, the incident is still on-going and members in REHAB may have important information that an Incident Commander (IC) may need, if a catastrophic event occurs.

6. The department needs to emphasize and train on Crew Accountability.
 - a. Incident Commanders (IC) and Division leaders must maintain a working knowledge of crew assignments and be able to report this information to the RIT teams and Accountability Officer (AO).
 - b. A training course needs to be developed for Company officers to demonstrate the key roles of working in a Division or Group. Points to emphasis would include:
 - i. Reporting face to face to a Division leader to “Check-in” or “Check-out”
 - ii. Report completion of all assignments to the Division leader
 - iii. Make all communications with the Division leader rather than directly to Command.
 - iv. A transition report needs to be provided to the Division leader every time a crew enters or exits a structure.
 - c. The definition of “Crew Integrity” needs to be defined as stated below and used consistently throughout the department.

“Crew Integrity is maintained when companies are in sight, touch, voice or has knowledge of each crew member’s position”.

(i.e. Crew integrity is considered continuous when a company is operating on a hose line but one crew member, who maintains constant contact with the hose, needs to operate out and away from the line of sight of the officer to assist with advancement)

Use of Information Technology (IT) for training

1. The department needs to develop an **on-line Intranet training site** that can be used to disseminate information within the department. (i.e. on the Fire Department I-Drive).
 - a. The Intranet site should be a secured area that can offer videos from on-scene devices (Command vehicles) or those made by members during district training etc.
 - b. The Intranet site could be used to offer tips and suggestions on training including;
 - i. Spotting, staging and operating apparatus.
(i.e. a 200’cord reel, mounted on a Ladder truck, should be completely un-rolled when used during extended incidents. This action eliminates heat build-up when the cord is rolled-up on itself which could eventually cause circuit breakers to be tripped.)
 - ii. Company and District level training (i.e. hose evolutions)

- c. The departments Intranet capabilities (I-drive) should be made available for all officers to share pertinent information after unique or significant events. (i.e. present After Action Reports (AAR's) that all members can read).

Task Level Evaluations and Recommendations:

Water Supply / Hose

1. To combat the higher levels of plastics and poly-carbon found in today's fire loads, the department needs to evaluate the use of Class A foam systems on apparatus.
 - a. The cost of a foam system on a new apparatus is approximately \$8000
 - b. The cost to retro-fit a foam system on an existing apparatus is approximately \$14,000
2. Proper hand line selection and Gallon-Per-Minute (GPM) water flows need to be developed to match the increasing plastic and poly-carbons that are encountered in today's fire loads.

On-Scene apparatus management program (Apparatus Placement – Level I staging)

1. Members need to properly spot, stage and deploy apparatus on scene. Apparatus should be located in a position that is based on **Forecasting** events and provide the incident commander the latitude of deploying additional equipment when needed.
2. Apparatus Spotting and Special Equipment (i.e. Ladders, Towers, Rescue Trucks, and MC008 etc.) need to be spotted in areas that will be most beneficial to the fireground operations. Training courses need to be created that help members understand the overall capabilities of this equipment and the importance for placement on scene.
3. Establish a **Clear Access Lane** - If an incident is forecasted to be a complex or long term event, a **Clear Access Lane** must remain open to the scene so that specialized units (Rescue Trucks, Ladder Trucks, and Towers etc.) can be positioned for maximum use.

Apparatus Maintenance

1. The Heavy Duty shop needs to be evaluated and properly funded to keep pace with the needs of the department. A new standard must be set to keep up with the work that is required to have front line apparatus properly maintained.
 - a. The department should follow manufactures recommendations for maintenance.
2. The Reserve apparatus fleet needs to be evaluated and fully funded. Safe operational apparatus must be available to replace a front line piece of equipment when it must be taken out of service.

Fireground Communications

1. The department needs to develop a comprehensive training program that reduces radio transmission time and is based on strong radio discipline.
 - a. All Company officers need to briefly repeat an order after it has been received from Command or a Division leader.
 - b. Officers should consistently practice reporting to Command or a Division leader when an assignment has been completed.
 - c. All members should be taught how to use CAN reports (Conditions, Actions and Needs) to focus on a situation and develop a clear message.
 - i. All company officers/members need to be trained on evaluating the conditions that they are working in and report this information in a standard format. The CAN method (Conditions, Actions and Needs), assist members by helping them stay focused on the most critical aspects during the time of emergency.
 - ii. Engine Company officers need to provide Division or Group leaders with continued updates as to the progress being made and the conditions in the immediate area that the companies are working in. (reports may include information provided by the Thermal Camera, fire extension or to request additional resources that may be needed).
 - iii. Ladder Company officers need to provide Division or Group leaders continued updates and detailed reports that are specific to ventilation. When an officer becomes aware of a potential danger (i.e. heavy-dead loads on a roof, unique or dangerous building construction or unique roof conditions) an immediate report should be provided to command.

- d. Members should stop asking permission to talk. Once a member has captured a Talkgroup, he/she should state their unit number and then give a brief message. Example;

In-correct transmission: [Tower 18] “Tower 18 to Command”
[Command] “Go ahead Tower 18”
[Tower 18] “Tower 18 to Command, ventilation is complete”]

Correct transmission: [Tower 18] “Tower 18 to command, ventilation complete”]

Ventilation Equipment and Techniques

1. Positive pressure fans should be purchased that provide a minimum of 30,000 cubic-feet-per minute (cfm)
2. Ventilation should become a common tactic used on the fire ground. Tactics (Vertical or Horizontal) should be selected that will best accomplish the objective set by the Incident Action Plan (IAP).
3. Ladder companies need to train and develop pre-assigned duties that are consistent throughout the department. Common practices during ventilation procedures should include:
 - a. Utilizing the quickest and safest way to ladder a building for ventilation
 - b. Proper selection and use of equipment needed to cut holes on various roof surfaces.
 - c. Knowing factors that help determine the best location to cut a hole on a roof.
 - d. Knowing the quantity and size of ventilation holes that are needed, depending on the type of structure and roof assembly.
4. Building construction and Ventilation training should be developed that is updated and reviewed annually by all members and should include the following topics;
 - a. “Wind Driven” fires - classes should provide a constant awareness of these types of non-routine and unexpected hazards.
 - b. A review of dead load weight on a roof and the effect it has when a hole is cut.
 - c. How load bearing on a structure begins to be compromised by heat, fire and additional live load weight (i.e. Water).

- d. Special topics such as the hazards associated with buildings that have a large open span should be emphasized. Firefighters should also be reminded of the risks associated with these types of structures.

Water supply

1. District Training Officers (DTO's) should be scheduling and conducting routine water supply drills on a consistent basis. Periods should include each set of weekends that their shift works.
2. Company officers need to be accountable for and train their crews on basic fireground water supply situations.
 - a. Establishing a positive water supply
 - b. Establishing one, two and three hand-line operations
 - c. Establishing master stream operations
3. Water supply training should always include hands on hose deployment that progresses from routine to complex hose evolutions.
4. Water supply training should always include hands on pumping exercises that progress from routine to complex hydraulic calculations.

Transitional Members (EMS to Suppression)

1. The transitional training program for members that are returning to a regular full-time suppression assignment needs to be modified to include the following:
 - a. Courses should be customized to coordinate with each specific rank and include all divisions. (example; Captains transferring from a permanent EMS assignment back to Suppression, Engineer Operator Paramedics assigned to a Medic unit transferring to a suppression apparatus etc.)

Thermal Imaging Camera (TIC's)

1. The Thermal Imaging Camera (TIC) has a broad use. An in-depth class needs to be developed that will provide consistent knowledge and use throughout the department. Examples;
 - a. TIC's can be utilized by exterior crews during a 360 degree size-up to determine fire location, heat conditions and exposure problems.
 - b. TIC's can be used by Ladder companies in smoky conditions to locate power lines before raising an aerial ladder.

- c. TIC's can be used by companies at Haz-Mat scenes to determine temperatures and quantities of product in containers.
- d. TIC's also have limitations and members must understand that they can provide a false sense of safety by providing limited temperature readings. The National Institute of Standards and technology (NIST) has conducted extensive testing and this information needs to be shared with the members of the department.

Department On-Line Training (Monthly Continuing Education)

1. Monthly Continuing Education (CE) should be strong in content and merit. Classes should address common fireground activities such as the safe use of equipment, standard techniques and department procedures.
2. On-line training should be used to re-enforce training, not introduce new complex ideas or equipment.

Equipment purchased and carried on Apparatus

1. The Houston Fire Department needs to develop a standard list of "minimum" equipment that should be assigned and carried on each class of apparatus. Requirements should meet all NFPA Standards (Engines, Ladders etc.)
2. All standardized equipment should be mounted or carried in the same area according to the class of apparatus.

Rescue and Safety

Below are the evaluations and recommendations that have been presented to Chief Garrison and his Command Staff by the Rescue and Safety workgroup. This workgroup was asked to evaluate and review two key elements at the Southwest Inn fire. The rescue operation and the overall scene safety. Once work began, the workgroup tapered their focus into eight essential objectives. They then worked to develop their recommendations for each of these areas. Since this pertained to operational matters, the recommendations were organized by Strategic, Tactical and Task level responsibilities.

Objective No. 1: Evaluate the use of IRIT and RIT Teams

Strategic Level Evaluations and Recommendations:

1. The department needs to re-assess the assignment of Initial Rapid Intervention Teams (IRIT). There should be more emphasis placed on assigning a formal RIT group as early in to an incident as possible.
2. The department needs to ensure that all members understand the capabilities and limitations of the Thermal Imaging Camera (TIC).
3. The department needs to ensure that all members are provided with formal training in Rapid Intervention Team (RIT) operations. Emphasis must include both initial and extended operations.
4. The Rapid Intervention Team (RIT) duty needs to be standardized throughout the department and accomplished by companies who are assigned to perform those duties upon arrival. The purpose of a Rapid Intervention Team (RIT) should be Proactive not Reactive and work to prevent a MAYDAY

Tactical Level Evaluations and Recommendations:

1. Incident Commanders, officers and members need to ensure that crew continuity is maintained at all times while operating at an incident.
 - a. The department needs to address freelancing at incidents.
 - i. Companies that freelance cause a breakdown in incident management.
 - ii. Companies that freelance can prevent the IC from assigning critical tasks that may need to be completed in a timely manner.

2. The department needs to develop procedures that create regular intervals for on-going size-ups that are performed by the Attack Engine, Division leaders and Safety officers. Consideration may be given to assigning a RECON Group. The Incident Commander should be notified any time pertinent hazards are identified.
3. The department should not consider the Engineer Operator assigned to the attack Engine or the Incident Commander (IC) as a second person of an Initial Rapid Intervention Team (IRIT). The department should explore new options such as assigning IRIT duties to the first EMS unit on scene until a formal RIT and or RIT Group can be formed.
4. There should be a formal Rapid Intervention Team (RIT) staging area designated at all incidents.
5. There should be a minimum of four (4) persons assigned as a Formal Rapid Intervention Team (RIT) at all incidents. To establish a RIT Group:
 - a. The Formal RIT will be established by assigning an Engine or Ladder company to RIT.
 - b. The company assigned to formal RIT would then combine with the IRIT (EMS unit) to form the Formal RIT Group.
 - c. The Formal RIT group would then consist of six members, four (4) members in full Personal Protective Equipment (PPE) ready to deploy and two (2) members available to perform in a RIT support role (i.e. identify and provide egress, deploy ladders, remove burglar bars, carry equipment, pull hose, force entry etc.) Note: this needs to be consistent with the RIT Guideline.
6. When a Rescue Truck is assigned to an incident, it may be added to the Formal RIT Group. The initial company (Engine or Ladder) assigned to Formal RIT should then remain as part of the Formal RIT group and not be re-assigned to another task.
7. Incident Commanders should consider deploying multiple Rapid Intervention Teams (RIT) at large incidents. The RIT group could have teams assigned to multiple divisions (Alpha, Bravo, Fire Floor, Division 14 etc.)
8. Rapid Intervention Teams (RIT) need to always include the roof as a potential area for a MAYDAY rescue. All members should be trained in the special techniques that would be needed for this type of rescue and prepared to deploy additional equipment for these circumstances. (i.e. Stokes Basket, additional ladders etc.).

9. One-hour Self Contained Breathing Apparatus (SCBA's) should be considered for use by all members assigned to a formal Rapid Intervention Team (RIT).
10. **"Incident Command Support Unit" (ICSU)** - The department should establish a new tactical assignment on the fire ground called the **"Incident Command Support Unit" (ICSU)**.
 - a. This unit would assist an Incident Commander (IC) in a support role at the Command Post (CP) in areas such as radio communication, accountability and crew assignments etc.
 - b. The Incident Commander (IC) should consider assigning an entire Company to the Command Post (CP) to function in this assignment.
11. The current 1-11 assignment should be increased by adding one (1) Rescue Truck and one (1) Ladder Company.
12. The department should develop funding and plan for on-board printers on all Command Vehicles (SUV's). This could provide Rapid Intervention Teams (RIT), Division leaders and or Safety Officers, with a hard copy of a Pre-incident Plan document (i.e. Digital Sandbox).
13. The department should provide extensive training on the Grace Accountability System.
 - a. Emphasis should be placed on the specific sounds for each signal that is either sent or received.
 - b. All members should have a clear working knowledge of these sounds and how to respond in an appropriate and timely manner.
14. The command staff position of "Accountability Officer" (AO) should only be re-assigned to another member **once** after the initial assignment has been given. This assignment is best filled by an assigned ICT. (See Fireground Workgroup recommendation)
15. The department should require Rapid Intervention Team (RIT) training every six (6) months that runs concurrent with other department training (i.e. Stokes Basket, Grace Accountability etc.)
16. The department should require Grace Accountability training every six (6) months that runs concurrent with other department training (i.e. Stokes Basket training, RIT etc.)

Task Level Evaluations and Recommendations:

1. Rapid Intervention Team (RIT) duties should include establishing a means of egress on all sides of a structure.
2. Chief Officers and Safety Officers should bring all of the Rapid Intervention Team equipment (RIT-Packs) and Grace Command Box that are assigned to their vehicles, to the Command Post (CP) or RIT staging area at large or multiple alarm incidents.
 - a. The RIT Pack can be utilized by additional RIT teams that are established within the RIT Group or when a MAYDAY involves more than one crew member.
 - b. The Grace Command Box may be needed for “Forward Accountability” or to replace the initial Grace Command Box if it experiences problems.
3. All Chief Officers and Safety Officers should be assigned Thermal Imaging Cameras (TIC’s) that should be utilized when assigned to divisions, conducting an interior or exterior size-up and or providing a Conditions, Actions and Needs report (CAN).
4. Companies assigned to be the formal Rapid Intervention Team (RIT), should bring a 2 ½ inch hose with nozzle from an apparatus other than the attack engine. RIT members should then attach it to the attack engine or an engine with a positive water source. RIT members should also notify the Engineer Operator of that engine which discharge the RIT line is attached to.
 - a. The intent of the 2 ½ inch hose line is not meant for the RIT team to deploy during a MAYDAY, but to proactively have one in place and available if needed.

Objective No. 2: Review MAYDAY procedures

Strategic Level Evaluations and Recommendations:

1. When a MAYDAY has been called and the deployment of the Rapid Intervention Team (RIT) has been ordered, the Incident Commander (IC) should remain in Command of the overall fire.
 - a. The Division Leader or officer in a Division should become the “Rescue Group” leader.

Tactical Level Evaluations and Recommendations:

1. When a MAYDAY has been declared and deployment of the Rapid Intervention Team (RIT) has been ordered, the Incident Commander (IC) should order the division leader that has the active MAYDAY to become the “Rescue Group” leader.
 - a. The “Rescue Group” leader should then answer all communications for this operation as “**Rescue Group**”.
2. The department should form a committee to evaluate the merits of placing the MAYDAY operation on a separate Talkgroup which would divide the incident communications over multiple Talkgroups. Communications during MAYDAY operations should then be based on standardize best practices.
3. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, the Incident Commander (IC) should assign an additional officer to report to the Division that the “Rescue Group” is operating in.
4. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, the Technical Rescue Team should receive an All-Call Page (**Rescue Pager 1-11**) and all Rescue units dispatched.
5. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, OEC should limit the verbal message after the 5 second alert tone.
6. The department should require training in MAYDAY procedures every six (6) months that runs concurrent with other department training (i.e. Stokes Basket training, RIT etc.)

Task Level Evaluations and Recommendations:

1. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, all un-committed Engineer Operators at the incident, should begin to collect any full air bottles located on the apparatus on scene and report to the Rapid Intervention Team (RIT) staging area.

Objective No. 3: Develop a Rescue Plan for MAYDAY Operations

Strategic Level Evaluations and Recommendations:

1. To maintain accountability and order on the fireground, Suppression and EMS crews should not respond to an incident unless assigned to and dispatched by the Office of Emergency Communication (OEC).
 - a. The action of a Unit self-dispatching to an incident should be prohibited throughout the city.
2. To maintain accountability and order on the fireground, a formal “Call-in” procedure should be established for all specialized members (i.e. Safety officers, Rescue Team members and Hazardous Material Team members etc.) during extended and/or MAYDAY incidents.
 - a. Off-duty fire department members **should not** report directly to an incident unless they are “**Called-in**” (i.e. Safety officers, Rescue Team, Hazardous Material Team etc.)
3. There should be a minimum staffing of five fully trained Rescue Technicians assigned to each Rescue Truck (RE010, RE042 and HR11) on all four shifts.
4. When an Incident Commander (IC) initiates a multiple alarm through the Office of Communication (OEC), an appropriate Level II staging area must be established.
 - a. The Incident Commander (IC) shall assign a “Staging Officer”.
 - b. All 2nd alarm and greater companies and/or members “Called-in” **must** report directly to the “Staging Officer” once arriving on location, unless given an order by the Incident Commander (IC) while en-route.

Tactical Level Evaluations and Recommendations:

1. All company Officers should be held responsible for maintaining strict accountability of their crew members when operating at an incident.

2. When a Rescue company arrives on location and is assigned to the Rapid Intervention Team (RIT), Rescue company crew members should perform the following three actions:
 - a. Perform a scene size-up
 - b. Report to the Rapid Intervention Team (RIT) staging location and augment the RIT Group
 - c. Develop a Rescue Plan with the Division leader and “Rescue Group” leader, in the event of a MAYDAY
3. The “Rescue Group” leader should contact Command and provide a Conditions, Actions, and Needs (C-A-N) report.

Task Level Evaluations and Recommendations:

1. Additional crews and hand-lines should be ordered to help protect the Rapid Intervention Teams (RIT) once a RIT team has been deployed.

Objective No. 4: Develop a Rescue - Risk Management Plan

Strategic Level Evaluations and Recommendations:

1. Risk Management means to simply identify, assess and prioritize risk and is an on-going process at every incident. This must become the culture of the Houston Fire Department.
2. Risk Management awareness and training must be initiated and continued to be a consistent practice by all members.
3. The department needs to establish a “Risk Decision Model” based on:
 - a. A Risk Management Plan
 - b. Critical Fireground benchmarks
 - c. Strategy – Offensive v. Defensive
 - d. Incident Action Plan
 - e. Deployment of Resources

Tactical Level Evaluations and Recommendations:

1. The following factors should be considered when forming a Risk Management Plan:
 - a. Occupancy type
 - b. Smoke Conditions
 - c. Type of Construction
 - d. Type of Roof System
 - e. Age of the Structure
 - f. Exposures
 - g. Time Considerations

2. Companies working in divisions should conduct ongoing size-ups (both Interior and Exterior). All pertinent information should be reported to the Incident Commander (IC), Division leader and Rapid Intervention Teams (RIT) / Rescue Teams.
 - a. Comparisons should be made with previous size-ups in order to determine improvement or the continuing deterioration of conditions

Objective No. 5: Evaluate Criteria for Rescue vs. Recovery

Strategic Level Evaluations and Recommendations:

1. The department needs to establish criteria that can help Incident Commanders (IC) amend Incident Action Plans (IAP's) in critical situations.
 - a. Crucial times include the decision process of going from a Rescue to Recovery operation.
 - i. When this decision must be made, it will be incident specific and the tactical change **must** be announced on the Radio so that all members on scene are aware of this decision.
 - b. Ultimately this assessment must be made by the Incident Commander (IC) and it is understandable that consultation with other members may be needed in order to make an informed and suitable choice.

Objective No. 6: Evaluate equipment needed for rescuing firefighters

Strategic Level Evaluations and Recommendations:

1. All department circular saws, cutting blades and chain saws need to be standardized and upgraded on Ladder Trucks. The recommended equipment to be purchased and maintained include:
 - a. Husqvarna Vent Master Chain Saws with Diamond blades
 - b. Stihl Rock Boss Chain Saws
2. Written training material for department saws needs to be evaluated and standardized.
 - a. Standard training and maintenance procedures need to be developed and taught throughout the department.
3. The 200' foot Search lines that are currently assigned to heavy apparatus are too small in diameter and difficult to manipulate with a gloved hand. The design of the Search line should be modified to include a larger diameter material (cord / rope) so that it can be deployed with a gloved hand.

Tactical Level Evaluations and Recommendations:

1. The Rapid Intervention Team Kit (RIT-Pack) needs to be evaluated and re-designed. A system that includes a smaller profile and only task specific equipment should be developed.
2. The current retractable Tag-lines (Part of the Search Line system) needs to be re-evaluated for its effectiveness in certain RIT Operations.
 - a. This equipment requires members to be well versed on deployment and can actually be consider a hazard if a member becomes entangled in their own equipment.
 - b. RIT Operations should be considered a quick search/locate/remove process when possible (small structures) and the use of the tag-line system may slow this operation.
 - c. The tag line system can be beneficial in large structures for search operations and for other comparable uses.

3. Command vehicles (SUV's) need to be issued Thermal Imaging Cameras (TIC's) that can be used when these officers are assigned as Division leaders. Examples;
 - a. Assist in conducting exterior size-ups
 - b. Assist in maintaining accountability in extreme smoke conditions
4. Additional Inter-department training needs to be developed between Suppression companies and other Special Operations units. Historically, suppression crews become the support group for rescue crews during extended rescue events.
 - a. Engine and Ladder companies need to train with the Technical Rescue Team (TRT) to become familiar with their capabilities and specialized equipment.

Objective No. 7: Evaluate the function and use of Safety Officers

Strategic Level Evaluations and Recommendations:

1. The department should increase the number of Safety Officers from three (3) per shift to four (4) per shift [one per Quadrant].
2. The department needs to increase the number of Safety Officers that are dispatched on large incidents and multiple alarm fires (from one to two Safety Officers).
3. The department should fund and add an Incident Command Technician (ICT) to each Safety Officer vehicle.
 - a. This action would meet the Two-in / Two-out rule which refers to the Occupational Safety and Health Administration (OSHA) policy. Texas having adopted the NFPA standards (i.e. NFPA 1500), refers directly to these requirements, which corresponds with the OSHA respiratory protection regulation. [23]

Objective No. 8: Evaluate the current assigned HFD Personal Protective Equipment (PPE)

Strategic Level Evaluations and Recommendations:

1. The Gloves that are currently issued to members as part of the departments Personal Protection Equipment Ensemble (PPE) do not provide good dexterity.
 - a. Members reported having trouble when attempting to use or manipulate some types of equipment.
 - b. New styles of gloves need to be tested for better dexterity.

2. All members should be issued a pair of work gloves that can be used for non-firefighting operations. (i.e. Rescue, overhaul etc.)
3. The current firefighting hood (Reed Hood) needs to be re-evaluated.
 - a. "Sock" style hoods need to be evaluated for thermal protection, steam protection, and ease of use.
 - b. New hoods should be tested to find one that provides:
 - i. Better range of motion
 - ii. Increases member's vision when applied over the Self Contained Breathing Apparatus (SCBA) face piece
 - iii. Provides an equal to or better level of protection
 - iv. Is easier to don and doff.
4. Members should be provided adequate training on all personal protective equipment (i.e. Coat, Pants, Boots, SCBA, Hoods, and Gloves etc.) that is purchased and issued by the Houston Fire Department. Specific areas should include:
 - a. NFPA Standards
 - b. Department Specifications
 - c. Material and Design
 - d. Proper Use and limitations
 - e. Cleaning, Care and Maintenance
5. Training needs to be developed and implemented to ensure that all members understand the full capabilities and limitations of the Personal Protective Equipment (PPE) that is being issued by the Houston Fire Department.

Communication and Technology

Through the years, the Houston Fire Department has continued to keep pace with the new technologies that have been introduced in the fire service. This would include equipment such as the GRACE Accountability system and the Thermal Imaging Camera. Other options like the new Digital radio System have just recently been introduced and being prepared to be placed in service. This workgroup was asked to evaluate and review all of the communication equipment and safety features that utilized advanced technology. They were then asked to explore new ideas that could strengthen the department's technology based programs. Below are the evaluations and recommendations that have been presented to Chief Garrison and his Command Staff by the Communication and Technology workgroup.

Objective No. 1: Evaluate the radio system and determine if there were transmission issues during the May 31, 2013 Southwest Inn fire.

The ability of a fire fighter to communicate is the most important aspect of safety when working in a hazard zone at an emergency incident. Communicating face to face is one option but only allows a member to exchange critical information to one person. Firefighters must have the ability to transmit important information such as a CAN report (Conditions, Actions and Needs) when faced with an immediate danger. Communicating with the Incident Commander, Division leader or OEC is a vital aspect to everyone's safety. A reliable and functional radio system is arguably one of the most important pieces of safety equipment in the department. A functional hand held radio should provide any trapped firefighter with the ability to call for help.

Up until April 26, 2013, the Houston Fire Department had been using a conventional 450 MHz analog UHF radio system. This equipment had become antiquated and found to be in unserviceable condition. For over 12 years, the City of Houston has been working on a joint project that would not only upgrade the radio system for the fire department but develop one that would be used by all city departments (HPD, Public works etc.). Motorola® was contracted to build a new state of the art 700/800 MHz digital trunking system. This would establish a standard communication system for all city departments, but more importantly, provide the firefighters of HFD with the crucial in-building coverage that they required. The new citywide digital radio system would allow all city departments to communicate with each other and referred to as Intra-operability. The second advantage to this upgrade known as Inter-Operability, would mean that all city departments would also have the ability to communicate with outside agencies as well.

One of the first steps that would have to take place before the system could even be tested, was to design, build and construct the infrastructure. The new digital system would require forty-eight (48) new transmission towers (antennas), state of the art consoles at the Office of Emergency Communication (OEC), and the installation of new radios in every fire station. Mobile and Portable radios would also need to be replaced, requiring extensive training and logistical planning.

By 2011, all of the major components were in place and the Houston Fire Department could now begin assessing the new digital system. Training was conducted in three phases but the final change-over into the new system would be deferred until the administration felt confident it was ready to be placed in service. Then, approximately one month prior to the Southwest Inn fire, HFD was compelled to switch to the new digital system due to unforeseen circumstances with the infrastructure of the old conventional system. Fortunately, all of the training had been completed, including the cadets at the training academy. Overall, the transition was successful and the department underwent one of the biggest changes in its recent history.

One of the most significant changes the new digital system provides is the use of multiple Talk Groups (channels). The old conventional system only provided three (3) main channels across the city, for fireground communication. The new digital system however, provides 24 Talk Groups for the same fireground communication. This is accomplished by using a Quadrant system which divides the city into four segments or quadrants (Northwest, Northeast, Southwest and Southeast). Each Quadrant (i.e. Southwest) now has the distinct advantage of having six (6) different Talk Groups available for fireground communication.

In addition, each firefighter's radio now has a new safety feature, the "Emergency Call Button". When activated, it sends an alert to all dispatch consoles at OEC. It also opens up the users "Mic" for 10 seconds to allow hands-free use and transmit an "Emergency message". Another feature of the new system provides the ability to record all data. Examples include when a user turns a radio on or off or changes to a different Talk Group and when a "Mic" is keyed to transmit a message.

The Communication and Technology workgroup began their evaluation by reviewing over 237,000 individual line items of data from the Southwest Inn fire. This was a very labor intensive task that was necessary to compare each transmission attempt against the recorded audio and printed transcript. This workgroup then began comparing the statements given by the crews during the initial interviews as well as performing additional follow-up interviews with some of the members that responded to the fire.

Besides reviewing data, the Communication and Technology workgroup reviewed previous coverage testing data and reached out to the Houston Fire Department Office of Communication (OEC) and Radio Communication Services (RCS). OEC is the central location of all emergency communications for the Houston Fire Department and RCS is the newly formed city department that operates and oversees the new digital radio system. It was believed that these two groups could help provide valuable insight in how the radio system performed at the Southwest Inn fire. Over the past several months, several tests were conducted to determine the overall radio coverage that is available in the Southwest Quadrant. More specifically, the area in and around the footprint where the Southwest Inn Hotel stood was tested by various methods. These tests were able to find reduced radio coverage in structures nearby this location. Most notably, in structures that had reinforced building components (i.e. elevator shafts, basements etc.). In addition, the number of media and cell phone signals operated near the fire scene was considered a potential source of interference. However, there was no way to test or prove this theory.

Coverage Issues

There were extensive coverage tests performed prior to the new radio system going into service that were overseen by both RCS and Motorola. However, these tests were not conducted utilizing the segmented manner in which the system is being used for the Fire Department. Because these tests utilized city wide Talk Groups, they may show better coverage than there actually is with the Quadrant system as used. Since the new digital radio system has been in place, there have been numerous reports from stations all across the city reporting coverage issues within various buildings. The most notable coverage issues were found in buildings such as hospitals, high-rise buildings and underground structures. Specific areas inside these structures include “fortified” sections of the building such as stairwells and basements. Due to numerous references being made regarding the Southwest Quadrant specifically, RCS and Motorola suggested the Northwest and Southwest towers be enabled for all Westside Talk Groups. This enabled radios to utilize the strongest tower regardless of the Talk Group the radio was set to and it seemed to help alleviate some of the issues. During the evaluation process, RCS was asked to conduct coverage testing in Southwest Houston at the request of the Communication and Technology workgroup. The RCS team utilized a portable radio from within a vehicle and tracked their results on the map shown below. The results, provided by RCS, show excellent coverage in this area. At this time, it cannot be determined if there were any coverage issues on the date of the Southwest Inn fire. This is due largely to the fact that there are currently no tracking methods in place to record this type of loss of coverage problem.



Digital Cliff

A **Digital Cliff** occurs when a radio is no longer able to receive a digital signal. The signals either come through or they don't, there is no gradual decline in signal strength rather a sudden drop in coverage. There are numerous factors that affect the ability of a digital signal to be received which allows for a radio to work in one location and not in another a few feet away. Simply put, a radio user may or may not be able to send or receive a message depending on which side of the cliff they are located. This differs from the old analog system, where a message may still be sent or heard even if the signal is weak. Therefore, the Digital Cliff effect can have a profound impact on all radio communications.

In order to address these coverage issues the Houston Fire Department should:

1. Work with Radio Communication Services (RCS) and Motorola® to develop a method that will allow the system to automatically track and log a radio when it goes in and out of a coverage area.
 - a. Any areas that are found to have coverage problems should be shared with all of the stations that respond in and around that area so that they are aware of the lack of reliable coverage.

2. Develop a method to track buildings and response areas that have poor system coverage.
 - a. This tracking system should provide officers and members with an easy method to report areas that are found to have a reduction in coverage area.
 - b. This system should be continuously monitored and updated in order to provide each station with the most current information on coverage problems that are found in their area.
 - c. Communication regarding these problems should be shared to all members of the department from the Command Staff to field personnel.
3. Develop a process to address any coverage problem that is discovered during the course of day to day operations.
 - a. Current coverage testing methods need to be evaluated and updated based on fire department needs and use of the system. It is felt that without the implementation of an enhanced coverage plan, firefighter safety will be compromised.
 - b. A system should be developed to enhance radio coverage in areas that are found to have weaker signals contributing to communication issues.
4. The Fire Department should continue to be updated and involved in all decisions that are made regarding the 700/800 digital radio system.

Transmission issues

The digital radio system is designed so that each radio is capable of sending transmissions to the towers in which it has been allowed to communicate with. This is determined by the Talk Group selected by the user. If one of the segmented Talk Groups is selected, the system allows the towers to be reached by the radio. Once a message is received by one or more towers within that quadrant, all of the towers within that same quadrant are utilized to broadcast that message to the radios tuned to the same Talk Group. Because the message is sent from all the towers at once, it should eliminate a weak signal from any particular radio. As long as the radio has a strong digital signal, it can send and receive messages. When the system is "open" (or not in use by another user), the radio can be keyed-up and a message can be sent. During this action, the radio user will receive a "Permission to Talk" tone advising that a Talk Path (channel) has been captured and a message can be sent. If another user attempts to send a message while the Talk Path is held by first user, the Talk Group is considered busy and the second user will receive a "bonk" signal. When a radio is unable to connect with the radio system, the radio will sound an "Out-of-Range" tone ("bonk"). This is produced to warn the user that the radio is no longer able to connect to the system and that the radio will not send or receive messages. A significant issue is that the same tone is used for both of these warnings which results in a radio user not knowing if the Talk Group is busy because another member is attempting to send a message or if there is no coverage available to transmit or receive a message.

In order to address this issue, the Houston Fire Department should:

1. Work in conjunction with Motorola® to develop a unique tone in order to differentiate between a lack of coverage and another radio user having control of the Talk Group.

“Transmission Bonk” signals

A “Bonk” signal occurs when a radio user is unable to capture or access a Talk Group. There are two reasons that a radio user would receive a “Bonk” signal. The first is caused by the radio not having sufficient coverage to connect with the system. RCS and Motorola® both state that currently, there is no method in place to track the problem that radio users have regarding coverage issues. The second reason a radio user would receive a “Bonk” signal is when the Talk Group is busy. This “Bonk” signal is considered a “Transmission “Bonk” and is able to be tracked through the radio data captured by the system. During the Southwest Inn fire there were a total of 761 “Transmission Bonks” signals on the Southwest Quadrant Talk Group assigned to this incident (SW TAC 11). The following is a breakdown of “Transmission “Bonks” during the first hour of the incident.

Time (30 minutes)	# of Bonks
First thirty (30) minutes	339
Pre collapse	83
Post collapse	256
First sixty (60) minutes	579
Pre collapse	83
Post collapse	496

There are several factors that lead to an increase in the number of “Transmission Bonks” or other radio issues during any emergency incident. Most notably are the following:

- a. The number of users
- b. The “digital delay”
- c. A “quick key”
- d. An open or stuck microphone
- e. OEC consoles/“priority radios”

Number of Users

It has been determined that the number of transmission related “Bonks” is directly proportional to the number of users on the Talk Group. Unlike the old 450MHz analog radio system, only one user can utilize the Talk Group at a time. If a radio user has captured the Talk Group (i.e. SW TAC 11), then all other users will receive a “Transmission Bonk” when keying the radio.

In order to address “Transmission Bonk” issues, the Houston Fire Department should:

1. Develop a strong radio training program that emphasizes good radio discipline.
 - a. Streamline traditional fireground communication from "Emergency Conversation" to "Emergency Communication".
 - b. Training members to use CAN reports (Conditions, Actions, and Needs).
 - c. Train members to use Face to Face communication when possible.
 - d. Train all company officers, Chief Officers and OEC in the use of multiple Talk Groups.

2. Update all radio communication guidelines (Radio and MDC) to reflect the changes that have been made to the current radio system being used by the department (700/800 MHz Digital radio system).
 - a. Guidelines must include the use of multiple Talk Groups.

Digital Delay

Digital Delay is a period of time (usually 1 to 1.5 seconds) that occurs after a radio user speaks and the message is sent through the digital system and heard on another radio. This delay leads to multiple personnel trying to use the radio at the same time and produces a large amount of “Transmission Bonks”.

In order to address Digital Delay issues, the Houston Fire Department should:

1. The Houston Fire Department should continue to work with RCS and Motorola® to find a way to eliminate or significantly reduce the 1 to 1.5 second digital delay.

Quick Key

A “Quick Key” occurs when a radio mic is engaged for any length of time $\frac{3}{4}$ of a second or less. These usually occur when the user accidentally touches or bumps the Push-to-Talk button (PTT) on their radio. When a “Quick Key” occurs, it captures the Talk Group for 3-4 seconds. During this time, the Talk Group is inaccessible to any other user needing to transmit a message. This issue can lead to several minutes of inaccessible talk time during an extended incident. This lost time could also result in an important radio message not being transmitted which could have a direct impact on firefighter safety.

During the first 60 minutes of the Southwest Inn fire, there were approximately 96 “Quick Keys” which totaled 6 minutes and 24 seconds of possible unusable talk time. This equates to approximately 11% loss of air time in the first hour. These 96 “Quick Keys” also led to 111 transmissions “Bonks” which is also estimated to be 19% of the total transmission “Bonks” that occurred at this fire.

It was further learned that some of these “Quick Keys” were the result of members in the department that weren’t assigned to the incident. Members across the city had turned on their radios to listen to the incident and at some point, accidentally created a “Quick Key” once their radio was turned to the assigned monitored Talk Group (SW TAC 11).

In order to address “Quick Key” issues, the Houston Fire Department should:

1. Educate all members in the department on the problems that can be created when a “Quick Key” occurs. Members should understand the direct impact that this issue has on the ability for firefighters to communicate on a fireground.
 - a. Develop a monthly Continuing Education course that introduces this issue
 - b. Train members through the use of the District Training Program.
2. Work with RCS and Motorola® to find a way to eliminate the “quick key” problem.

“Open” or a “Stuck” microphone

An “Open” or “Stuck” microphone can be caused by equipment malfunctions or when a radio user pushes the PTT button intentionally or unintentionally and doesn’t have a message.

In order to address the problem of “Open” or “Stuck” microphones the Houston Fire Department should:

1. Reduce the total amount of time a radio user can transmit a message from 60 seconds to 30 seconds after pushing the PTT button and capturing a Talk Group.
2. Enable a 10 sec timeout if no voice or verbal transmission is sent once a PTT button is pushed.
3. Explore the capabilities of OEC or RCS having the ability to remove a user’s radio from a Talk Group when it is determined that equipment failure has occurred.
 - a. OEC, at the Incident Commanders direction, should cautiously use the capability of removing a specific user from one Talk Group and moving them to another monitored Talk Group in order to still have contact with that user but eliminate the problem of the equipment blocking all use of the Talk

Group. The malfunctioning equipment should be replaced as quickly as possible to ensure that member still has radio communication capabilities.

OEC Consoles/Priority Radios

The radio consoles used by the Communication Captains at OEC have the unique ability to transmit and receive at the same time. This allows for OEC to transmit while another user has the talk path captured and is transmitting on a talk group. This is the only time a user has the ability to transmit while another user is transmitting on the same talk group without receiving a “bonk”. While this ability has positive and negative benefits, one of the negatives has a direct impact on fireground communications. If a portable radio user in the field is transmitting a message and OEC keys up and begins transmitting, all the other users on the fireground only hear the message from OEC and the original user has no way of knowing that his/her message was interrupted. The first user assumes the message went through and all other users on the scene heard the transmission.

In order to use this feature in a manner that provides maximum benefit, the department should make sure that:

1. OEC maintains a constant situation awareness about this feature and be careful not to transmit over any important fireground communication.
2. OEC members should be involved in simulator training at VJTF with Incident Commanders so all members can work together and understand capabilities of the OEC consoles (see other recommendation regarding training)

Note:

The Command staff first learned of the difficult radio communications that took place at the Southwest Inn fire, shortly after the Recovery Committee was formed. Consequently, the following recommendations were drafted soon after and implemented in September of 2013. This immediate action was taken to promote a positive change and try to improve the radio system.

1. The department needs to enable the Priority radio feature to include specific units in the field. Positions that should be considered for having this type of radio feature includes:
 - a. Shift Commander’s
 - b. District Chief’s
 - c. ICT’s performing “Accountability Officer” (AO) duties
 - d. Incident Safety Officer’s

- e. Radios assigned to Mobile Command 008 (MC008)
 - f. Portable radios at OEC
2. Portable radios in the field that have the Priority feature should be identified by using a different colored outer shell. This is necessary so that members know they are using a Priority radio. (i.e. Red outer shell for District Chief's, Orange outer shell for OEC etc.). All members should understand that when using a Priority radio, they have the ability to override another member that is using a non-priority radio.

Since making these modifications, new issues have surfaced calling for further evaluation. This work group feels that Priority radios used in the field, can cause the following problems to occur:

- *Priority radios interrupting messages from non-priority users*
- *Non priority radio users being unable to access the talk group because priority radios have the talk paths occupied*
- *Interference with the "Emergency Call Button" feature:*
 - *When the "Emergency Call Button" is pressed on a non-priority radio (yellow outer shell), the Priority radio (red or orange outer shell) can override the message to be sent by a member that pressed the "Emergency Call Button".*
 - *When the non-priority radio (yellow outer shell) user pushes the PPT button and transmits again, it will then override the priority radio.*
 - *Consequently, the last PTT button pressed on either the non-priority radio (yellow outer shell) or the Priority radio (red or orange outer shell) will capture the Talk Group and knock off the current user.*
 - *The user of a radio that has activated the "Emergency Call Button" will not know that a Priority radio (red or orange outer shell) has captured the Talk Group (no bonk) during the initial 10 seconds of activation.*
 - *Motorola® is researching this issue and attempting to resolve the problem of a Priority radio (red or orange outer shell) having the ability to "override" a non-priority radio (yellow outer shell) that has activated the "Emergency Call Button".*

In order to better utilize the Priority radio feature, the Houston Fire Department should:

1. Form a committee to further investigate the Priority radio feature. This committee should assess the value and overall impact the Priority feature has on fireground communication.

2. The transmission of a Mayday firefighter is paramount and should always be given the top priority.
3. Provide additional training to all field personnel in the use of the “Emergency Call Button” and the effects that the priority radios have when this safety feature is activated.
4. District Training classes and Monthly Continuing Education classes should be used as a means to promote proper radio usage.
5. Develop a method for field personnel to practice using the “Emergency Call Button” when training on “MAYDAY” procedures. This training could be enhanced by using “Simulation radios” that have the “Emergency Call Button” deactivated. The “Simulation radios should be identified by a different color so that they are not placed in service in the field. (i.e. blue outer shell).

“Bleed Over”

“Bleed over” can occur when two or more Talk Group’s have audio that is transmitted on the same talk group.

At approximately 12:34, the Southwest TAC 12 Talk Group (SW TAC 12) bled over onto the Southwest TAC 11 Talk Group (SW TAAC 11). Then again, at approximately 12:45, an OEC transmission on the Southwest TAC 16 Talk Group (SW TAC 16) bled over onto Southwest TAC11 Talk Group (SW TAC 11). After exhaustive research, it is still unclear why or how this happened.

In order to address the problem of “Bleed Over”, the Houston Fire Department should:

1. OEC and RCS should develop a reporting procedure for tracking all “Bleed Over” occurrences.
2. The department should continue to work with RCS and Motorola® to investigate these occurrences and learn how this happened and what needs to be accomplished in order to prevent this from affecting future incidents.

Objective No. 2: Evaluate the radio components used by field personnel. This included the radios and the EZ Com system.

Portable Radios

Currently the Houston Fire Department uses the Motorola® APX 7000 radio which comes equipped with an orange “Emergency Call Button”. This feature provides the user with an open microphone and priority use of a Talk Group when activated. At the time of this incident, the “Emergency Call Button” had only been available to our members for approximately one month. There were no “Emergency Call Button’s” activated at the Southwest Inn Fire.

It has been determined by this workgroup that hands on training has been difficult in the department largely due to the fact that there is no “test” mode that allows field personnel to practice a “MAYDAY” using the “Emergency Call Button”.

1. A training plan should be developed that incorporated use of the “Emergency Call Button” when declaring a “MAYDAY”.
2. A “Simulation” radio should be developed that only emits an alert tone on the training radio itself so that members can practice activating this feature during training.
3. All department guidelines that reference “MAYDAY” procedures need to be updated to include the use of the “Emergency Call Button”.

The current APX 7000 portable radios used by HFD are not user friendly during fire incidents when members are utilizing PPE. Activation of the “Emergency Call Button” is very difficult because the button is not conducive to use with firefighting gloves.

1. HFD should be included in all purchasing decisions made by other city departments regarding purchasing of equipment to be used by firefighters.
2. The department should upgrade all portable radios to the newer “firefighter friendly” Motorola Radio APX 7000XE. (see; Figure 13.1 and 13.2)



Figure 13.1



Figure 13.2

Scott E-Z RadioComm System (enhanced communication device used with the SCBA)

The Scott E-Z RadioComm System is comprised of three components;

- The **“Pigtail”** which attaches the Scott E-Z RadioComm System to the Motorola® radio.
- The **“Push to Talk”** section that connects the “Pigtail” to the “Head-set” piece which is mounted to the Self Contained Breathing Apparatus (SCBA) face piece. This part of the system allows the user to press a large button and key the radio in order to transmit a message.
- The **“Head-set”** which attaches to the users SCBA face piece. This item functions as both a microphone for the Motorola® radio and a voice amplifier for the radio user to enhance communication with other members working in the immediate area.

Since the changeover to the new radio system, non-functioning components of this system have been turned into RCS at alarming rates. There was a change with the manufacturer of this product which may be a large factor in the increase of problems. The rate has almost tripled since the switch to the APX 7000 radio and more research should be conducted to determine if the new radio plays a role in the increase of problems.

There was an independent investigation into the HFD voice amplifier equipment conducted by Stone Mountain, Ltd. Their report from January 2014, stated that the equipment tested showed low transmit audio levels compared to the transceiver’s internal microphone. An additional test, conducted by members of this workgroup, determined there was difference in modulation levels between the XTS radio and the APX radio. This test utilized an 800 MHz Motorola XTS 2500 radio equipped with the pigtail previously used by HFD and an 800 MHz Motorola APX 7000 radio equipped with the current pigtail used by HFD. The same “Push to Talk” and “Headset” was utilized on both radios. The same verbiage and sound pressure level was used into the headset and there was a noticeable drop-off in modulation levels with the APX radio.

Additionally, over the past few years several issues have been reported by members using the Scott E-Z RadioComm system. Through field testing and interviews with members in the field, these problems have been identified and are found to include issues with all three components of the Scott E-Z Com System (i.e. “Pigtails”, “Push to Talk” and “Headsets”). Specific problems include:

- The “Push to Talk” button is located on the front of the device and can create multiple accidental “Quick Key” transmissions when unintentionally pushed or bumped.

- A hard wire cable designed to connect the “Headset” to the “Push to Talk” component of the system is thin. When a member attempts to connect an SCBA regulator to his/her face piece, the thin wire can get caught between this connection resulting in an unsecured regulator and compromised seal. (see; Figure 13.3 and 13.4)



Figure 13.3



Figure 13.4

- Radiant heat has been found to melt the thin casing that protects the wires that connect the three Scott E-Z Com System components. Once the internal hard wires are exposed, radio problems such as “Quick Keys can occur.

To resolve the problems that the firefighters are experiencing with the Scott E-Z Com System, the Houston Fire Department should:

1. Work with RCS and Motorola to determine if the APX 7000 radio plays a role in the increase in non-working components of the Scott E-Z RadioComm.
2. The department needs to invest the time and money necessary to research all new technology that is available in enhanced communication equipment. Accessories that function as both an earpiece and microphone in or out of Personal Protective Equipment (PPE) should be evaluated.
3. Field test new communication systems that will enhance radio transmissions and help members communicate more effectively on the fire ground.
 - a. Systems tested should include both hard wired and wireless technology that is available as of 2014.
 - b. Look for a system that has a side mounted "Push to talk" feature to help eliminate "Quick Key" issues
4. The department needs to evaluate the durability of the current E-Z Com System when it is exposed to high temperatures.
 - a. A way to protect the E-Z Com equipment from failure due to heat needs to be researched and implemented.
5. A Bulletin should be written directing personnel on how to properly test, maintain and report any problems found when using the current Scott E-Z Com System.
6. Develop training that informs all members of the problems associated with this equipment (i.e. wires getting caught between a regulator and the face piece and accidental "Quick Key's")
7. Guidelines need to be written that allow OEC the ability to re-assign a radio that is experiencing equipment failure. A Communications Officer should be able to re-assign the radio that has problems from one Talk Group to another monitored Talk Group. This process is needed when a radio or E-Z Com System is not working correctly and it is drastically effecting fireground communication.
 - a. This procedure should only be allowed to take place at the direction of an Incident Commander (IC).
 - b. Any radio removed from a Talk Group should be re-assigned to a "Monitored" Talk Group so that the member(s) who are experiencing radio problems can still be in contact with the IC and OEC.

Use of portable radio's after doffing Personal Protection Equipment (PPE)

The Communication and Technology workgroup would also like to address the difficulty that members have receiving and sending messages after a member removes their full Personal Protective Equipment (PPE).

- When a member is in full PPE, the radio is generally carried in a designated pocket that is sewn to the chest of every PPE coat. Scott E-Z RadioComm equipment is used that enhances a member's ability to send and receive messages.
- When a member doffs their full PPE, they are faced with few alternatives on how to carry their radios and still be able to hear and send messages. Most firefighters "clip" the radio to their side using the belt-clip attached to the radio.
- Members have difficulty hearing their unit number when being called on the radio or miss complete messages. This in turn creates unnecessary radio transmissions that must be repeated in order to receive messages.

The Houston Fire Department can reduce the amount of missed transmissions which would generate less radio usage by budgeting for new radio accessories that would improve fireground communications. Items to be considered include:

1. Motorola "Fire" Lapel microphones should be purchased for all riding positions. This accessory can be used when personnel are not in full PPE. These devices could also be used as a temporary solution to the EZ RadioComm issues discussed above.

Objective No. 3: Evaluate the Self Contained Breath Air (SCBA) equipment

The four Self Contained Breathing Air (SCBA) units that were worn by the LODD members were sent to the National Personal Protective Technology Laboratory (NPPTL) in Pittsburgh, PA. The testing and evaluations that were performed were conducted through a standard protocol that the National Institute for Occupational Safety and Health (NIOSH) provides during all investigations. Additionally, the Texas State Fire Marshal's Office (SFMO) assisted by the Texas Commission on Fire Protection (TCFP) reviewed all Maintenance and Air Quality documents on file for these same four units.

Results given by all agencies involved in this investigation reported that all documents, inspections and Air Quality records were all shown to be in date. Furthermore, the SCBA's that were tested by the NPPTL did not appear to have any maintenance catastrophic failure that would have prevented this equipment from performing properly.

The administration should continue to support and fund the full efforts of the Breathing Air Services division of the Houston Fire Department in order to accomplish the following goals:

1. All SCBA units in the Houston Fire Department should be upgraded to the 2007 or newer NFPA standard.
2. The department should evaluate - Remote air monitoring technology
3. The department should invest in the Scott Pak-Link equipment necessary for downloading available data from department SCBA.

Objective No. 4: Evaluate the GRACE Industries, Inc. Accountability System

As the Communication and Technology workgroup began to research the use of the GRACE Accountability System, it was quickly learned that the incident data saved on the GRACE Command box was not available. The first GRACE Command box used for accountability at the Southwest Inn fire, the one assigned to District 68, was used for approximately five (5) hours until the battery on this unit had run-down. At that point, a second GRACE Command Box was placed in service.

In the days that followed this incident, staff members from Emergency Response Command, NIOSH Team members and Technicians from GRACE industries attempted to retrieve the data that should have been stored on this equipment. However, it was determined that the GRACE In-Command program did not have an auto-save feature and the data was lost when the battery ran out.

Extensive efforts were made in order to collect the data from the In-Command software that is used with this equipment. The unit from District 68 was sent to GRACE Industries, in Fredonia, PA., in an attempt to have their engineers retrieve the data. Confirmation was sent back that stating "After extensive analysis, we were not successful in retrieving a meaningful data-log from the PC that was running the In-Command software during the May 31st incident".

Note: Prior to this incident, all users of this equipment would have to follow a "shut-down" procedure in order to save the data collected by the software in this equipment. The fact that GRACE did not consider the battery running down before data could be saved was learned as a direct result of this incident. In July 2013, GRACE Industries corrected this problem by updating the program used with this system and has added an auto-save feature to the software.

HFD staff members, again not wanting to give up, then decided to send the GRACE Command box from District 68 to the Houston Police Department – Digital Forensic Laboratory for further review. Again, no data was able to be retrieved.

The only usable data that was collected from the GRACE Accountability System was that which was stored on each member's individual T-pass. It was determined that all T-Pass equipment functioned properly however, one notable difference was that the clock set on two of the LODD T-pass devices were not set on the correct time which resulted in incorrect time stamps during operation. A possible contributing factor in this may have been that some T-pass devices were unable to be properly turned off due to damage and the batteries were allowed to run completely down.

Below are a list of issues found associated with the GRACE Accountability System;

1. There was a delay in verifying the status of members in alarm at the Southwest Inn fire. Some of the contributing factors include:
 - a. There was a report of District 68's GRACE command box "freezing-up" for a prolonged period. However, this cannot be verified due to the loss of data as explained above.
 - i. The Communication and Technology workgroup conducted a test at VJTF to simulate the conditions that would have been found at the Southwest Inn fire.
 - ii. The test used the actual Grace Command box from District 68 that was used at the Southwest Inn incident.
 - iii. This test included a total of ninety-eight (98) T-Pass devices all in operation at the same time. At one point, twenty-nine (29) of the ninety-eight (98) were placed into alarm. The Grace Command box did not "freeze-up" or appear to have notable problems.
2. Crews were unable to conduct verbal Personal Accountability Reports (PAR's) over the radio because of the high volume of radio traffic.
3. It was determined that the assignment of "Accountability Officer" (AO) was transferred multiple times. This resulted in numerous members being assigned to operate the GRACE Command box.
4. Numerous firefighters / companies were being rotated through various assignments for an extended period. When members were given an opportunity to take a break, they would take their SCBA's off which allowed the GRACE Accountability T-Pass devices to go into alarm. Unattended SCBA units accounted for a large number of false T-Pass alarms that the "Accountability Officer" was forced to manage.

5. The GRACE Accountability System uses “Repeaters” to help strengthen the system. “Repeaters” are small devices that should be deployed over large area incidents or those with confined spaces to help redirect the messages sent from a GRACE Command box to T-Pass devices and from devices to the GRACE Command box. A limited number of “Repeaters” were deployed by company officers at the Southwest Inn fire.

The Houston Fire Department should consider the following corrective measures to improve the capabilities and operations of the GRACE Accountability System:

1. The Houston Fire Department should limit the scope of operators that are assigned to operate the GRACE Accountability System to the position of Incident Command Technician (ICT). There should also be designated ICT replacements, chosen by the DC, to fill that role when the regular ICT is not at work. These replacements should be included in all ICT training.
2. The position of Accountability Officer (AO) should only be transferred once during an active fire ground operation or significant event.
3. Incident Command Technicians should be trained and considered the Subject Matter Expert’s (SME’s) on the GRACE Accountability System for the department. All ICT’s should be continually trained in the areas of new procedures, trouble shooting and updating of T-Pass devices.
4. The department should require training in GRACE Accountability procedures every six (6) months that runs concurrent with other department training (i.e. Stokes Basket training, RIT etc.)
5. Monthly safety reminders should be developed that emphasis important details regarding department safety equipment. A simple message that reminds members the importance of “Keying” a T-Pass device when no longer wearing an SCBA can prevent added confusion and stress on the fireground.
6. The entire department should be trained to use **Electronic PAR’s** when conducting “routine” or “urgent” roll-call PAR’s on the fireground.
 - a. **Electronic PAR’s** used during “abandonment evacuations” are imperative when an urgent PAR is needed to confirm the status of every member on scene.
 - b. **Electronic PAR’s** used for routine “PAR checks” will decrease the amount of radio traffic necessary by limiting verbal PAR’s.

- c. **Electronic PAR's** cannot always be considered as 100% accurate. Therefore, a trained ICT is the best person to identify inaccuracies and initiate a verbal PAR.
 - d. **Verbal PAR's** should still be conducted by the "Accountability Officer" (AO) or Incident Commander (IC) anytime a company is in alarm or when the immediate safety of a member or company is unknown and needs to be verified.
- 8. In years past, initial training advocated that "Repeaters" were needed when companies were working in confined spaces or areas out of range of the signal being produced by the GRACE Command box (i.e. basements, upper floors of high-rise structures etc.). The department should include a section in a regular training program that addresses the need for the deployment of multiple "Repeaters" on any fireground (i.e. warehouses, large commercial structures etc.)
- 9. The department should evaluate and purchase 12 volt repeaters that can be mounted on the tips of the aerial ladders. This feature would produce an elevated "repeater" that could be used at large scale incidents and help strengthen a signal sent and received by a GRACE Command box.
- 10. "Accountability Officers" (AO) need to have access to multiple radios so that each Talk Group that is assigned to an incident can be monitored and used to complete verbal PAR's. (i.e. SW TAC 11, SW TAC 12, SW TAC 13 etc.).
- 11. An "Accountability Group" should be formed any time multiple Talk Groups are assigned to an incident and are being used for operations. This group would be needed to assist the (AO) with monitoring multiple Talk Groups and conducting verbal PAR's.
- 12. A training course needs to be developed that teaches members how to operate the GRACE Accountability System when an incident is using multiple Talk Groups.
 - a. The GRACE Accountability System has the capability of "grouping" that could enable an "Accountability Officer" (AO) to group each company under a specific Talk Group, Division, or functional group. This is an advanced feature that would require a narrowed scope of GRACE Command box operators (i.e. ICT's).

Objective No. 5: Evaluate the use of the Thermal Imager Camera's (TIC's)

There were no problems identified with the use of thermal imaging equipment at the Southwest Inn fire. However, it was repeatedly noted that the exterior size up by RIT 60 proved invaluable.

1. Since placing thermal Camera Technology in service in the Houston Fire Department, several advancements have been made and new uses for this technology have been learned. The use of Thermal Imaging Camera's (TIC's) in the Houston Fire Department should be expanded through an updated and comprehensive training program. Specific categories that should be taught include:
 - a. The use of TIC's during initial and ongoing size-ups for a variety of incidents:
 - HAZ-MAT
 - Fires
 - Rescues
 - b. Locating victims
 - Fires
 - Large open areas
 - Bodies of water
 - c. Misconceptions of thermal imaging technology
2. Thermal Imagers (TIC's) should be available for all division leaders to use and assist with interior and exterior size-ups. TIC's should be issued to all Command vehicles.
3. The Houston Fire department should re-evaluate the guidelines that address the use of TIC readings that are reported by the first-in companies that enter a structure. As reported by NIOSH during their site visit, these readings may be miss-leading and create a false sense of safety.

Additional information regarding Temperature Measurement and Thermal Imagers can be found in an article written by Jonathan Bastian. Fire Engineering – December 2013. This article addresses common misconceptions about thermal cameras and their use for temperature measurement. One of the most common mistakes is that the camera estimates air temperature. Thermal imagers do not read air temperatures; they read surface temperatures.

Objective No. 6: Operations performed by OEC

The Office of Communication (OEC) is an intricate part of the Houston Fire Department. This is where all communication starts when a citizen or other outside agencies call HFD for assistance. Once an incident has been dispatched and units are responding, the officers in OEC take on a support role for the Incident Commander and assist with specific fireground communications.

Through the years, guidelines have been developed that incorporate specific requirements for Communication Officers to announce when certain benchmarks are achieved or an Incident Action Plan (IAP) has been changed. These announcements may include changes in fire attack, changing from an offensive to a defensive operation, the call for MAYDAY, evacuations, and PAR due times. Some of these communications have been found to hinder routine fireground communications or worse during times of emergency.

In order to improve mutual understanding and need by both OEC personnel and field personnel, the Houston Fire department should introduce the following training.

1. OEC personnel should participate in training with suppression personnel at the VJTF during simulations.
2. Guidelines and procedures currently used by members in OEC should be updated to reflect the following changes:
 - a. Fires should be dispatched to a dedicated TAC channel (Talk Group).
 - i. Future alarm companies dispatched to an incident should have the record updated to the correct TAC Talk Group. During the Southwest Inn incident, some extra alarms companies were dispatched to the MAYDAY talk group instead of TAC 12.
 - b. Communications officers should not repeat information that is said by a member operating on the fireground.
3. The individual Motorola® radio consoles that communication officers use in OEC to conduct radio transmissions, were engineered with adjustable volume controls and other unique features that enhance the individuals performance. At times, transmissions made by OEC are extremely loud or soft depending on the individual using each console.
 - a. Communication officers should constantly monitor the volume settings at the console that they are operating from and make the necessary adjustments so that a consistent quality of tone and volume is projected over each Talk Group.

4. At times, suppression personnel have experienced radio equipment problems while operating on scene. When this occurs, the procedure generally calls for the Incident Commander to request a “Radio-man” to report to the incident to repair or replace the equipment. During the Southwest Inn fire, requests for a “Radio-man” were made six (6) separate times but it was learned that this request was being sent to the wrong support group.
 - a. The Office of Communications needs to update all contact information for support staff that is called upon to assist suppression and EMS personnel when members have equipment problems in the field.

Objective No. 7: Evaluate additional New Technology

New technology and advancements in areas such as video equipment has become a fresh and dynamic way for fire departments to document the actions taken on scene. This ability leads to multiple opportunities for any department that wants to grow and learn from past incidents. Documented video can be used as a training tool for internal classes as well as promoting a positive image for the fire department. Emphasis should not be placed on the negative draw backs that this technology could bring, but look to the advantages that the department could gain by implementing this technology.

1. The Houston Fire Department needs to re-evaluate the position on the use of video and photography equipment used by members at an incident. Though this may create some legal issues in the matter of evidentiary value (Note; as is the case with EMS regarding AED recordings), it could also provide an invaluable training tool.
2. The department should consider purchasing cameras for command vehicles that would afford the department with the unique opportunity to record large scale incidents and those that provide the ability to learn from. If video was recorded using HFD owned equipment, it would become HFD property and or evidence.
3. The Houston Fire Department should form a committee to review all new technology that is available in the fire service. This group should meet on a regular basis and research the most up to date advances that are being developed throughout the world in today’s modern fire service. Current progressive projects that should be considered include:
 - a. The use of cameras by HFD as well as individual members
 - b. The Scott SENS2 system air management
 - c. Pre-incident planning and response programs
 - d. Tactical worksheets and programs

Timeline / Process / Procedure

Below are the evaluations and recommendations that have been presented to Chief Garrison and his Command Staff by the Timeline / Process / Procedure workgroup. This workgroup was charged with investigating the timeline of the fire and establishing definitive benchmarks that would be used to evaluate how the department performed in the days and weeks that followed. As problems were identified, members from this workgroup reviewed the issue and identified solutions. In the end, five documents were created with the aim of assisting the members that were severely injured as well as the families of the fallen firefighters who so richly deserve all of our support.

Strategic Level Evaluations and Recommendations:

1. A position of “**Station Assistance Officer**” should be created. This Person should be appointed to any crew that has experienced a Line-of-Duty Death or other significant accident while on duty.
 - a. Specific responsibilities would include:
 - i. Keeping the station(s) informed of paramount information regarding the incident.
 - ii. Establishing an open line of communication with the department and city officials.
2. Members of both crews most affected by the loss felt an absence of support by the Command Staff. Members wanted to be updated with the progress of the investigation.
 - a. There should be a set of meetings scheduled through a “**Station Assistance Officer**” that allows for members of the Command Staff to meet with the stricken stations and provide regular updates to the members.
3. Certain agencies are invested with the authority to investigate all deaths within the City of Houston (HPD, the Harris County Medical Examiner, and the Texas State Fire Marshals’ Office etc.) Each agency follow specific protocols during their investigation up to and including the movement and transportation of those lost. However, there are exigent circumstances when members that are lost in a Line-of-Duty fatality must be moved to preserve their bodies.
 - a. An Incident Commander (IC) must have the ability to make an informed decision and order fallen firefighters to be removed from an area if their bodies or the safety of other firefighters that must assist in the recovery are in danger.

- b. Houston Arson and HPD Homicide should develop an agreement that allows HFD to process the scene of any fire related death in the City of Houston. HPD Homicide should assist Houston Arson upon request or if the scene involves a homicide before the fire.
4. The Harris County Medical Examiner's Office (HCMEO) is charged with the responsibility of providing a cause of death for each firefighter Line-of Duty fatality. This agency uses the Firefighter Autopsy Protocol that is detailed by the United States Fire Administration.
 - a. A Memorandum of Understanding (MOU) should be created between HFD and the HCMEO.
 - i. This directive would help to establish a standard protocol for the investigation and transportation phase of the recovery process.
 - ii. This directive would also help to reduce misunderstandings that tend to come up at the Task level between personnel working for both agencies.
5. A "**Line-of-Duty Death Task Force**" should be created. This team should consist of the following key advocates that are needed during this critical time.
 - a. Funeral Coordinator(s)
 - b. Members assigned to the Firefighter's Support Network
 - c. HFD Staff Services
 - d. The HFD Honor Guard
 - e. The HFD Chaplain
 - f. Members of the HFD Command Staff
 - g. Members of the Houston Professional Firefighters - Local 341
6. The National Fallen Firefighters Foundation has established courses that provide multiple layers of LODD training.
 - a. Formal training needs to be established that provides members with tools that are needed to manage a LODD incident.
 - b. Multiple HFD members should be trained in each position especially in the position of Funeral Coordinator.

7. The Houston Fire Department is comprised of several divisions. A culture change is needed within the department to help members understand that each division should support one another anytime there is a request for assistance. (i.e. Suppression personnel need to assist Houston Arson personnel throughout an investigation on scene; such as overhaul activities, evidence collection and safety awareness.)
 - a. Safety Officers should extend their expertise to Arson personnel when they have to work in areas that are deemed unstable.

8. The out pouring show of support to the members of the Houston Fire Department in the days and weeks that followed was seen throughout the city. Contributions came in from all sectors that wanted to share food, flowers and monetary donations. At times there were extreme amounts of food building at the station that could have been distributed among other stations or charities, cash was also collected at the stations.
 - a. All monetary donations should be entered in the Captains log and then forward to a representative from HFD Staff Services.
 - b. Relationships should be established with local charitable organizations that are willing to assist with organizing an abundant amount of donations.
 - c. A department policy / process needs to be in place to help members of a stricken station(s) coordinate these gifts.

9. Notification of the next-of-kin during times of tragedy is a very sensitive aspect that must be performed in a timely manner. Correct and up to date "Emergency Contact" information is an absolute must, in order to conduct this service.
 - a. The department needs to establish a systematic way to update and maintain "Emergency Contact" information. The HFD Information Technology (HFD - IT) department needs to develop an electronic version of a member's Permanent Personnel Form (HFD Form 42).
 - b. Emergency contact information should be updated annually. (example; when the annual Employee Evaluations are completed, review of "Emergency Contact" information should be incorporated into part of the process).

10. The City of Houston recognizes the Houston Professional Fire Fighters Association Local 341, International Association of Fire Fighters, as the exclusive bargaining agent for all Firefighters as found in - Section 174.003, Texas Local Government Code 146. [24] The leaders of this organization (Local 341) have always stepped up to the challenge of providing a professional and dignified ceremony for the fallen men and women of Local 341. However, in the event that a fallen firefighter is not a member in good standing with this organization (Local 341), the City of Houston and the Houston Fire Department need to be prepared to facilitate these services.
 - a. The department should establish a protocol for this situation and be prepared to facilitate a non-Union Line-of-Duty Death.
 - b. This service should be conducted by the members of the “**Line of Duty Task Force**”

11. The Houston Fire Department should establish an Internal Disaster Guideline. This guideline would be used to help manage a line-of-duty death or significant internal event. This document would assist the department by establishing a systematic approach for coordinating internal resources during a significant internal event. This guideline should include basic information that can be modified as needed and used while the department is faced with an adversity that is disrupting the normal day to day operations. The department would then have the ability to plan for these rare occurrences rather than making forced decisions at the time of the hardship. Specific areas that should be addressed include:
 - a. The assignment of a “**Station Assistance Officer**” should be assigned as soon as possible in order to assist the affected crew members with communications, department procedures and critical needs (i.e. medical evaluation, CISM etc.).
 - b. A model should be provided that lists the order of Command Staff that is responsible for the notification of next-of-kin.
 - c. A hierarchy and suggested list of attendees during the notification process of the next-of-kin.
 - i. This group should include a member of the Command staff as well as any member(s) that are friends of this family and can offer a personal sense to the condolences.
 - d. A Wall-of-Honor should be formed with all of the members on scene as the fallen members are recovered from the structure or area of discovery and brought to the vehicle that will transfer them to the Harris County Medical Examiner’s Office.
 - e. Create a process for coordinating the procession of the fallen member(s) from the scene to the Harris County Medical Examiner’s Office.

- f. Design a process that allows the affected crew members to be part of the procession from the scene to the Medical Examiner's office and then back to their station to clean up and organize themselves.
- g. A procedure should be established that details how and when members will be sequestered in order to provide a statement and interview.
 - i. Any members that respond to an incident and presented with a devastating situation such as a crew member expiring should be allowed to participate in the Recovery Process as well as the Wall-of-Honor. Note: This action may be paramount in the recovery process for that member and they should be provided the option of whether to participate prior to being released from the scene in order to work with the investigating agencies.
 - ii. This show of respect should be performed by all members on scene as a demonstration of solidarity to our fallen member(s).
- h. Provisions made for the welfare (Food, shelter, medical evaluations etc.) of both the members that will be providing interviews and statements as well as those that remain on scene and assist with the investigation.
- i. Transportation should be arranged for the members that must provide interviews and statements at the location that the process will take place.
 - i. Mass transportation should be provided (i.e. AMBUS 8 or METRO).
- j. The station that the stricken members are from should be secured with assistance by the Houston Police Department (HPD), immediately following the announcement of a fallen firefighter.
 - i. Returning crews should be provided the privacy deserved so that they can clean up and organize themselves.
 - ii. In the aftermath of a Line of Duty Death, all off-duty personnel should restrict themselves to the apparatus floor until such time that the on-duty crews have had a chance to return to the station and perform hygiene and eat.
 - iii. This action will assist in securing the fallen members personal effects, and departmental records, as well as providing privacy to the on-duty crews.
- k. The development of a non-Union Line-of-Duty death ceremony should be arranged and provided by the Houston Fire Department and the City of Houston.

Tactical Level Evaluations and Recommendations:

1. It is understood that there are detailed steps that must take place once a Line-of-Duty death or significant accident occurs. However, if firefighters are to be sequestered so that they can provide interviews and statements to investigating agencies (i.e. HFD Arson, Texas State Fire Marshall's Office etc.) then appropriate accommodations must be secured.
 - a. The facility must be of an adequate size to manage a large number of people that is expected to be processed.
 - b. Facilities should be equipped with amenities that will be needed to manage 30 to 50 people. Staff members must have the ability to control the environmental conditions in-side the building regardless of time of day/year.
 - c. Members being sequestered, should be provided basic needs such as food, continual medical evaluation and dry clothes.

2. It is understood that there are detailed steps that must take place once a Line-of -Duty death or significant accident occurs. However, firefighters that are required to give a statement need to be told and understand that the process is one of fact-finding in nature and that Houston Arson Bureau and other agencies are legally obligated to investigate the event.
 - a. Members need to understand that this process is not meant to point blame or prosecute the person giving a statement.
 - b. The department (Arson) should develop a training course to educate **all** members, on the process that will take place during the interviews.
 - c. Members should be instructed on the legal aspect of providing statements. (i.e. details about the Garrity warning that is signed for their protection).

3. The Texas State Fire Marshal's Office (SFMO) is statutorily invested with the authority to investigate all firefighter deaths that occur in the State of Texas. This agency uses a questionnaire style document as their means to obtain detailed information after an incident has occurred.
 - a. A process should be developed that allows the Houston Arson Bureau and the SFMO to work together and lesson the overall time required for our members to have to spend giving these statements.

4. There is a tremendous amount of management and organization that must take place after a line-of-duty death. Members must always remember that every action that occurs after the department enters into a recovery operation, directly impacts the healing process.
 - a. On scene coordination must be organized by a member that has complete authority to make time sensitive decisions.
 - b. This person should be the Assistant Chief of Emergency Operations or his/her designee.
 - c. This Assistant Chief or his/her designee should respond directly to the scene if not already on location and assume the role of "**Recovery Group**" leader.

5. The Critical Incident Stress Management Team (CISM) is a highly trained, dedicated and professional group of individuals. These men and women volunteer their time and provide an invaluable service to our members. The magnitude of this event has had a significant impact on hundreds of members throughout the department including the members of this stress management group.
 - a. The coordinators of this team should perform an internal evaluation of the process that took place during the Southwest Inn fire.
 - b. The department needs to ensure that the CISM program has layers of support in place to assist those members of the team that provided the many hours of support.

6. The Houston Fire Department has suffered Line-of Duty Deaths due to both Traumatic and Medical reasons. Though both are devastating, the investigations are conducted quite differently. The process involved with investigating a Line-of-Duty Death that in non-fire related, is conducted by the Houston Police Department.
 - a. The process for conducting a non-fire related Line-of-Duty death needs to be addressed in an Internal Disaster Guideline.

Task Level Evaluations and Recommendations:

1. The Houston Fire Department should conduct a medical evaluation on all personnel that have responded to and worked on scene of an LODD or other significant event.
 - a. Evaluations should be performed by HFD EMS personnel (EMS Medical Directors, EMS Supervisors or Paramedics).
 - b. Procedures for accomplishing this task should be listed in an Internal Disaster Guideline. (See. Strategic Level recommendation No. 10)

2. Every department member intimately involved with the process of a Line-of-Duty death or significant accident (members assisting with family, HFD Honor Guard etc.) should be monitored for Post-Traumatic Stress Disorder (PTSD).
3. Members who are peace officers and assigned to HFD Staff Services should be given the sole responsibility of collecting all personal items that belong to a member that has fallen in the Line-of-Duty. The following actions should be taken in a prompt manner:
 - a. HFD Staff Services should collect all personal items that remain on the apparatus of the member who has suffered a Line-of-duty death.
 - b. HFD Staff Services should collect all administrative files (Form 42, Station file, Training records etc.) from the deceased member's station.
 - c. HFD Staff Services should expeditiously locate and seal any lockers of a deceased member with evidence tape for security and evidentiary purposes.
 - d. HFD Staff Services should document all actions taken in the member's form 42, the Station Captain's Log and all additional internal reporting documents.
 - e. HFD Staff Services should then, at a later date, unseal the lockers as soon as practical with the officers and crew members of the deceased firefighter(s) shift being present. All items should be inventoried prior to being handed over to family members.
 - f. Material things that have no evidentiary value such as vehicles, wallets etc. should be given back to the family as soon as possible. However, Houston Arson Bureau personnel with the rank of Assistant Arson Investigator or higher will be the only person who can make the determination prior to release.
4. All Personal Protective Equipment that is worn by a member who is lost in the Line-of-Duty is considered evidence. All members in the department should be instructed to mark each piece of personal equipment that is assigned to the member with their name or payroll number so that the items can be easily identifiable.
 - a. A secondary identification process can be the Bar code tag that is affixed to each issued piece of City of Houston PPE.
5. Over the years, the department has implemented several types of warning methods to alert members on scene to potential hazards (traffic Cones, yellow scene tape, red Scene tape etc.)
 - a. Members should be trained and made aware that any area taped off with "**Crime Scene**" tape is off-limits, to all personnel regardless of rank.
 - b. Members should only be granted access to these specific areas when escorted by a member of the Houston Arson Bureau (peace officer).

Section 14

Actions taken by HFD - May 31, 2013 to Present

Just hours after the event, the Houston Fire Department began the long road to recovery. This would be a very open and active process that would encompass all areas of the department.

The Command Staff, the Southwest Inn Recovery Committee, Special groups formed during research as well as many other departments across the city have all worked together to find meaningful ways of improving our department. Several corporations that have been affiliated with the Houston Fire Department for many years have also provided endless service or equipment to help improve our performance (i.e. Motorola, Scott Industries, and Grace Industries etc.)

Below is a list of the actual changes that have taken place since the Southwest Inn Fire. Many were either in the development stage prior to the event or have taken place since being discovered during the investigation.

(June, 2013)

1. The Communications and Technology workgroup met with Motorola® to voice concerns about several problems that were discovered during the Southwest Inn fire. Among the issues discussed were with the Digital delay and the need to research new technology that would provide shorter key-up time when no audio is transmitted. A follow-up meeting was scheduled for November, 2013.

(July 2013)

2. Radio Code Plug Changes and APX system re-programming occurred
 - a. The Emergency Button was changed from a 1-second push to a 2-second push.
 - b. The "Permission to Talk" time limit was shortened from 60 seconds to 30 seconds.
3. The City of Houston - Radio Communication Systems (RCS) division requested Motorola® to research the following features in order to shorten delays and improve emergency radio communication.
 - a. Quick-Key "Bonk"
 - b. Create a transmission complete tone (user un-keys the radio)
 - c. Different tones be created for "Out-of-Range" warnings versus a "Busy signal"

4. An Electronic Command Board was being developed to assist Incident Commander's with tracking fireground assignments.
5. Work began to re-designing and update the Rapid Intervention Team equipment (RIT Packs). The HFD Rapid Intervention Team (RIT) Guideline was also being re-evaluated and a new RIT Performance Standard was being developed.

(August 2013)

6. A new section was added to the HFD Protective Clothing Guideline II-02 to give Safety Officer's direction on how to collect firefighters PPE and firefighting equipment when an injury or significant event occurs. The purpose is to ensure that any equipment damaged at an incident is properly inspected and tested before being placed back on an apparatus or in-service.

(September 2013)

7. Radio prioritization was established that would provide District Chiefs with priority communications over all other radios on the fireground. The order of priority is as follows [22]
 - a. 1st priority - OEC Dispatch Consoles / OEC Portables (Orange shell)
 - b. 2nd priority - Deputy / District Chief / Safety Officer Mobile Radios
 - c. 3rd priority - Deputy / District Chief / Safety Officer Portables (Red shell)
 - d. Heavy Apparatus / All other Portable radios (Yellow shell)
8. The GRACE Accountability System was upgraded:
 - a. Software was updated and additional training was provided to Incident Command Technicians (ICT's).
 - b. All T-PASS devices (individual firefighter monitoring devices) were upgraded to the TPASS4 model
9. HFD IT began work on creating electronic personnel files (Form 42's). This will measure was performed to help keep members emergency contact information current and readily available.[25]

(October 2013)

10. The Houston Arson Bureau and the State Fire Marshal's Office (SFMO) created a process that would limit the impact on members during an interview process.
 - a. The SFMO provided the Houston Arson Bureau with documents that can be completed concurrently with department statement interviews so that members don't have to repeat this process multiple times with different investigators.

11. A new Internal Disaster guideline was being drafted to help members during these types of events.
 - a. This guideline is aimed at assisting members with decision making and overall management after a significant event has occurred that affects the normal day to day operations of our department.

12. New fireground communication procedures were developed to help reduce radio transmissions.
 - a. Incidents Commanders were instructed to begin using additional Talkgroups for support roles at an incident.
 - b. Units that are responding on additional alarms, Staged or in rehab should be placed on a separate Talkgroup.
 - c. This process was designed to reduce excessive radio communication on the Fireground Talkgroup.
 - d. Communication on a monitored Fireground Talkgroup should be reserved for Strategic and Tactical operations. [25]

13. The City of Houston - Radio Communication Services (RCS) worked to improve the infrastructure of the new Digital APX system. Areas targeted were in the Medical Center, Galleria and Downtown corridors. Others locations across the city are still in various stages of upgrades. Equipment was added or adjustments made to the system to improve in-building coverage. [25]

14. During the first quarter of FY2014, 12 Communication Captain's positions were created to increase the total staffing numbers at the Office of Communication (OEC). These additional positions were added for several reasons however one of the biggest advantages was to enhance OEC capabilities when additional Talkgroups are requested for fireground communications. [25]

15. OEC staff members began a ride along program with District Chiefs. [25]
 - a. This arrangement was made to provide an opportunity to open up dialogue between members in the field and Communication Captains.
16. The Val Janke Training Facility (VJTF) began working on developing enhanced training in two critical areas. [25]
 - a. Incident Command Technicians (ICT)
 - b. A Building Collapse courses

(November 2013)

17. A follow-up meeting was held with Motorola® regarding the three items presented in June of 2013.
 - a. “Digital Cliff”
 - b. “Quick Key”
 - c. A 10 second time out if no voice is transmitted

Note: The Houston Fire Department was informed that Engineers were still exploring these issues and new upgrades to the 700/800 Digital System may be available that address these concerns in the 3rd quarter 2014.

(December 2013)

18. A new city ordinance was being drafted that addresses buildings with poor radio coverage. This document will outline new requirements that property owners and management companies will need to accomplish in order to meet the standards set for firefighter safety regarding in-building coverage.

(January 2014)

19. The project of issuing the updated RIT Packs was completed by Emergency Operations. [26] [28]

(February 2014)

20. The Houston Fire Department began using a new style of firefighting glove (Honeywell Superglove with Sleevemate). This glove was approved by the Personal Protective Equipment Committee in October of 2013.

21. The Office of Emergency Response - Special Projects and the Val Janke Training Facility (VJTF) established a partnership with Scott Industries® and began development of a new training video for Thermal Imaging Camera classes.

(March 2014)

22. A plan was implemented to have all Incident Command Technicians become Subject Matter Experts (SME) for the GRACE Accountability System. [27]
 - a. HFD Safety Officers conducted this training which included how to maintain routine updates to the system.
23. An HFD document was drafted to help the families of a deceased member for future planning after a catastrophic event.
 - a. This document will be provided through the Firefighter Support Network and was originally developed by the National Fallen Firefighters Foundation.

(April 2014)

24. The Digital Sandbox program was introduced to District Chiefs in a 3 hour training session. This new platform will provide the ability for electronic storage and retrieval of building assessments in the field with as well as offer real time information. Most Tactical Evaluation and Assessment Plans (TEAPS) that are currently on file in the department are being entered into the system. Future use will include information that is shared by other city departments and regional agencies.
25. Grant Funding was secured to upgrade the Mobile Data Terminals (MDT's) in each emergency response vehicle to ToughPads.
26. The Eagle-X Thermal Cameras that were returned to HFD Supply when the new model of TIC was delivered, were issued to all Incident Command Vehicles. [28]
27. Shift Commanders on all four shifts began "Situational Awareness / Building Construction" training. This hour long presentation was given on a District level. [28]

(May 2014)

28. A committee was formed to evaluate a “Blended Fire / EMS Response” for multiple Task level duties including IRIT and RIT.
29. Temple Transducer Headsets were purchased through Grant funding. This equipment is being issued to Incident Command Vehicles and will enhance the capabilities of the Incident Commander (IC), the Incident Command Technicians (ICT’s) and Accountability Officer’s (AO).
30. The administration began reviewing department guidelines pertaining to on-scene video recording. The use of helmet cameras, Dash Cams and other portable recording devices are being evaluated for future use.

Section 15

Houston Arson Bureau - Briefing on Origin and Cause

The fire incident which occurred at 6855 Southwest Freeway (Southwest Inn) and resulted in the deaths of four Houston Firefighters was investigated by the State Fire Marshal's office, Bureau of Alcohol, Tobacco, Firearms, and Explosives, the Houston Police Department's Homicide Division, and the Houston Fire Department's Arson Bureau, utilizing a multi-agency team concept. Chief Investigator L. Gonzales, with the Houston Arson Bureau was tasked with coordinating and overseeing the scene examination and assembled an origin and cause team which consisted of Deputy State Fire Marshal, C. Janssen, Special Agent, E. Evers, and Senior Investigator R. Carnes.

Prior to beginning the debris removal, a structural engineering firm was contracted by the City of Houston to assist with the investigation in an effort to determine if the design or load of the roof contributed to the early collapse. The engineering firm concluded the roof functioned as designed and did not exceed the weight load capacity.

During the initial stages of the fire scene examination, information was obtained from two confidential informants indicating the fire was deliberately started. The Houston Police Department's Homicide division was contacted and asked to assist in following up on the C.I.'s information. A team of detectives were assembled and conducted interviews with witnesses, persons of interest, and conducted covert operations in an effort to validate the allegations. After an extensive investigation HPD did not find any evidence that a crime had been committed.

Senior Investigator Hernandez coordinated the efforts of a team of investigators assigned to locate and interview all employees of the Bho-Jan restaurant, employees of the Southwest Inn and the occupants of the motel.

Two employees of the Bho-Jan restaurant told investigators they placed several polyurethane mattresses and other combustibles in close proximity to the gas water heater approximately one hour prior to the fire.

After completing the fire scene examination the "Origin and Cause" team determined the fire originated inside the utility room of the Bho-Jan restaurant. The utility room housed several large electrical breaker boxes, a step- down electrical transformer, gas water heater, and stored combustibles. The determination of the origin involves, witness information, evaluation of fire patterns, arc mapping, and fire dynamics.

The origin and cause team developed and tested several working hypothesis attempting to explain the cause of the fire. During the testing investigators utilized an electrical engineer, a mechanical engineer and a professor from a local university. One of the working hypothesis, involved a phenomenon known as “Flame roll out”, in which an excess amount of gas escapes the combustion chamber then ignites outside of the chamber, which could ignite nearby combustibles. Investigators also conducted a test to determine if radiant heat transferred through the open combustion chamber door could ignite nearby combustibles. During the scene examination investigators located outdoor “Tiki” torches next to the water heater so experiments were conducted to determine if the water heater’s pilot flame could ignite the vapors of the torch oil. The testing revealed that the water heater was functioning properly prior to the fire and no conclusive evidence as to the cause of the fire.

The Houston Arson Bureau and Houston Police Department’s Homicide Division continued a joint follow-up investigation reviewing prior witness statements, conducted numerous walk-through interviews at the site, and re-interviewed several key witnesses.

After reviewing all witness information and testing results investigators determined the fire originated in the attic space/crawl space above the kitchen area adjacent to the utility room and not inside the utility room which was originally thought to be the room or area of origin. Investigators concluded the damage inside the utility was caused by falling fire debris. All agencies involved in this investigation concur with these findings and will list the classification of the fire as “Undetermined” because investigators were unable to identify the exact cause of the fire. Although the exact cause of the fire was not determined, all agencies involved agree there is no evidence at the present time to indicate the fire was deliberately started.

At the present time, the Houston Arson Bureau is completing all outstanding supplemental reports, documenting the above-mentioned findings. The Houston Arson Bureau has asked the State Fire Marshal’s office and the Bureau of Alcohol, Tobacco, Fire arms, and Explosives to provide a copy of their final report upon completion. The Houston Arson Bureau would like to compare all three reports for consistency before releasing a final investigative summary. I anticipate the final report will be completed by the end of August.

*Leocadio Gonzales
Assistant Chief Investigator
Houston Fire Department
Houston Arson Bureau*

Appendix A

Catalog of recommendations to address: Fireground Operations

Date completed or addressed: _____

1. OEC should fulfill a Support role for Emergency Operations and not give direction or orders during an incident.

Date completed or addressed: _____

2. OEC should relay pertinent information to units **by voice** rather than transmitting data on the Mobile Data Computers (MDC's). (i.e. OEC is receiving multiple calls vs. caller states the fire is trash in the back yard.)

Date completed or addressed: _____

3. Communication Captains need to apply correct guidelines and procedures to the incidents. (i.e. during the MAYDAY, OEC advised all engineers to sound air-horns)

Date completed or addressed: _____

4. OEC should automatically assign a monitored TAC-channel (Talkgroup) on all Box alarms dispatched as a structure fire.

Date completed or addressed: _____

5. When an Emergency Evacuation is declared, OEC should limit the length of the verbal message that is stated after the 5 second tone is transmitted.

Example; [5 sec. tone] "The Incident Commander has ordered an Emergency Evacuation"

Date completed or addressed _____

6. Only the Incident Commander should answer radio transmissions as "**Command**". All other operational assignments should use their division or functional area to identify their transmissions.

Date completed or addressed: _____

7. The first arriving officer should assume command and communicate directly with all responding companies that are assigned to an incident, rather than transmitting a message to OEC and have it repeated. (i.e. Main Street Command to all responding units, continue non-emergency.)

Date completed or addressed: _____

8. Communication Captains should remain at OEC and not respond to multiple alarm incidents in OEC1. It is believed that these members can be better utilized by monitoring additional Talkgroups at the Houston Emergency Communications Center (HECC) during large scaled events.

Date completed or addressed: _____

9. Additional District Chief's should be requested early in an event to assist with the Incident Command structure.
 - a. The Command Staff and administrative members that self-respond to incidents should function in a support role.
 - i. The NIMS system should be adhered to and these members should always seek opportunity to provide assistance to the Incident Command Structure.
 - ii. These members should have clear defined roles once on scene, especially after a catastrophic incident occurs that requires higher level planning.
 - iii. Roles for all staff members should be updated and defined in HFD guidelines. (refer; HFD Guideline - Incident Management; Volume II Reference No. II-06, Sec. 6.06F)

Date completed or addressed: **October 2013**

10. When an Incident Commander makes the determination to upgrade a Box Alarm assignment, the Incident Commander (IC) should establish a Level II staging area and request an "un-monitored" "**Support Talkgroup**". This Support Talkgroup will be used to communicate with the staged and or responding companies. The Staged and responding companies should then listen to both the "**monitored**" operations Talkgroup and the "un-monitored" Support Talkgroup while waiting to be given an assignment.

Date completed or addressed: _____

11. When an Incident Commander (IC) initiates a multiple alarm through the Office of Communication (OEC), an appropriate Level II staging area must be established.
 - a. All 2nd alarm and greater companies and/or members “Called-in” **must** report directly to the “Staging Officer” once arriving on location, unless given an order by the Incident Commander (IC) while en-route.

Date completed or addressed: _____

12. The location and assignment of a Staging Officer needs to become a priority and all companies assigned to staging should be instructed where and how to park their apparatus so that they can be easily deployed when needed.

Date completed or addressed: _____

13. The command staff position of “Accountability Officer” (AO) should only be re-assigned to another member **once** after the initial assignment has been given. This assignment is best filled by a trained Incident Command Technician (ICT).

Date completed or addressed: _____

14. There should be a standard method in place to report pertinent information when the assignment of “Accountability Officer” (AO) has been passed to another member.

Date completed or addressed: _____

15. All Chief vehicles are equipped with three (3) “Priority” radios. The person assigned to be the “Accountability Officer” (AO) should always use one of these “Priority” radios.

Date completed or addressed: _____

16. “Accountability Officers” (AO) need to have access to multiple radios so that each Talk Group that is assigned to an incident can be monitored and used to complete verbal PAR’s. (i.e. SW TAC 11, SW TAC 12, SW TAC 13 etc.).

Date completed or addressed: _____

17. When an incident escalates, the Incident Commander (IC) should consider assigning an “Accountability Group” to assist the “Accountability Officer” (AO) in maintaining situation awareness and helping to expand this important function at every fire.

Date completed or addressed: _____

18. An “Accountability Group” should be formed any time multiple Talk Groups are assigned to an incident and are being used for operations. This group would be needed to assist the (AO) with monitoring multiple Talk Groups and conducting verbal PAR’s.

Date completed or addressed: _____

19. The Houston Fire Department should limit the scope of operators that are assigned to operate the GRACE Accountability System to the position of Incident Command Technician (ICT). There should also be designated ICT replacements, chosen by the DC, to fill that role when the regular ICT is not at work. These replacements should be included in all ICT training.

Date completed or addressed: _____

20. Incident Commanders should use the Grace System to perform “Electronic PAR’s” for routine PAR checks so that each member on the fireground is contacted individually. It is believed that this procedure would also improve communications by reducing radio traffic.

Date completed or addressed: _____

21. The use of Electronic - Personal Accountability Reports (PAR’S) should be used for routine and non-emergent accountability procedures.

- a. The incident commander would announce over the radio that an “Electronic PAR” will be conducted and that all members are to acknowledge the Accountability Officer (AO) and then “clear” the signal from their T-Pass.

Date completed or addressed: _____

22. Mobile Command 8 (MC008) should be dispatched on 3rd alarm fires.

Date completed or addressed: _____

23. When developing an Incident Action Plan, the Incident Commander should “**Forecast**” the incident to determine if there is potential for being a complex or long term event that may require additional apparatus. Incident Commanders can then “Plan” rather than “React” to sudden changes that occur at an incident.

Date completed or addressed: _____

24. If an incident is forecasted to be a complex or long term event, consideration for an adequate Level II staging area needs to be addressed.

Date completed or addressed: _____

25. Apparatus placement is a key component of “**Forecasting**”. The intended use for each apparatus must be considered before it is spotted and placed into operation.

Date completed or addressed: _____

26. The department needs to emphasize an On-Scene apparatus management program (Apparatus Placement – Level I staging)

Date completed or addressed: _____

27. Members need to properly spot, stage and deploy apparatus on scene. Apparatus should be located in a position that is based on **Forecasting** events and provide the incident commander the latitude of deploying additional equipment when needed.

Date completed or addressed: _____

28. Apparatus Spotting and Special Equipment (i.e. Ladders, Towers, Rescue Trucks, and MC008 etc.) need to be spotted in areas that will be most beneficial to the fireground operations. Training courses need to be created that help members understand the overall capabilities of this equipment and the importance for placement on scene.

Date completed or addressed: _____

29. Establish a “**Clear Access Lane**” - If an incident is forecasted to be a complex or long term event, a “**Clear Access Lane**” must remain open to the scene so that specialized units (Rescue Trucks, Ladder Trucks, and Towers etc.) can be positioned for maximum use.

Date completed or addressed: _____

30. If an incident is forecasted to be a complex or long term event, consideration for a formal REHAB group needs to be addressed. The location of this group should be large enough to accommodate all support units (i.e. Rehab truck, Cascade etc.)

Date completed or addressed: _____

31. All support functions at an incident, should be located in one designated area to help manage and assist crews. (example; Rehab, Cascade, Radio support etc.)

Date completed or addressed: _____

32. All members in the department need to understand that REHAB is an assignment.

Date completed or addressed: _____

33. Accountability of all members assigned to REHAB needs to be performed and personnel need to be evaluated.
- a. Members need to remember that even though they are assigned to REHAB, the incident is still on-going and members in REHAB may have important information that an Incident Commander (IC) may need, if a catastrophic event occurs.

Date completed or addressed: _____

34. Incident Commanders, officers and members need to ensure that crew continuity is maintained at all times while operating at an incident.

Date completed or addressed: _____

35. The department needs to address freelancing at incidents.
- a. Companies that freelance cause a breakdown in incident management.
 - b. Companies that freelance can prevent the IC from assigning critical tasks that may need to be completed in a timely manner.

Date completed or addressed: _____

36. All company Officers should be held responsible for maintaining strict accountability of their crew members when operating at an incident.

Date completed or addressed: _____

37. The Incident Commander (IC) must always make a verbal announcement when a change of strategy or the Incident Action Plan (IAP) is altered.

Date completed or addressed: _____

38. All Company officers need to briefly repeat an order after it has been received from Command or a Division leader.

Date completed or addressed: _____

39. If changing from an Offensive to a Defensive attack, the IC should only give one (1) apparatus (i.e. the Attack Pumper) the order to sound the air-horn for 10 seconds.
- Reasoning:** This will control the amount and duration of sound that is being generated during a critical period of the incident.
- a. These changes must be made in all HFD Guidelines (i.e. II-03 Electronic Accountability, 6.09 C. - page 12)
 - b. The department should consider adding an air-horn button to all pump panels.

Date completed or addressed: _____

40. Officers should consistently practice reporting to Command or a Division leader when an assignment has been completed.

Date completed or addressed: _____

41. Members should stop asking permission to talk. Once a member has captured a Talkgroup, he/she should state their unit number and then give a brief message.
Example;

In-correct transmission: [Tower 18] "Tower 18 to Command"
[Command] "Go ahead Tower 18"
[Tower 18] "Tower 18 to Command, ventilation is complete"]

Correct transmission: [Tower 18] "Tower 18 to command, ventilation complete"]

Date completed or addressed: _____

42. Ventilation should become a common tactic used on the fire ground. Tactics (Vertical or Horizontal) should be selected that will best accomplish the objective set by the Incident Action Plan (IAP).

Date completed or addressed: _____

43. There should be a formal Rapid Intervention Team (RIT) staging area designated at all incidents.

Date completed or addressed: _____

44. Incident Commanders should consider deploying multiple Rapid Intervention Teams (RIT) at large incidents. The RIT group could have teams assigned to multiple divisions (Alpha, Bravo, Fire Floor, Division 14 etc.)

Date completed or addressed: _____

45. Rapid Intervention Teams (RIT) need to always include the roof as a potential area for a MAYDAY rescue. All members should be trained in the special techniques that would be needed for this type of rescue and prepared to deploy additional equipment for these circumstances. (i.e. Stokes Basket, additional ladders etc.).

Date completed or addressed: _____

46. Rapid Intervention Team (RIT) duties should include establishing a means of egress on all sides of a structure.

Date completed or addressed: _____

47. One-hour Self Contained Breathing Apparatus (SCBA's) should be considered for use by all members assigned to a formal Rapid Intervention Team (RIT).

Date completed or addressed: _____

48. When a MAYDAY has been called and the deployment of the Rapid Intervention Team (RIT) has been ordered, the Incident Commander (IC) should remain in Command of the overall incident.
- a. The Division Leader or officer in a Division should become the "Rescue Group" leader.

Date completed or addressed: _____

49. Chief Officers and Safety Officers should bring all of the Rapid Intervention Team equipment (RIT-Packs) and Grace Command Box that are assigned to their vehicles, to the Command Post (CP) or RIT staging area at large or multiple alarm incidents.
- a. The RIT Pack can be utilized by additional RIT teams that are established within the RIT Group or when a MAYDAY involves more than one crew member.
 - b. The Grace Command Box may be needed for "Forward Accountability" or to replace the initial Grace Command Box if it experiences problems.

Date completed or addressed: _____

50. When a MAYDAY has been declared and deployment of the Rapid Intervention Team (RIT) has been ordered, the Incident Commander (IC) should order the division leader that has the active MAYDAY to become the "Rescue Group" leader.
- a. The "Rescue Group" leader should then answer all communications for this operation as "**Rescue Group**".

Date completed or addressed: _____

51. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, the Incident Commander (IC) should assign an additional officer to report to the Division that the "Rescue Group" is operating in.

Date completed or addressed: _____

52. When a MAYDAY situation occurs, the Incident Commander should make a statement that declares "**Emergency Traffic Only**".
- a. All non-emergency communications should be made face to face to a division or group leader.

Date completed or addressed: _____

53. The "Rescue Group" leader should contact Command and provide a Conditions, Actions, and Needs (C-A-N) report.

Date completed or addressed: _____

54. When a Rescue company arrives on location and is assigned to the Rapid Intervention Team (RIT), Rescue company crew members should perform the following three actions:
- a. Perform a scene size-up
 - b. Report to the Rapid Intervention Team (RIT) staging location and augment the RIT Group
 - c. Develop a Rescue Plan with the Division leader and "Rescue Group" leader, in the event of a MAYDAY

Date completed or addressed: _____

55. Additional crews and hand-lines should be ordered to help protect the Rapid Intervention Teams (RIT) once a RIT team has been deployed.

Date completed or addressed: _____

56. Companies working in divisions should conduct ongoing size-ups (both Interior and Exterior). All pertinent information should be reported to the Incident Commander (IC), Division leader and Rapid Intervention Teams (RIT) / Rescue Teams.
- a. Comparisons should be made with previous size-ups in order to determine improvement or the continuing deterioration of conditions.

Appendix B

Catalog of recommendations to address: Training needs

Date completed or addressed: _____

1. The National Incident Command System (NIMS) is not used consistently throughout the department.
 - a. Classroom training should be developed that provide officers with an opportunity to learn how to build from a routine type incident (no signs of fire) to a more advanced scenario (Multiple alarms, MAYDAY etc.)
 - b. Classroom lesson plans should pre-empt all Chief Officer Development Classes (CODC) prior to actual simulations.
 - c. Simulation should be performed at a slower pace and focus on building a correct Incident Command model.
 - d. Instruction needs to be developed that includes “Forecasting” how an incident might build and requesting additional Support Talkgroups.
 - e. Instruction needs to be developed that includes the use of multiple or alternative communication devices. (i.e. communicating with OEC using Cell phones and Mobile Data Transmitters [MDT’s] would help reduce non-emergency radio transmissions).
 - f. Simulation should stop whenever a learning point can be shared and then continue once corrected.

Date completed or addressed: _____

2. Chief Officer Development Classes (CODC) need to be more in-depth and include the following classroom topics.
 - a. Building Construction
 - i. Clay Tile roofs
 - ii. Structures with large roof spans
 - iii. Expanding incidents - National Incident Management System (NIMS)
 - iv. Utilizing multiple radio Talkgroups at a single incident
 - v. Organizing a call for “MAYDAY”
 - b. Fire incidents that involve Content vs. Structure
 - c. A course developed on the dynamics of modern day fuel loads. (i.e. more Plastics, less Cotton and wood)

Date completed or addressed: _____

3. Any member (Engineer Operator or Firefighter) that performs in the ICT position should be qualified.
 - a. To be considered qualified, a member should complete an official ICT course and participate in regular training with Chief Officer's and other trained ICT's.

Date completed or addressed: _____

4. New firefighting techniques should be established to address higher fuel loads in structures.

Date completed or addressed: _____

5. A training course needs to be developed for Company officers to demonstrate the key roles of working in a Division or Group. Points to emphasis would include:
 - a. Reporting face to face to a Division leader to "Check-in" or "Check-out"
 - b. Report completion of all assignments to the Division leader
 - c. Make all communications with the Division leader rather than directly to Command.

Date completed or addressed: _____

6. The department needs to emphasize and train on Crew Accountability.
 - a. Incident Commanders (IC) and Division leaders must maintain a working knowledge of crew assignments and be able to report this information to the RIT teams and "Accountability Officer" (AO).

Date completed or addressed: _____

7. The department needs to develop an **on-line Intranet training site** that can be used to disseminate information within the department. (i.e. on the Fire Department I-Drive).

Date completed or addressed: _____

8. The Intranet site should be a secured area that can offer videos from on-scene devices (Command vehicles) or those made by members during district training etc.

Date completed or addressed: _____

9. The Intranet site could be used to offer tips and suggestions on training including;
 - a. Spotting, staging and operating apparatus.
 - b. Company and District level training (i.e. hose evolutions)

Date completed or addressed: _____

10. The department needs to provide training on proper radio discipline. Members should transmit specific information and not use the radio to conduct conversations that would be more appropriate face to face.

Date completed or addressed: _____

11. All members should be taught how to use CAN reports (Conditions, Actions and Needs) to focus on a situation and develop a clear message.
 - a. All company officers/members need to be trained on evaluating the conditions that they are working in and report this information in a standard format. The CAN method (Conditions, Actions and Needs), assist members by helping them stay focused on the most critical aspects during the time of emergency.
 - b. Engine Company officers need to provide Division or Group leaders with continued updates as to the progress being made and the conditions in the immediate area that the companies are working in. (reports may include information provided by the Thermal Camera, fire extension or to request additional resources that may be needed).
 - c. Ladder Company officers need to provide Division or Group leaders continued updates and detailed reports that are specific to ventilation. When an officer becomes aware of a potential danger (i.e. heavy-dead loads on a roof, unique or dangerous building construction or unique roof conditions) an immediate report should be provided to command.

Date completed or addressed: _____

12. The departments Intranet capabilities (I-drive) should be made available for all officers to share pertinent information after unique or significant events. (i.e. present After Action Reports (AAR's) that all members can read).

Date completed or addressed: _____

13. Ladder companies need to train and develop pre-assigned duties that are consistent throughout the department. Common practices during ventilation procedures should include:

- a. Utilizing the quickest and safest way to ladder a building for ventilation
- b. Proper selection and use of equipment needed to cut holes on various roof surfaces.
- c. Knowing factors that help determine the best location to cut a hole on a roof.
- d. Knowing the quantity and size of ventilation holes that are needed, depending on the type of structure and roof assembly.

Date completed or addressed: _____

14. Building construction and Ventilation training should be developed that is updated and reviewed annually by all members and should include the following topics;

- a. "Wind Driven" fires - classes should provide a constant awareness of these types of non-routine and unexpected hazards.
- b. A review of dead load weight on a roof and the effect it has when a hole is cut.
- c. How load bearing on a structure begins to be compromised by heat, fire and additional live load weight (i.e. Water).
- d. Special topics such as the hazards associated with buildings that have a large open span should be emphasized. Firefighters should also be reminded of the risks associated with these types of structures.

Date completed or addressed: _____

15. District Training Officers (DTO's) should be scheduling and conducting routine water supply drills on a consistent basis. Periods should include each set of weekends that their shift works.

Date completed or addressed: _____

16. Company officers need to be accountable for and train their crews on basic fireground water supply situations.

- a. Establishing a positive water supply
- b. Establishing one, two and three hand-line operations
- c. Establishing master stream operations

Date completed or addressed: _____

17. Water supply training should always include hands on hose deployment that progresses from routine to complex hose evolutions.

Date completed or addressed: _____

18. Water supply training should always include hands on pumping exercises that progress from routine to complex hydraulic calculations.

Date completed or addressed: _____

19. The Thermal Imaging Camera (TIC) has a broad use. An in-depth class needs to be developed that will provide consistent knowledge and use throughout the department. Examples;

- a. TIC's can be utilized by exterior crews during a 360 degree size-up to determine fire location, heat conditions and exposure problems.
- b. TIC's can be used by Ladder companies in smoky conditions to locate power lines before raising an aerial ladder.
- c. TIC's can be used by companies at Haz-Mat scenes to determine temperatures and quantities of product in containers.
- d. TIC's also have limitations and members must understand that they can provide a false sense of safety by providing limited temperature readings. The National Institute of Standards and technology (NIST) has conducted extensive testing and this information needs to be shared with the members of the department.

Date completed or addressed: _____

20. The transitional training program for members that are returning to a regular full-time suppression assignment needs to be modified as follows:

- a. Courses should be customized to coordinate with each specific rank and include all divisions. (example; Captains transferring from a permanent EMS assignment back to Suppression, Engineer Operator Paramedics assigned to a Medic unit transferring to a suppression apparatus etc.)

Date completed or addressed: _____

21. The department needs to ensure that all members understand the capabilities and limitations of the Thermal Imaging Camera (TIC).

Date completed or addressed: _____

22. The use of Thermal Imaging Camera's (TIC's) in the Houston Fire Department should be expanded through an updated and comprehensive training program.

Specific categories that should be taught include:

- a. The use of TIC's during initial and ongoing size-ups for a variety of incidents:
 - HAZ-MAT
 - Fires
 - Rescues
- b. Locating victims
 - Fires
 - Large open areas
 - Bodies of water
- c. Misconceptions of thermal imaging technology

Date completed or addressed: _____

23. Monthly Continuing Education (CE) should be strong in content and merit. Classes should address common fireground activities such as the safe use of equipment, standard techniques and department procedures.

Date completed or addressed: _____

24. On-line training should be used to re-enforce training, not introduce new complex ideas or equipment.

Date completed or addressed: _____

25. The department needs to ensure that all members are provided with formal training in Rapid Intervention Team (RIT) operations. Emphasis must include both initial and extended operations.

Date completed or addressed: _____

26. The department should require Rapid Intervention Team (RIT) training every six (6) months that runs concurrent with other department training (i.e. Stokes Basket, Grace Accountability etc.)

Date completed or addressed: _____

27. In years past, initial training advocated that “Repeaters” were needed when companies were working in confined spaces or areas out of range of the signal being produced by the GRACE Command box (i.e. basements, upper floors of high-rise structures etc.). The department should include a section in a regular training program that addresses the need for the deployment of multiple “Repeaters” on any fireground (i.e. warehouses, large commercial structures etc.)

Date completed or addressed: _____

28. The department should provide extensive training on the Grace Accountability System.

- a. Emphasis should be placed on the specific sounds for each signal that is either sent or received.
- b. All members should have a clear working knowledge of these sounds and how to respond in an appropriate and timely manner.

Date completed or addressed: _____

29. The department should require Grace Accountability training every six (6) months that runs concurrent with other department training (i.e. Stokes Basket training, RIT etc.)

Date completed or addressed: _____

30. The department should require training in MAYDAY procedures every six (6) months that runs concurrent with other department training (i.e. Stokes Basket training, RIT etc.)

Date completed or addressed: _____

31. Members should be provided adequate training on all personal protective equipment (i.e. Coat, Pants, Boots, SCBA, Hoods, and Gloves etc.) that is purchased and issued by the Houston Fire Department. Specific areas should include:

- a. NFPA Standards
- b. Department Specifications
- c. Material and Design
- d. Proper Use and limitations
- e. Cleaning, Care and Maintenance

Date completed or addressed: _____

32. Risk Management awareness and training must be initiated and continued to be a consistent practice by all members.

Date completed or addressed: _____

33. Additional Inter-department training needs to be developed between Suppression companies and other Special Operations units. Historically, suppression crews become the support group for rescue crews during extended rescue events.
- a. Engine and Ladder companies need to train with the Technical Rescue Team (TRT) to become familiar with their capabilities and specialized equipment.

Date completed or addressed: _____

34. Develop training that informs all members of the problems associated with E-Z-Comm equipment (i.e. wires getting caught between a regulator and the face piece and accidental "Quick Key's")

Date completed or addressed: _____

35. Incident Command Technicians should be trained and considered the Subject Matter Expert's (SME's) on the GRACE Accountability System for the department. All ICT's should be continually trained in the areas of new procedures, trouble shooting and updating of T-Pass devices.

Date completed or addressed: _____

36. In order to address "Transmission Bonk" issues, the Houston Fire Department should:
- a. Develop a strong radio training program that emphasizes good radio discipline.
 - b. Streamline traditional fireground communication from "Emergency Conversation" to "Emergency Communication".
 - c. Training members to use CAN reports (Conditions, Actions, and Needs).
 - d. Train members to use Face to Face communication when possible.
 - e. Train all company officers, Chief Officers and OEC in the use of multiple Talk Groups.

Date completed or addressed: _____

37. In order to address “Quick Key” issues, the Houston Fire Department should:

- a. Educate all members in the department on the problems that can be created when a “Quick Key” occurs.
 - i. Members should understand the direct impact that this issue has on the ability for firefighters to communicate on a fireground.
- b. Develop a monthly Continuing Education course that introduces this issue
- c. Train members through the use of the District Training Program.

Date completed or addressed: _____

38. Monthly safety reminders should be developed that emphasize important details regarding department safety equipment. A simple message that reminds members the importance of “Keying” a T-Pass device when no longer wearing an SCBA can prevent added confusion and stress on the fireground.

Date completed or addressed: _____

39. Provide additional training to all field personnel in the use of the “Emergency Call Button” and the effects that the priority radios have when this safety feature is activated.

Date completed or addressed: _____

40. District Training classes and Monthly Continuing Education classes should be used as a means to promote proper radio usage.

Date completed or addressed: _____

41. Develop a method for field personnel to practice using the “Emergency Call Button” when training on “MAYDAY” procedures. This training could be enhanced by using “Simulation radios” that have the “Emergency Call Button” deactivated. The “Simulation radios should be identified by a different color so that they are not placed in service in the field. (i.e. blue outer shell).

Date completed or addressed: _____

42. A training course needs to be developed that teaches members how to operate the GRACE Accountability System when an incident is using multiple Talk Groups.
- a. The GRACE Accountability System has the capability of “grouping” that could enable an “Accountability Officer” (AO) to group each company under a specific Talk Group, Division, or functional group. This is an advanced feature that would require a narrowed scope of GRACE Command box operators (i.e. ICT’s).

Date completed or addressed: _____

43. The entire department should be trained to use **Electronic PAR’s** when conducting “routine” or “urgent” roll-call PAR’s on the fireground.
- a. **Electronic PAR’s** used during “abandonment evacuations” are imperative when an urgent PAR is needed to confirm the status of every member on scene.
 - f. **Electronic PAR’s** used for routine “PAR checks” will decrease the amount of radio traffic necessary by limiting verbal PAR’s.
 - g. **Electronic PAR’s** cannot always be considered as 100% accurate. Therefore, a trained ICT is the best person to identify inaccuracies and initiate a verbal PAR.
 - h. **Verbal PAR’s** should still be conducted by the “Accountability Officer” (AO) or Incident Commander (IC) anytime a company is in alarm or when the immediate safety of a member or company is unknown and needs to be verified.

Date completed or addressed: _____

44. A training plan should be developed that incorporated use of the “Emergency Call Button” when declaring a “MAYDAY”.

Date completed or addressed: _____

45. A “Simulation” radio should be developed that only emits an alert tone on the training radio itself so that members can practice activating this feature during training.

Date completed or addressed: _____

46. OEC members should be involved in simulator training at VJTF with Incident Commanders so all members can work together and understand capabilities of the OEC consoles (see other recommendation regarding training)

Date completed or addressed: _____

47. The National Fallen Firefighters Foundation has established courses that provide multiple layers of LODD training.
 - a. Formal training needs to be established that provides members with tools that are needed to manage a LODD incident.
 - b. Multiple HFD members should be trained in each position especially in the position of Funeral Coordinator.

Date completed or addressed: _____

48. Over the years, the department has implemented several types of warning methods to alert members on scene to potential hazards (traffic Cones, yellow scene tape, red Scene tape etc.)
 - a. Members should be trained and made aware that any area taped off with "**Crime Scene**" tape is off-limits, to all personnel regardless of rank.
 - b. Members should only be granted access to these specific areas when escorted by a member of the Houston Arson Bureau (peace officer).

Appendix C

Catalog of recommendations to address: Personnel and Administrative issues

Date completed or addressed: _____

1. The definition of “Crew Integrity” needs to be defined as stated below and used consistently throughout the department.

“Crew Integrity is maintained when companies are in sight, touch, voice or has knowledge of each crew member’s position”.

(i.e. Crew integrity is considered continuous when a company is operating on a hose line but one crew member, who maintains constant contact with the hose, needs to operate out and away from the line of sight of the officer to assist with advancement)

Date completed or addressed: _____

2. The Heavy Duty shop needs to be evaluated and properly funded to keep pace with the needs of the department. A new standard must be set to keep up with the work that is required to have front line apparatus properly maintained.

Date completed or addressed: _____

3. The department should follow manufactures recommendations for maintenance on all apparatus.

Date completed or addressed: _____

4. The Reserve apparatus fleet needs to be evaluated and fully funded. Safe operational apparatus must be available to replace a front line piece of equipment when it must be taken out of service.

Date completed or addressed: _____

5. The department needs to re-assess the assignment of Initial Rapid Intervention Teams (IRIT). There should be more emphasis placed on assigning a formal RIT group as early in to an incident as possible.

Date completed or addressed: _____

6. The Rapid Intervention Team (RIT) duty needs to be standardized throughout the department and accomplished by companies who are assigned to perform those duties upon arrival. The purpose of a Rapid Intervention Team (RIT) should be Proactive not Reactive and work to prevent a MAYDAY.

Date completed or addressed: _____

7. The department needs to develop procedures that create regular intervals for on-going size-ups that are performed by the Attack Engine, Division leaders and Safety officers. Consideration may be given to assigning a “**RECON Group**”. The Incident Commander should be notified any time pertinent hazards are identified.

Date completed or addressed: _____

8. There should be a minimum of four (4) persons assigned as a Formal Rapid Intervention Team (RIT) at all incidents. To establish a RIT Group:
 - a. The Formal RIT will be established by assigning an Engine or Ladder company to RIT.
 - b. The company assigned to formal RIT would then combine with the IRIT (EMS unit) to form the Formal RIT Group.
 - c. The Formal RIT group would then consist of six members, four (4) members in full Personal Protective Equipment (PPE) ready to deploy and two (2) members available to perform in a RIT support role (i.e. identify and provide egress, deploy ladders, remove burglar bars, carry equipment, pull hose, force entry etc.) Note: this needs to be consistent with the RIT Guideline.

Date completed or addressed: _____

9. The department should not consider the Engineer Operator assigned to the attack Engine or the Incident Commander (IC) as a second person of an Initial Rapid Intervention Team (IRIT). The department should explore new options such assigning IRIT duties to the first EMS unit on scene until a formal RIT and or RIT Group can be formed.

Date completed or addressed: _____

10. When a Rescue Truck is assigned to an incident, it may be added to the Formal RIT Group. The initial company (Engine or Ladder) assigned to Formal RIT should then remain as part of the Formal RIT group and not be re-assigned to another task.

Date completed or addressed: _____

11. The current 1-11 assignment should be increased by adding one (1) Rescue Truck and one (1) Ladder Company.

Date completed or addressed: _____

12. The department should develop funding and plan for on-board printers on all Command Vehicles (SUV's). This could provide Rapid Intervention Teams (RIT), Division leaders and or Safety Officers, with a hard copy of a Pre-incident Plan document (i.e. Digital Sandbox).

Date completed or addressed: March 2014

13. Companies assigned to be the formal Rapid Intervention Team (RIT), should bring a 2 ½ inch hose with nozzle from an apparatus other than the attack engine. RIT members should then attach it to the attack engine or an engine with a positive water source. RIT members should also notify the Engineer Operator of that engine which discharge the RIT line is attached to.
 - a. The intent of the 2 ½ inch hose line is not meant for the RIT team to deploy during a MAYDAY, but to proactively have one in place and available if needed.

Date completed or addressed: _____

14. The department should form a committee to evaluate the merits of placing the MAYDAY operation on a separate Talkgroup which would divide the incident communications over multiple Talkgroups. Communications during MAYDAY operations should then be based on standardize best practices.

Date completed or addressed: _____

15. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, the Technical Rescue Team should receive an All-Call Page (**Rescue Pager 1-11**) and all Rescue units dispatched.

Date completed or addressed: _____

16. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, OEC should limit the verbal message after the 5 second alert tone.

Date completed or addressed: _____

17. When a MAYDAY has been declared and the deployment of the Rapid Intervention Team (RIT) has been ordered, all un-committed Engineer Operators at the incident, should begin to collect any full air bottles located on the apparatus on scene and report to the Rapid Intervention Team (RIT) staging area.

Date completed or addressed: _____

18. To maintain accountability and order on the fireground, Suppression and EMS crews should not respond to an incident unless assigned to and dispatched by the Office of Emergency Communication (OEC).
 - a. The action of a Unit self-dispatching to an incident should be prohibited throughout the city.

Date completed or addressed: _____

19. To maintain accountability and order on the fireground, a formal "Call-in" procedure should be established for all specialized members (i.e. Safety officers, Rescue Team members and Hazardous Material Team members etc.) during extended and/or MAYDAY incidents.

Date completed or addressed: _____

20. Off-duty fire department members **should not** report directly to an incident unless they are "**Called-in**" (i.e. Safety officers, Rescue Team, Hazardous Material Team etc.)

Date completed or addressed: _____

21. There should be a minimum staffing of five fully trained Rescue Technicians assigned to each Rescue Truck (RE010, RE042 and HR11) on all four shifts.

Date completed or addressed: _____

22. The department needs to establish a “Risk Decision Model” based on:
- a. A Risk Management Plan
 - b. Critical Fireground benchmarks
 - c. Strategy – Offensive v. Defensive
 - d. Incident Action Plan
 - e. Deployment of Resources

Date completed or addressed: _____

23. Risk Management means to simply identify, assess and prioritize risk and is an on-going process at every incident. This must become the culture of the Houston Fire Department.

Date completed or addressed: _____

24. The following factors should be considered when forming a Risk Management Plan:
- a. Occupancy type
 - b. Smoke Conditions
 - c. Type of Construction
 - d. Type of Roof System
 - e. Age of the Structure
 - f. Exposures
 - g. Time Considerations

Date completed or addressed: _____

25. The department needs to establish criteria that can help Incident Commanders (IC) amend Incident Action Plans (IAP's) in critical situations.
- a. Crucial times include the decision process of going from a Rescue to Recovery operation.
 - b. When this decision must be made, it will be incident specific and the tactical change **must** be announced on the Radio so that all members on scene are aware of this decision.
 - c. Ultimately this assessment must be made by the Incident Commander (IC) and it is understandable that consultation with other members may be needed in order to make an informed and suitable choice.

Date completed or addressed: _____

26. The department should increase the number of Safety Officers from three (3) per shift to four (4) per shift [one per Quadrant].

Date completed or addressed: _____

27. The department needs to increase the number of Safety Officers that are dispatched on large incidents and multiple alarm fires (from one to two Safety Officers).

Date completed or addressed: _____

28. The department should fund and add an Incident Command Technician (ICT) to each Safety Officer vehicle.
- a. This action would meet the Two-in / Two-out rule which refers to the Occupational Safety and Health Administration (OSHA) policy. Texas having adopted the NFPA standards (i.e. NFPA 1500), refers directly to these requirements, which corresponds with the OSHA respiratory protection regulation.

Date completed or addressed: _____

29. Guidelines need to be written that allow OEC the ability to re-assign a radio that is experiencing equipment failure. A Communications Officer should be able to re-assign the radio that has problems from one Talk Group to another monitored Talk Group. This process is needed when a radio or E-Z Com System is not working correctly and it is drastically effecting fireground communication.
- a. This procedure should only be allowed to take place at the direction of an Incident Commander (IC).
 - b. Any radio removed from a Talk Group should be re-assigned to a "Monitored" Talk Group so that the member(s) who are experiencing radio problems can still be in contact with the IC and OEC.

Date completed or addressed: _____

30. The administration should continue to support and fund the full efforts of the Breathing Air Services division of the Houston Fire Department in order to accomplish the following goals:
- a. All SCBA units in the Houston Fire Department should be upgraded to the 2007 or newer NFPA standard.
 - b. The department should evaluate - Remote air monitoring technology
 - c. The department should invest in the Scott Pak-Link equipment necessary for downloading available data from department SCBA.

Date completed or addressed: _____

31. A Bulletin should be written directing personnel on how to properly test, maintain and report any problems found when using the current Scott E-Z Com System

Date completed or addressed: _____

32. The Houston Fire department should re-evaluate the guidelines that address the use of TIC readings that are reported by the first-in companies that enter a structure. As reported by NIOSH during their site visit, these readings may be miss-leading and create a false sense of safety.

Date completed or addressed: _____

33. All department guidelines that reference "MAYDAY" procedures need to be updated to include the use of the "Emergency Call Button".

Date completed or addressed: _____

34. Update all radio communication guidelines (Radio and MDC) to reflect the changes that have been made to the current radio system being used by the department (700/800 MHz Digital radio system).
- a. Guidelines must include the use of multiple Talk Groups.

Date completed or addressed: _____

35. Guidelines and procedures currently used by members in OEC should be updated to reflect the following changes:
- a. Fires should be dispatched to a dedicated TAC channel (Talk Group).
 - b. Future alarm companies dispatched to an incident should have the record updated to the correct TAC Talk Group.
 - c. Communications officers should not repeat information that is said by a member operating on the fireground.
 - d. The Office of Communications needs to update all contact information for support staff that is called upon to assist suppression and EMS personnel when members have equipment problems in the field.

Date completed or addressed: _____

36. **“Incident Command Support Unit” (ICSU)** - The department should establish a new tactical assignment on the fire ground called the **“Incident Command Support Unit” (ICSU)**.
- a. This unit would assist an Incident Commander (IC) in a support role at the Command Post (CP) in areas such as radio communication, accountability and crew assignments etc.
 - b. The Incident Commander (IC) should consider assigning an entire Company to the Command Post (CP) to function in this assignment.

Date completed or addressed: _____

37. A position of **“Station Assistance Officer”** should be created. This Person should be appointed to any crew that has experienced a Line-of-Duty Death or other significant accident while on duty.
- a. Specific responsibilities would include:
 - i. Keeping the station(s) informed of paramount information regarding the incident.
 - ii. Establishing an open line of communication with the department and city officials.

Date completed or addressed: _____

38. There should be a set of meetings scheduled through a **“Station Assistance Officer”** that allows for members of the Command Staff to meet with the stricken stations and provide regular updates to the members.

Date completed or addressed: _____

39. An Incident Commander (IC) must have the ability to make an informed decision and order fallen firefighters to be removed from an area if their bodies or the safety of other firefighters that must assist in the recovery are in danger.

Date completed or addressed: _____

40. Houston Arson and HPD Homicide should develop an agreement that allows HFD to process the scene of any fire related death in the City of Houston.
- a. HPD Homicide should assist Houston Arson upon request or if the scene involves a homicide before the fire.

Date completed or addressed: _____

41. The Houston Fire Department should form a committee to review all new technology that is available in the fire service. This group should meet on a regular basis and research the most up to date advances that are being developed throughout the world in today's modern fire service. Current progressive projects that should be considered include:
- a. The use of cameras by HFD as well as individual members
 - b. The Scott SENS2 system air management
 - c. Pre-incident planning and response programs
 - d. Tactical worksheets and programs

Date completed or addressed: _____

42. A Memorandum of Understanding (MOU) should be created between HFD and the HCMEQ.
- a. This directive would help to establish a standard protocol for the investigation and transportation phase of the recovery process.
 - b. This directive would help to reduce misunderstandings that tend to come up at the Task level between personnel working for both agencies.

Date completed or addressed: _____

43. Safety Officers should extend their expertise to Arson personnel when they have to work in areas that are deemed unstable.

Date completed or addressed: _____

44. All monetary donations should be entered in the Captains log and then forward to a representative from HFD Staff Services.

Date completed or addressed: _____

45. Relationships should be established with local charitable organizations that are willing to assist with organizing an abundant amount of perishable donations.

Date completed or addressed: _____

46. A department policy / process needs to be in place to help members of a stricken station(s) coordinate perishable gifts.

Date completed or addressed: _____

47. A "**Line-of-Duty Death Task Force**" should be created. This team should consist of the following key advocates that are needed during this critical time.
- a. Funeral Coordinator(s)
 - b. Members assigned to the Firefighter's Support Network
 - c. HFD Staff Services
 - d. The HFD Honor Guard
 - e. The HFD Chaplain
 - f. Members of the HFD Command Staff
 - g. Members of the Houston Professional Firefighters - Local 341

Date completed or addressed: **September 2013**

48. The department needs to establish a systematic way to update and maintain "Emergency Contact" information. The HFD Information Technology (HFD -IT) department needs to develop an electronic version of a member's Permanent Personnel Form (HFD Form 42).

Date completed or addressed: _____

49. The department should establish a protocol for a non-Union Line-of-Duty Death and be prepared to facilitate this service.
- a. This service should be organized by the members of the "**Line of Duty Task Force**"

Date completed or addressed: _____

50. The Houston Fire Department should establish an Internal Disaster Guideline. This guideline would be used to help manage a line-of-duty death or significant internal event. This document would assist the department by establishing a systematic approach for coordinating internal resources during a significant internal event. This guideline should include basic information that can be modified as needed and used while the department is faced with an adversity that is disrupting the normal day to day operations. The department would then have the ability to plan for these rare occurrences rather than make forced decisions at the time of the hardship. Specific areas that should be addressed include:

- a. The assignment of a “**Station Assistance Officer**” should be assigned as soon as possible in order to assist the affected crew members with communications, department procedures and critical needs (i.e. medical evaluation, CISM etc.).
- b. A model should be provided that lists the order of Command Staff that is responsible for the notification of next-of-kin.
- c. A hierarchy and suggested list of attendees during the notification process of the next-of-kin.
- d. This group should include a member of the Command staff as well as any member(s) that are friends of the family and can offer a personal sense to the condolences.
- e. A Wall-of-Honor should be formed with all of the members on scene as the fallen members are recovered from the structure or area of discovery and brought to the vehicle that will transfer them to the Harris County Medical Examiner’s Office.
- f. Create a process for coordinating the procession of the fallen member(s) from the scene to the Harris County Medical Examiner’s Office.
- g. Design a process that allows the affected crew members to be part of the procession from the scene to the Medical Examiner’s office and then back to their station to clean up and organize themselves.
- h. A procedure should be established that details how and when members will be sequestered in order to provide a statement and interview.
- i. Any members that respond to an incident and presented with a devastating situation such as a crew member expiring should be allowed to participate in the Recovery Process as well as the Wall-of-Honor. Note: This action may be paramount in the recovery process for that member and they should be provided the option of whether to participate prior to being released from the scene in order to work with the investigating agencies.
 - i. This show of respect should be performed by all members on scene as a demonstration of solidarity to our fallen member(s).

- j. Provisions made for the welfare (Food, shelter, medical evaluations etc.) of both the members that will be providing interviews and statements as well as those that remain on scene and assist with the investigation.
- k. Transportation should be arranged for the members that must provide interviews and statements at the location that the process will take place.
 - i. Mass transportation should be provided (i.e. AMBUS 8 or METRO).
- l. The station that the stricken members are from should be secured with assistance by the Houston Police Department (HPD), immediately following the announcement of a fallen firefighter.
 - i. Returning crews should be provided the privacy deserved so that they can clean up and organize themselves.
 - ii. In the aftermath of a Line of Duty Death, all off-duty personnel should restrict themselves to the apparatus floor until such time that the on-duty crews have had a chance to return to the station and perform personal hygiene and eat.
 - iii. This action will assist in securing the fallen members personal effects, and departmental records, as well as providing privacy to the on-duty crews.
- m. The development of a non-Union Line-of-Duty death ceremony should be arranged and provided by the Houston Fire Department and the City of Houston.

Date completed or addressed: _____

51. It is understood that there are detailed steps that must take place once a Line-of - Duty death or significant accident occurs. However, firefighters that are required to give a statement need to be told and understand that the process is one of fact-finding in nature and that Houston Arson Bureau and other agencies are legally obligated to investigate the event.
- a. Members need to understand that this process is not meant to point blame or prosecute the person giving a statement.
 - b. The department (Arson) should develop a training course to educate **all** members, on the process that will take place during the interviews.
 - c. Members should be instructed on the legal aspect of providing statements. (i.e. details about the Garrity warning that is signed for their protection).

Date completed or addressed: _____

52. Emergency contact information should be updated annually. (example; when the annual Employee Evaluations are completed, review of "Emergency Contact" information should be incorporated into part of the process).

Date completed or addressed: _____

53. It is understood that there are detailed steps that must take place once a Line-of-Duty death or significant accident occurs. However, if firefighters are to be sequestered so that they can provide interviews and statements to investigating agencies (i.e. HFD Arson, Texas State Fire Marshall's Office etc.) then appropriate accommodations must be secured.

- a. The facility must be of an adequate size to manage a large number of people that is expected to be processed.
- b. Facilities should be equipped with amenities that will be needed to manage 30 to 50 people. Staff members must have the ability to control the environmental conditions in-side the building regardless of time of day/year.
- c. Members being sequestered, should be provided basic needs such as food, continual medical evaluation and dry clothes.

Date completed or addressed: _____

54. There is a tremendous amount of management and organization that must take place after a line-of-duty death. Members must always remember that every action that occurs after the department enters into a recovery operation, directly impacts the healing process.

- a. On scene coordination must be organized by a member that has complete authority to make time sensitive decisions.
- b. This person should be the Assistant Chief of Emergency Operations or his/her designee.
- c. This Assistant Chief or his/her designee should respond directly to the scene if not already on location and assume the role of "**Recovery Group**" leader.

Date completed or addressed: October 2013

55. The Texas State Fire Marshal's Office (SFMO) is statutorily invested with the authority to investigate all firefighter deaths that occur in the State of Texas. This agency uses a questionnaire style document as their means to obtain detailed information after an incident has occurred.
- a. A process should be developed that allows the Houston Arson Bureau and the SFMO to work together and lesson the overall time required for our members to have to spend giving these statements.

Date completed or addressed: _____

56. The Critical Incident Stress Management Team (CISM) is a highly trained, dedicated and professional group of individuals. These men and women volunteer their time and provide an invaluable service to our members. The magnitude of this event has had a significant impact on hundreds of members throughout the department including the members of this stress management group.
- a. The coordinators of this team should perform an internal evaluation of the process that took place during the Southwest Inn fire.
 - b. The department needs to ensure that the CISM program has layers of support in place to assist those members of the team that provided the many hours of support.

Date completed or addressed: _____

57. The Houston Fire Department has suffered Line-of Duty Deaths due to both Traumatic and Medical reasons. Though both are devastating, the investigations are conducted quite differently. The process involved with investigating a Line-of-Duty Death that in non-fire related, is conducted by the Houston Police Department.
- a. The process for conducting a non-fire related Line-of-Duty death needs to be addressed in an Internal Disaster Guideline.

Date completed or addressed: _____

58. Every department member intimately involved with the process of a Line-of-Duty death or significant accident (members assisting with family, HFD Honor Guard etc.) should be monitored for Post-Traumatic Stress Disorder (PTSD).

Date completed or addressed: _____

59. The Houston Fire Department should conduct a medical evaluation on all personnel that have responded to and worked on scene of an LODD or other significant event.
- a. Evaluations should be performed by HFD EMS personnel (EMS Medical Directors, EMS Supervisors or Paramedics).
 - b. Procedures for accomplishing this task should be listed in an Internal Disaster Guideline.

Date completed or addressed: July 2014

60. Members who are peace officers and assigned to HFD Staff Services should be given the sole responsibility of collecting all personal items that belong to a member that has fallen in the Line-of-Duty. The following actions should be taken in a prompt manner:
- a. HFD Staff Services should collect all personal items that remain on the apparatus of the member who has suffered a Line-of-duty death.
 - b. HFD Staff Services should collect all administrative files (Form 42, Station file, Training records etc.) from the deceased member's station.
 - c. HFD Staff Services should expeditiously locate and seal any lockers of a deceased member with evidence tape for security and evidentiary purposes.
 - d. HFD Staff Services should document all actions taken in the member's form 42, the Station Captain's Log and all additional internal reporting documents.
 - e. HFD Staff Services should then, at a later date, unseal the lockers as soon as practical with the officers and crew members of the deceased firefighter(s) shift being present. All items should be inventoried prior to being handed over to family members.
 - f. Material things that have no evidentiary value such as vehicles, wallets etc. should be given back to the family as soon as possible. However, Houston Arson Bureau personnel with the rank of Assistant Arson Investigator or higher will be the only person who can make the determination prior to release.

Appendix D

Catalog of recommendations to address: Equipment needs

Date completed or addressed: _____

1. To combat the higher levels of plastics and poly-carbon found in today's fire loads, the department needs to evaluate the use of Class A foam systems on apparatus.
 - a. The cost of a foam system on a new apparatus is approximately \$8000
 - b. The cost to retro-fit a foam system on an existing apparatus is approximately \$14,000

Date completed or addressed: _____

2. Proper hand line selection and Gallon-Per-Minute (GPM) water flows need to be developed to match the increasing plastic and poly-carbons that are encountered in today's fire loads.

Date completed or addressed: _____

3. Positive pressure fans should be purchased that provide a minimum of 30,000 cubic-feet-per minute (cfm)

Date completed or addressed: _____

4. The Houston Fire Department needs to develop a standard list of "minimum" equipment that should be assigned and carried on each class of apparatus. Requirements should meet all NFPA Standards (Engines, Ladders etc.)

Date completed or addressed: _____

5. All standardized equipment should be mounted or carried in the same area according to the class of apparatus.

Date completed or addressed: April 2014

6. All Chief Officers and Safety Officers should be assigned Thermal Imaging Cameras (TIC's) that should be utilized when assigned to divisions, conducting an interior or exterior size-up and or providing a Conditions, Actions and Needs report (CAN).

Date completed or addressed: _____

7. All department circular saws, cutting blades and chain saws need to be standardized and upgraded on Ladder Trucks. The recommended equipment to be purchased and maintained include:
 - a. Husqvarna Vent Master Chain Saws with Diamond blades
 - b. Stihl Rock Boss Chain Saws

Date completed or addressed: _____

8. Written training material for department saws needs to be evaluated and standardized.
 - a. Standard training and maintenance procedures need to be developed and taught throughout the department.

Date completed or addressed: _____

9. The 200' foot Search lines that are currently assigned to heavy apparatus are too small in diameter and difficult to manipulate with a gloved hand. The design of the Search line should be modified to include a larger diameter material (cord / rope) so that it can be deployed with a gloved hand.

Date completed or addressed: February 2014

10. The Gloves that are currently issued to members as part of the departments Personal Protection Equipment Ensemble (PPE) do not provide good dexterity.
 - a. Members reported having trouble when attempting to use or manipulate some types of equipment.
 - b. New styles of gloves need to be tested for better dexterity.

Date completed or addressed: _____

11. The current retractable Tag-lines (Part of the Search Line system) needs to be re-evaluated for its effectiveness in certain RIT Operations.
 - a. This equipment requires members to be well versed on deployment and can actually be consider a hazard if a member becomes entangled in their own equipment.
 - b. RIT Operations should be considered a quick search/locate/remove process when possible (small structures) and the use of the tag-line system may slow this operation.
 - c. The tag line system can be beneficial in large structures for search operations and for other comparable uses.

Date completed or addressed: _____

12. All members should be issued a pair of work gloves that can be used for non-firefighting operations. (i.e. Rescue, overhaul etc.)

Date completed or addressed: January 2014

13. The Rapid Intervention Team Kit (RIT-Pack) needs to be evaluated and re-designed. A system that includes a smaller profile and only task specific equipment should be developed.

Date completed or addressed: _____

14. The current firefighting hood (Reed Hood) needs to be re-evaluated.
 - a. "Sock" style hoods need to be evaluated for thermal protection, steam protection, and ease of use.
 - b. New hoods should be tested to find one that provides:
 - i. Better range of motion
 - ii. Increases member's vision when applied over the Self Contained Breathing Apparatus (SCBA) face piece
 - iii. Provides an equal to or better level of protection
 - iv. Is easier to don and doff.

Date completed or addressed: _____

15. Work with Radio Communication Services (RCS) and Motorola® to develop a method that will allow the system to automatically track and log a radio when it goes in and out of a coverage area.
 - a. Any areas that are found to have coverage problems should be shared with all of the stations that respond in and around that area so that they are aware of the lack of reliable coverage.

Date completed or addressed: _____

16. Develop a method to track buildings and response areas that have poor system coverage.
 - a. This tracking system should provide officers and members with an easy method to report areas that are found to have a reduction in coverage area.
 - b. This system should be continuously monitored and updated in order to provide each station with the most current information on coverage problems that are found in their area.

Date completed or addressed: _____

17. Communication regarding poor system coverage problems should be shared to all members of the department from the Command Staff to field personnel.

Date completed or addressed: _____

18. Motorola "Fire" Lapel microphones should be purchased for all riding positions. This accessory can be used when personnel are not in full PPE. These devices could also be used as a temporary solution to the EZ RadioComm issues discussed above.

Date completed or addressed: December 2013

19. Develop a process to address any radio coverage problems that are discovered during the course of day to day operations.
 - a. Current coverage testing methods need to be evaluated and updated based on fire department needs and use of the system. It is felt that without the implementation of an enhanced coverage plan, firefighter safety will be compromised.
 - b. A system should be developed to enhance radio coverage in areas that are found to have weaker signals contributing to communication issues.

Date completed or addressed: June 2013

20. The Fire Department should continue to be updated and be involved in all decisions that are made regarding the 700/800 digital radio system.

Date completed or addressed: July 2013

21. Work in conjunction with Motorola® to develop a unique tone in order to differentiate between a lack of coverage and another radio user having control of the Talk Group.

Date completed or addressed: June 2013

22. The Houston Fire Department should continue to work with RCS and Motorola® to find a way to eliminate or significantly reduce the 1 to 1.5 second digital delay.

Date completed or addressed: June 2013

23. In order to address “Quick Key” issues, the Houston Fire Department should work with RCS and Motorola® to find a way to eliminate the “quick key” problem.

Date completed or addressed: July 2013

24. In order to address the problem of “Open” or “Stuck” microphones the Houston Fire Department should - Reduce the total amount of time a radio user can transmit a message from 60 seconds to 30 seconds after pushing the PTT button and capturing a Talk Group.

Date completed or addressed: June 2013

25. In order to address the problem of “Open” or “Stuck” microphones the Houston Fire Department should - Enable a 10 sec timeout if no voice or verbal transmission is sent once a PTT button is pushed.

Date completed or addressed: _____

26. In order to use the OEC Consoles and Priority Radios in a manner that provides maximum benefit, the department should make sure that OEC maintains a constant situation awareness about this feature and be careful not to transmit over any important fireground communication.

Date completed or addressed: _____

27. Explore the capabilities of OEC or RCS having the ability to remove a user's radio from a Talk Group when it is determined that equipment failure has occurred.
- a. OEC, at the Incident Commanders direction, should cautiously use the capability of removing a specific user from one Talk Group and moving them to another monitored Talk Group in order to still have contact with that user but eliminate the problem of the equipment blocking all use of the Talk Group. The malfunctioning equipment should be replaced as quickly as possible to ensure that member still has radio communication capabilities.

Date completed or addressed: September 2013

28. The department needs to enable the Priority radio feature to include specific units in the field. Positions that should be considered for having this type of radio feature includes:
- a. Shift Commander's
 - b. District Chief's
 - c. ICT's performing "Accountability Officer" (AO) duties
 - d. Incident Safety Officer's
 - e. Radios assigned to Mobile Command 008 (MC008)
 - f. Portable radios at OEC

Date completed or addressed: September 2013

29. Portable radios in the field that have the Priority feature should be identified by using a different colored outer shell. This is necessary so that members know they are using a Priority radio. (i.e. Red outer shell for District Chief's, Orange outer shell for OEC etc.). All members should understand that when using a Priority radio, they have the ability to override another member that is using a non-priority radio.

Date completed or addressed: _____

30. In order to better utilize the Priority radio feature, the Houston Fire Department should: Form a committee to further investigate the Priority radio feature. This committee should assess the value and overall impact the Priority feature has on fireground communication.
- a. The transmission of a Mayday firefighter is paramount and should always be given the top priority.

Date completed or addressed: _____

31. In order to address the problem of "Bleed Over", the Houston Fire Department should have OEC and RCS develop a reporting procedure for tracking all "Bleed Over" occurrences.

Date completed or addressed: _____

32. In order to address the problem of "Bleed Over", the Houston Fire Department should continue to work with RCS and Motorola® to investigate these occurrences and learn how this happened and what needs to be accomplished in order to prevent this from affecting future incidents.

Date completed or addressed: _____

33. HFD should be included in all purchasing decisions made by other city departments regarding purchasing of equipment to be used by firefighters.

Date completed or addressed: _____

34. The department should upgrade all portable radios to the newer "firefighter friendly" Motorola Radio APX 7000XE.

Date completed or addressed: _____

35. To resolve the problems that the firefighters are experiencing with the Scott E-Z Com System, the Houston Fire Department should work with RCS and Motorola to determine if the APX 7000 radio plays a role in the increase in non-working components of the Scott E-Z RadioComm.

Date completed or addressed: _____

36. The department needs to invest the time and money necessary to research all new technology that is available in enhanced communication equipment. Accessories that function as both an earpiece and microphone in or out of Personal Protective Equipment (PPE) should be evaluated.

Date completed or addressed: _____

37. The department needs to field test new communication systems that will enhance radio transmissions and help members communicate more effectively on the fire ground.
- a. Systems tested should include both hard wired and wireless technology that is available as of 2014.
 - b. Look for a system that has a side mounted "Push to talk" feature to help eliminate "Quick Key" issues

Date completed or addressed: _____

38. The department needs to evaluate the durability of the current E-Z Com System when it is exposed to high temperatures.
- a. A way to protect the E-Z Com equipment from failure due to heat needs to be researched and implemented.

Date completed or addressed: _____

39. All SCBA units in the Houston Fire Department should be upgraded to the 2007 or newer NFPA standard.

Date completed or addressed: _____

40. The department should evaluate - Remote air monitoring technology

Date completed or addressed: **August 2014**

41. The department should invest in the Scott Pak-Link equipment necessary for downloading available data from department SCBA.

Date completed or addressed: _____

42. The department should evaluate and purchase 12 volt repeaters that can be mounted on the tips of the aerial ladders. This feature would produce an elevated "repeater" that could be used at large scale incidents and help strengthen a signal sent and received by a GRACE Command box.

Date completed or addressed: _____

43. Communication officers should constantly monitor the volume settings at their consoles that they are operating from and make the necessary adjustments so that a consistent quality of tone and volume is projected over each Talk Group.

Date completed or addressed: **May 2014**

44. The Houston Fire Department needs to re-evaluate the position on the use of video and photography equipment used by members at an incident. Though this may create some legal issues in the matter of evidentiary value (Note; as is the case with EMS regarding AED recordings), it could also provide an invaluable training tool.

Date completed or addressed: _____

45. The department should consider purchasing cameras for command vehicles that would afford the department with the unique opportunity to record large scale incidents and those that provide the ability to learn from. If video was recorded using HFD owned equipment, it would become HFD property and or evidence.

Date completed or addressed: _____

46. All Personal Protective Equipment that is worn by a member who is lost in the Line-of-Duty is considered evidence. All members in the department should be instructed to mark each piece of personal equipment that is assigned to the member with their name or payroll number so that the items can be easily identifiable.
 - a. A secondary identification process can be the Bar code tag that is affixed to each issued piece of City of Houston PPE.

References

1. Houston Fire Department, FY2013 – 2015 Strategic Plan; page 6
2. District Chief Robert Garcia., personal interview. Houston Fire Department – Emergency Response Command - HFD Staffing Office
3. The Houston Fire Department., from <<http://www.houstontx.gov/fire/>>
4. The Weather Channel., “Houston Weather”, from <<http://www.weather.com/>>
5. Wunderground., “Houston Weather”, from <<http://www.wunderground.com/>>
6. Google Map., (6876-6884 Southwest Fwy), from <<http://www.google.com/>>
7. Houston Chronicle., “Houston TranStar photograph”, from <<http://www.chron.com>>
8. Houston Chronicle., <<http://www.chron.com>>
9. Christopher Beasley., CFI-Deputy State Fire Marshal, Texas State Fire Marshal’s Office, correspondence document, Building construction - 09-12-2013.
10. City of Houston Public Works and Engineering – Building Permit Department - department documents generated from archives presented during meeting held at Permitting office; 1002 Washington Ave. Houston Texas on *June 13, 2013*.
11. NFPA 220, “Standard on Types of Building Construction,” *National Fire Protection Agency*, Quincy MA, 2012.
12. Huitt-Zollars, Inc., “Structural Evaluation of Wooden Roof Truss Associated with BHOJAN Restaurant Roof Collapse”, *September 9, 2013*.
13. Diagram; Overview of Common Truss Construction – prepared and presented to HFD by Christopher W. Beasley; Senior Inspector, Deputy State Fire Marshal, CFI. Fire Safety Inspection Services. *February 8, 2014*.
14. Interviews and Statements collected from 1st alarm companies by HFD Arson investigators and investigators of the Texas State Fire Marshal’s Office, *May 31, 2014*.
15. Fire Chief Phil Boriskie., “**10 Rules of Survival**”-**Size-up**, Houston Fire Department; Bulletin No. 37”, *November 5, 2009*.
16. TDI TEXAS.GOV., firefighter Fatality Investigations in Texas, from <<http://www.tid.texas.gov/fire/fmloddiinvesti.html>>
17. Texas Commission on Fire Protection., Government Code Title 4. Executive Branch SUBTITLE B. Law Enforcement and Public Protection SUBCHAPTER A. General provisions. from <<http://www.statutes.legis.state.tx.us/Docs/GV/htm/GV.419.htm>>
18. Harris County Medical Examiner’s., Firefighters Autopsy Protocol; U.S. Fire Administration (USFA), revision *September 2007*.
19. Centers for Disease Control and Prevention., National Institute of Occupational Safety and Health. from <<http://www.cdc.gov/niosh/fire/implweb.html>>

20. Fire Chief Terry Garrison., “**Recovery Process**”, - A MESSAGE FROM THE CHIEF, Houston Fire Department, *June 20, 2013*.
21. Executive Assistant Fire Chief Richard Mann., “**Recovery Committee Update**”, Houston Fire Department; Special Bulletin No. 92 , *July 8, 2013*
22. Fire Chief Terry Garrison., “**Southwest Inn Fire – Recovery Committee Update**” Houston Fire Department; Special Bulletin No. 148, *October 25, 2013*.
23. United States Department of Labor, Occupational Safety and Health Administration, Firefighters’ Two-in/Two-out Regulation, from
<<http://www.iaff.org/hs/PDF/2in2out.pdf>>
24. Agreement between the City of Houston, Texas and Houston Professional Fire Fighters Association, Local 341 International Association of Fire Fighters; 2009 through 2010 –Article 3 (Recognition); page 9; and or - Section 174.003, Texas Local Government Code, from
<<http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.174.htm>>
25. Executive Assistant Fire Chief Richard Mann., Houston Fire Department; Emergency Response Command News and Information, *October 2013*.
26. Executive Assistant Fire Chief Richard Mann., “**Rapid Intervention Team (RIT) Pack Standardization**”, Houston Fire Department; Special Bulletin No. 12 , *January 23, 2014*
27. District Chief Jeffrey Cook., Houston Fire Department, Emergency Response – Special Projects; Interdepartmental Memorandum; HFD District Chief’s, *March 2014*.
28. Executive Assistant Fire Chief Richard Mann., Houston Fire Department; Emergency Response Command - News and Information, *April 2014*.
29. Friendswood Reporter News
<<http://friendswood.myreporternews.com/author/jim/>>

Final word

an “Eternal Flame”



On Saturday March 1, 2014, members of the Friendswood Volunteer Fire Department traveled to Houston to present an “Eternal Flame” sculpture to the Houston Fire Department in honor of the four firemen who died in the Houston hotel fire May 31, 2013.

The hand-crafted wood sculpture was created by Ross Benson – a retired oil equipment company owner, honorary FVFD member and cancer survivor – whose own 3-year-old granddaughter lost her battle with Leukemia in 2009.

Benson’s original woodcarving, “Eternal Flame,” was done in her memory.

The new “Eternal Flame” will be located in the entry of the HFD Jahnke Training Center immediately south of Hobby Airport, where it will be seen by all new recruits and all trainees from around the world. [29]

The Houston Fire Department would like to thank all of those who have given so much all across the Houston Metropolitan area. The outpouring of gifts, and continued prayer will not be forgotten. It is only through your help and support that reminds us why we work so hard.