EVALUATING COMPLIANCE WITH NFPA 1710

EXECUTIVE PLANNING

By: Vincent J. Werner
Garland Fire Department
Garland, Texas

An applied research project submitted to the National Fire Academy as part of the Executive Fire Officer Program

February 15, 2002

ABSTRACT

This research project examined National Fire Protection Association (NFPA) Standard 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments,* as it pertained to the Garland Fire Department. The problem was that Garland had not determined if it met the assignment and staffing objectives of 1710. The purpose of this research was to determine Garland's degree of compliance with those objectives and address any shortfalls. Evaluative research was used to answer the following questions:

1. Did the Garland Fire Department meet NFPA 1710 response time objectives for fire and emergency medical incidents?

2. Did the Garland Fire Department meet NFPA 1710 assignment staffing objectives?

3. What actions could the Garland Fire Department take if such compliance was lacking?

The procedures consisted of a literature review, three interviews, a survey of suburban fire departments in Dallas County, and a statistical analysis of department response times for fire and medical incidents.

The results established that Garland met 1710's response time objectives for advanced life support (ALS) incidents but did not for fire incidents and first responders in medical incidents. Garland met 1710 assignment staffing objectives for initial full alarm assignments and ALS incidents. It did not meet 1710's objective of four on-duty personnel staffing every engine and truck company. The results concluded that Garland should utilize a 1996 needs assessment, expand use of mutual aid, and seek federal financing in hiring firefighters.

Recommendations included implementation of an 11-station concept, a long-term commitment by Garland's City Council to hire additional firefighters, an upgrade of the computer dispatch system, and securing federal funding to hire more firefighters. The project also proposed that key department personnel improve their proficiency in statistical analysis.

TABLE OF CONTENTS

PAGE

INTRODUCTION

In this country, fire protection is primarily a function of local government. Because of that single factor, the issue of how much fire protection is to be provided is left in the hands of a wide variety of skilled and unskilled individuals. City Councils, Boards of Fire Protection Districts, and other bodies of government spend a great deal of time wrestling over the question of just how much money to spend on protection. Lacking an adequate measuring stick for what the fire department is supposed to be doing, they end up focusing almost all of their attention on the input (Coleman, 1998). At least that was the common wisdom prior to the emergence of National Fire Protection Standard (NFPA) 1710. In July 2001, the NFPA Standards Council voted to issue NFPA 1710 as a standard (International Association of Fire Chiefs [IAFC], 2001).

The problem was that the Garland Fire Department had not determined if it met the requirements of NFPA 1710, as it pertained to staffing assignments and response times. The purpose of this research was to determine Garland's existing degree of compliance with NFPA 1710 as it pertained to those areas. Evaluative research was used to compare the specific requirements of NFPA 1710 to staffing and response times of the Garland Fire Department. The evaluative research method was used to answer the following questions:

1. Did the Garland Fire Department meet NFPA 1710 response time objectives for fire and emergency medical incidents?

2. Did the Garland Fire Department meet NFPA 1710 assignment staffing objectives?

3. What actions could the Garland Fire Department take if such compliance was lacking?

BACKGROUND AND SIGNIFICANCE

The City of Garland, located northeast of Dallas, has a population of 220,000. The city measures 58 square miles and has a combination of light to heavy industry along with its residential areas. The department currently operates nine fire stations, and has nine engine companies, seven Mobile Intensive Care Units (MICU's), four truck companies, and 230 uniformed personnel. Garland's original volunteer fire department was organized on October 22, 1915, with 46 men and was equipped with a two-wheel handcart for extinguishing house fires. The tanks and hoses were later moved to the first motorized apparatus, a 1916 Ford Model-T chassis. Garland hired its first firefighter in 1944 and from there the department grew to 16 personnel with two fire stations in 1955, 25 firefighters and three stations in 1957, 31 firefighters in 1959, 51 firefighters and four fire stations in 1964. The staffing rose to 174 in 1982 with six fire stations (L. Corcoran, 2001). Today the department has 230 uniformed personnel at nine fire stations.

Prior to 1959, the paid firefighters worked a shift schedule of six days on duty and then one day off duty. In 1959 the department went to a two-platoon system, with each firefighter having a shift schedule of 24 hours working at the station, then being off for 24 hours, before

returning to work again. Generally there were four or five firefighters staffing every company. It was rare when a fire company responded with less than four firefighters (L. Corcoran, personal communication, November 6, 2001).

On September 4, 1966, the Garland Fire Department went to a three-platoon system. The work schedule became one of working a 24-hour shift at the station, then being off-duty for 48 hours. As the city's population grew in the 1970s and more stations were added, staffing patterns changed. The practice of four firefighters per company disappeared. The norm became three firefighters per company. It was during this time that the department also allowed the practice of two firefighters staffing an engine at a station that had another three-person company in service (L. Corcoran, personal communication, November 6, 2001). This practice continued until 1988, when a minimum staffing policy was finally created. This policy guaranteed three firefighters staffing each company. The department was authorized to call off-duty personnel to work overtime as necessary to comply with the minimum staffing level (Anderson, 1988). Reality was different. The overtime budget was never large enough to keep all fire companies fully staffed 365 days a year. Whenever the money was close to being exhausted, the remaining amount was rationed in order to reach the end of the budget year. This was accomplished by taking an engine company out of service (J. Perry, personal communication, December 4, 2001). Computerized dispatch and record keeping arrived in Garland in 1988. Up to that time all record keeping was done on paper. During this era of paper records there were no statistics maintained on response times and other related data (L. Corcoran, personal communication, November 6, 2001).

The department created its Emergency Medical Services (EMS) Division in 1977 when it assumed the responsibility for emergency medical responses. In the first few hectic months, practically anyone could be assigned to the ambulance, regardless of medical certification. Eventually, within the first year, paramedics completed training and were assigned to the ambulances. The only modification to this setup was the upgrade of Garland's ambulances to MICUs from ALS ambulances in 1992 (J. Perry, personal communication, December 4, 2001). The MICU certification was a level of EMS response higher than ALS, based upon certification of personnel and the level of service and interventions provided by those personnel (Emergency Services Act, 1989).

The fire protection environment in which the Garland Fire Department operated had undergone change as well. Much of this change dealt with the role of the NFPA and the standards it published. The standards began to move in the direction of prescribing how a fire department should operate. An early example was NFPA Standard 1500. The genesis of 1500 began in 1985 when a group of fire service and the allied professionals gathered as a NFPA technical committee and developed the *Standard on Fire Department Occupational Safety & Health*. The original focus was to develop a directive that would be a benchmark of a comprehensive safety and health program for fire departments. After two years of meetings, research and public comments, the 1500 standard was adopted by the membership. In 1992, the standard came up for revision and controversy arose over a revision that included a section on fire ground staffing. The dispute over this revision led to the International Association of Fire Fighters (IAFF) withdrawing from the NFPA. The final revision of 1500 did not include the staffing amendment (Rubin & Foley, 1993).

In 1995, the NFPA Standards Council moved forward on the development of NFPA 1200, *Standard for Organization, Operation, Deployment and Evolvement of Public Fire Protection and Emergency Medical Services*. The comments on NFPA 1200 were the most ever received by a NFPA Technical Committee. Many of the comments heard across the board were:

(1) It squeezed local control.

(2) It was too expensive.

(3) Many fire departments would have serious difficulty meeting the standard (Manning, 1997, p. 5).

Among 1200's requirements were the capability to safely initiate a primary interior attack within 10 minutes of the receipt of the alarm, including uninterrupted 400 gallons per minute (gpm) water supply for 30 minutes, stretching an initial attack line and backup line with two firefighters each, conducting ventilation with two firefighters, and designating two firefighters as a rapid intervention crew. A total of 11 to 13 firefighters would be required initially on the fire ground (Manning, 1997). After receiving more than 20,000 comments on the draft standard, the NFPA 1200 technical committee voted to return the document to the Standards Council, effectively killing it (International Association of Fire Chiefs, 2001). Perhaps the major benefit of the 1200 debate was that for the first time a national benchmark had been proposed for the nation's fire departments, providing a detailed list of tasks, performance objectives, staffing, and service delivery issues (Thorp, 1997).

Garland's Fire Chief, Dan Grammer, responded to 1500's passage by requiring all officers to study the standard and analyze where Garland fell short in meeting the standard. This analysis resulted in the creation of exercise areas at the fire stations along with the purchase of quality exercise equipment for those areas. Another change was the requirement of an annual doctor's physical for firefighters including EKG, X-ray, blood work and examination. A final development was the policy of dispatching a safety officer to all structure fires. One problem did exist with the safety officer concept, as the job was delegated to a shift lieutenant known as EMS-1, whose primary job had been to supervise MICU crews (Garland Fire Department, 1996). Using a lieutenant in this position led to questions of how effective he could perform as a safety officer when confronting a superior officer over a safety issue on the fire ground. When analyzing the overall result of 1500, the department had established a precedent of attempting to comply with a national standard.

Within the nightmare that was September 11, 2001, one of the comments of the day provided more insight on staffing issues. Gary Briese, Executive Director of the IAFC, visited the Pentagon after the terrorist attack. It was his observation that the Arlington, Virginia Fire Department was hampered in its operation at the scene by its three-person crews that responded on some of its engines (G. Briese, personal communication, September 20, 2001). Another current event in Houston added to the debate in Texas. Veteran Houston firefighter, Captain Jay P. Jahnke died on October 3, 2001, during a six-alarm fire at a Houston apartment complex. Jahnke's company consisted of only two firefighters beside himself. This event, in light of 1710's adoption earlier that year, focused questions in the state as to the safety of dispatching companies to fires with only three personnel ("Houston Death," 2001).

This research project was related to an applied strategic planning model utilized by the instructors of the *Executive Planning* course at the National Fire Academy. At the time of the course in August 2001, the program chair was revising much of the course content in the notebook. Thus the instructors made use of handouts and other articles. One of the class resources was *Applied Strategic Planning: An Overview* by Leonard Goodstein, Timothy Nolan, and J. William Pfeiffer. This resource contained an applied strategic planning model developed by the authors. Two aspects of that model bore particular importance for this research project. The first concept was a performance audit. After an ideal future had been determined, a planning team audited its organization for its present performance. A second factor of the model that came into play was gap analysis. This envisioned a comparison with the information generated during the performance audit with what was required for achieving the strategic plan (Goodstein, Nolan, and Pfeiffer, 1992). Any strategy to implement 1710 in Garland could benefit from the use of this model, including a performance audit and a gap analysis. NFPA 1710 also envisioned implementation as a multi-year process as the first quadrennial report about implementation wouldn't be due to the authority having jurisdiction (AHJ) until 2006 (2001). One of the basic tenets emphasized in the lectures of *Executive Planning* was to follow steps in a process to accomplish some goal. Compliance with 1710 might indeed involve steps of a long process of implementation for the Garland Fire Department.

LITERATURE REVIEW

Unit Response Time Standards

NFPA 1710 established the following time objectives for fire response:

1. Turnout time of one minute.

2. Four minutes or less for the arrival of the first arriving engine company at a fire suppression incident and/or eight minutes or less for the deployment of a full first alarm assignment at a fire suppression incident.

3. A performance objective of not less than 90 percent for the achievement of either response time objective (Sec. 4.1.2.1, 2001).

The and/or construction of the fire response times allowed for those instances when the first due engine might not be available when a call arrived. In that case the intent of the standard would be met by putting all first alarm units on scene before eight minutes (IAFC, 2001).

NFPA 1710 established the following response time objectives for EMS response:

1. Turnout time of one minute.

2. Four minutes or less for the arrival of a unit with first responder or higher level capability.

3. Eight minutes or less for the arrival of an advanced life support unit.

4. Performance objective of not less than 90 percent for each response time (Sec.4.1.2.1, 2001).

In the case of EMS response times there was no and/or construction in the standard language as with the time objectives for fire response. The reasoning behind this was due in part to the recommendations of medical organizations such as the American Heart Association and the Journal of the American Medical Association (IAFC, 2001). Additional requirements that pertained to both response time objectives were evaluations and reports that dealt with the response times. The fire department was required to collect and evaluate the data of response times, and then address any areas that did not meet 1710 in a quadrennial report.

Garland Fire Department Directives and Standard Operating Procedures (SOP's) that addressed response times were also reviewed in the literature search. Directive 212, *Level of Demand,* determined a response time based on a gpm rating for the "largest" fire that might occur in the building. For example, a building with a rating in the gpm category of 0-1500 required one engine within five minutes and a second engine, truck, ambulance, and Chief Officer within 10 minutes. This was required 90 percent of the time (Garland Fire Department, 1990). Actual practice was something else. The directive was never implemented although it was also never repealed. Its existence was on paper only (J. Perry, personal communication, December 4, 2001). Directive 203, *Driving*, contained paragraphs that worked against 1710 time objectives. One of its paragraphs stressed reducing to code one on fire response if the first unit checked on scene with nothing showing (Garland Fire Department, 1999). The rationale behind this paragraph was that there was considerable concern over the possibility of Garland apparatus colliding with private vehicles that did not see the emergency vehicles in operation. The belief was that accidents were more likely than a delayed arrival at a fire causing a problem (J. Perry, personal communication, December 4, 2001).

In 1999 the department published its first directive that directly addressed response times. Directive 237, *Response Time Goals*, set a response time goal of five minutes. This time started at the moment that the call was dispatched to the fire station and ended when a unit checked on scene. It also called for computing an average response time from all incidents within a given year (Garland Fire Department, 1999). It made no commitment as to analysis of response times or of any corrective action if the response goal was not met. SOP 227, *Response Standards,* dealt with the area of enroute times. 1710 referred to this as turnout time. Depending on whether the donning of protective clothing was necessary on the call, it set enroute times of 45 seconds to 1 minute during the daytime, and 1 minute 30 seconds at nighttime. To establish consistency, the SOP mandated that the enroute time began when the dispatcher finished the initial voice message and ended when the apparatus moved out of the station (Garland Fire Department, 1998).

Staffing Requirements

NFPA 1710 is about numbers. The standard established the following staffing requirements for the initial full alarm assignment:

1. Incident Commander.
2. Minimum 400 gpm uninterrupted water supply with pump operator.
3. Two hand lines with combined minimum 300 gpm flow with minimum of two personnel on each line.
4. One support person for each attack and backup line.
5. Minimum of one search & rescue team with minimum of two personnel.
6. Minimum of one ventilation team with a minimum of two personnel.
7. An Initial Rapid Intervention Crew (IRIC) with a minimum of two personnel (Sec. 5.2.3.2.2, 2001).

If an aerial was put into operation, one additional person had to maintain primary control of the turntable at all times. If the incident commander had a staff aide dedicated to him, the initial staffing increased by one. A study of these requirements necessitated a level of staffing of anywhere from 14 to 16 depending on circumstances. There was an additional requirement of a safety officer and adding two more personnel to the IRIC if additional alarms were called (IAFC, 2001).

1710 called for every engine and truck company to be staffed with four firefighters. These minimums were increased in the standard to five or six firefighters if the jurisdiction contained tactical hazards, high hazard occupancies, and other pertinent factors. Of particular relevance was the definition of a company, which allowed for a company to respond in multiple vehicles (2001). This was used to counter arguments against 1710 that it mandated four firefighters on every piece of equipment.

However, opponents still cited the fact that 1710 could require fire chiefs to modify elements of their operations and change dispatch procedures so as to ensure two vehicles were dispatched at the same time when that might not be the present case (IAFC, 2001).

There was no doubt that the company definition allowed fire chiefs an alternative if they did not want four personnel on each piece of equipment. But this definition cannot be interpreted as a way to lessen economic costs. A department would still face the requirement of dispatching a certain number of firefighters to the initial alarm. If a city did not want four on an engine, they would have to find more vehicles to transport the firefighters. Faced dispatching 14-16 firefighters to the first alarm, and having only so many vehicles in a fleet, most authors agreed with Hal Bruno's observation. In practical terms, a minimum of four firefighters would be needed on most truck and engine companies in order to meet the standard (Bruno, 2001a).

NFPA 1710 deferred to local regulation as to the composition and training of Basic Life Support (BLS) and ALS units. It dictated that personnel deployed to an ALS emergency response include a minimum of two members trained at the emergency medical technician (EMT)-basic level and two members trained at the emergency medical technician-paramedic level (2001). Garland Fire Department Directive 143, *Staffing Policy,* addressed staffing the department's fire stations as follows:

1. Single engine stations, with no ambulance assigned, staffed with four firefighters.

2. All other engine companies staffed with three firefighters each.

3. All truck companies staffed with three firefighters each.

4. All ambulances staffed with two paramedics each.

5. A Battalion Chief with a Command Technician.

6. A Lieutenant as EMS-1.

7. At least two paramedics at Stations 8 & 9 (Sec.143.2, 2001c).

It established 57 firefighters as the minimum total staffing for a battalion. When the required number was not available, off-duty personnel were called to maintain the minimum staffing level (2001c). The staffing of at least two paramedics at Stations 8 and 9 bore special comment. These two engines, located at single engine stations, were staffed with four firefighters. Second, they were established as ALS engines. They maintained this ALS capability in the EMS equipment they carried. Directive 610, *Expanding Ambulance Area*, mandated dispatching only an ambulance to minor medical emergencies and an engine and an ambulance to major medical emergencies. The minor medical emergencies were a small category; mainly consisting of broken limbs, minor illnesses of a general nature, and obstetrics. If the minor emergency occurred in either District 8 or 9, the ALS engine would be dispatched first to assess the patient. If transport capability were necessary, the engine would call for the nearest ambulance (Garland Fire Department, 2001). A final note was that all other engines and truck companies carried automatic external defibrillators, and all firefighters in the Operations Division had to be certified as either paramedics or EMT's (Garland Fire Department, 2001a). It must again be noted that the overtime budget was never large enough to sustain the minimum staffing for an entire year. Every year at some point, engine(s) were taken out of service due to staffing shortages and the lack of overtime money (J. Perry, personal communication, December 4, 2001).

As to the initial alarm assignments for a house fire, Garland dispatched two engines, one truck company, one ambulance, one engine or truck company as the IRIC, the EMS-1, and the Battalion Chief with his aide (2001b). This provided a minimum of 17 firefighters on the initial alarm assignment, and could be higher if the engines from District 8 or 9 were involved in the assignment.

Compliance with 1710

The standard offered several avenues for obtaining compliance with its requirements. One of those avenues had already been mentioned, that of the definition of a company that allowed the members of the company to respond in multiple vehicles. 1710 also offered the concept of equivalency. Paragraph 1.3 of the standard stated that nothing in the standard was intended to prohibit the use of systems, methods, or approaches of equivalent or superior performance to those prescribed in the standard. Finally, 1710 allowed meeting its objectives through mutual aid agreements with other departments, although the standard set requirements for any mutual aid agreements that were used to reach 1710 compliance (2001).

Compliance with 1710 involved political and economic equations as well. The National League of Cities and the International City/County Management Association continued to oppose 1710 as they had during the approval process. The primary reason city management was likely to give for its lack of support was that the new standard required spending beyond what cities were prepared to budget. The IAFF advised public pressure is brought to bear upon elected city officials to lend their support. It also emphasized the importance of educating public officials and building public support for implementation. IAFF felt one of the best arguments for implementation was that as other jurisdictions began to accept the standard, other departments who didn't were in danger of appearing dated or lacking in some respect ("IAFF Developing Plan," 2001).

As to the use of equivalency, one particular model uncovered in the literature search was the *Oregon Fire Resource Deployment Standard*. It called for a methodology to determine staffing. Critical task analysis evaluated the number of personnel needed to safely and effectively perform specific tasks within the scope of the service level objectives and SOP's defined by the AHJ. The concentration of fixed and mobile resources would be defined by an adopted deployment standard based on this analysis. It also called for community risk assessment as part of the deployment standard process (2001).

Garland had employed mutual aid sparingly. In return for the use of Dallas Fire Department (DFD) Training Facilities and the DFD Hazardous Materials Response Team, Garland responded to all fire and medical emergencies at a lake that was within Garland city limits but belonged to the city of Dallas (D. Grammer, personal communication, October 11, 2001). The agreement with Richardson was executed in 1995. Richardson provided one engine company to respond to structure fires in northwest Garland while Garland would provide a MICU to respond to an area of northeast Richardson (D. Grammer, personal communication, October 11, 2001).

Staffing had also been a subject of study in Garland itself. In 1996 Chief Grammer published the *Garland Fire Department Needs Analysis* for Garland's City Manager. The study sought to change the basic paradigm that a fire department's basic function was fire-related. Instead it focused on Garland's EMS response, based on the fact that 75 percent of department incidents were EMS-related (1996). Grammer focused on the level of service in regards to one of the most serious medical calls encountered, that of cardiac arrest. More specifically, he tied response to the brain viability of a person in complete arrest. At four minutes after arrest, brain

damage began, and at six minutes, irreversible brain damage had occurred. Therefore, the most beneficial department response would be one that allowed firefighters on a MICU, ALS engine, or BLS engine with an AED to reach a person within four minutes of suffering an arrest (1996).

An analysis tool utilized in this study was a computer software program, *Flame: Fire Station Location and Mapping Environment* (*FLAME*). The software provided graphic illustrations of the effects on response times by such acts as placing additional apparatus in service, varying the number of apparatus in a new station, relocating an old fire station, locating a new fire station, and effecting a new mutual aid agreement (Bode Research Group, 1994). In addition to the software, Chief Grammer made the following assumptions in order to meet the four-minute response time. There would be a 45 second recognition time, where another person recognized the medical emergency and called 911. There was a 45 second dispatch time, and a 2 minute 30 second travel time. It was determined that to meet these results, Garland needed 41 fire stations, an additional 417 firefighters, and an additional 28 fire engines (1996). These findings never received serious consideration because of the prohibitive financial costs associated with them. Chief Grammer continued his experimentation with *FLAME* and finally developed what was informally called the 11-station concept.

This dispensed with the recognition time and dispatch time and simply depended on no more than five minutes lapsing between the arrest and the arrival of the department. It required 11 fire stations, four beyond what was then the current seven, and 16 additional firefighters. It was estimated that the five-minute response could be achieved 90 percent of the time. It also included the transfer of engines from two company stations into the four new stations by themselves. That was a bow to economics, as there would no need to buy additional vehicles. Chief Grammer intended to maintain the policy of four firefighters staffing engines at single company fire stations by hiring the 16 firefighters. In calculating the number of firefighters needed to transform a three-person company into a four-person company, Chief Grammer invoked the use of a numerical staffing factor of 1.26. Simply hiring 3 additional firefighters to put a fourth firefighters on each of the three shifts' three-person crew would not account for sick time and vacation used by firefighters. Grammer used the 1.26 factor to multiply the basic number to get the actual number needed. For example, 3 firefighters X 1.26 = 3.78 = 4 firefighters needed to change a three-person to a four-person company on all three shifts (1996).

The study, produced in 1996, could be admired for its proactive thinking. It predated much of the public debate over NFPA 1200, much less 1710. It was bold in its concept of focusing on EMS response in place of the traditional fire response. There were areas where one could disagree. One weakness was that a delay in recognition of a medical emergency could seriously hamper meeting the five-minute response. A witness, if one existed, might wait 30 seconds or even 2 minutes. However, in attempting to meet the five-minute response on cardiac arrests, Chief Grammer had devised a possible framework for meeting 1710. If a system could be developed where it consistently put an engine on scene of a medical emergency in five minutes, the same would hold true for fire responses. In 1997 Station 8 opened. In 2001 Station 9 opened. Their locations were determined by the 11-station concept developed in this study. As per Directive 143, the single engines placed in Stations 8 and 9 were both staffed with four firefighters and made ALS engines. If this needs assessment was a possible blueprint for 1710 implementation, demographic changes in the city since 1996 would have to be considered.

Construction of a state highway in northern Garland in 1999 had generated a building boom in the northern part of the city that was unforeseen in the study. At the time of the study, the highway was at least 15 years from completion. Changing the highway to a toll way pushed the starting date up earlier than expected. If the study were to be of value, newer analysis with the *FLAME* software would be required. Another weakness of the study was that it did not modify Directive 143. The study left 7 of 11 stations staffed by multiple units, and under 143, assigned three firefighters to each of the six engines and three truck companies stationed in those seven stations (1996).

Others argued against adoption of 1710. One such author was Ken Oriole. He felt that departments should use the deployment standard to do long range planning. He quoted John Rukima, Director of Dashe County (NC) Department of Public Safety, "It's never a good idea to adopt a standard because you're liable to it." He also advocated the position taken by Nick Russo, Chief of Hull (MA) Fire Rescue, that the best strategy was to use the four years after 1710's adoption to collect data under 1710's mandate and use it to show elected officials where their fire department fell short of the standard. They could tell the elected officials how much it would cost to fix the problem, with the city officials left to make the budget decisions on implementation (Oriole, 2001).

Against the background of any deployment standard adoption stood one large obstacle. That obstacle was economics. In Texas there was no state or municipal income taxes. One of the largest revenue streams a city depended upon was the sales tax allocation it received from the state. An analysis of recent allocations showed Garland to be at a significant economic disadvantage to its sister suburbs. In 1999 Garland received $17 million in sales tax allocations. In 2000 the figure was $18.3 million, which then decreased to a projected $18.1 million in 2001. Neighboring Plano, a suburb with roughly the same population had, over the same period of time, allocations of $40.4 million, $47.3 million, and $47.5 million, respectively. Another neighbor, Richardson, had only one third the population of Garland, yet Richardson's figures over the same period were $22.7 million, $24.5 million, and $23.2 million ("Allocation Historical Summary," 2002, pp. 1-2). The implications of the data were clear. Garland started out at a significant financial disadvantage, vis-à-vis its sister suburbs, when it sought to pay for city services.

This economic picture sharpened in light of the monetary costs of each new firefighter position. Based on computations by the department's budget specialist, each additional firefighter cost the city $55,000 (D. Major, personal communication, December 12, 2001). Other sources reviewed in this research have already alluded to economics as being one of the reasons against 1710 adoption. Fierce opposition continued to come to 1710 from organizations representing mayors, city managers, county executives, and other local government officials. They saw 1710 as a threat to home rule and an "unfunded mandate" that would force them to spend money they didn't have to hire firefighters in order to be in compliance with the standard (Bruno, 2001c). With Garland's poor sales tax base, that argument was a powerful one. Opposition continued from other directions. Local government officials charged 1710 infringed on the right and responsibility of local elected officials to set their own standards for fire and emergency service protection. They claimed that the "one size fits all" national standard was unworkable and not supported by scientific data. Perhaps their greatest fear was that failure to

comply would make them vulnerable to lawsuits after serious fires (Bruno, 2001b). Included in this opposition were such groups as National League of Cities, the U.S. Conference of Mayors, the International City/County Management Association, National Public Employer Labor Relations Association, International Personnel Management Association, Washington State Association of Fire Chiefs, and the National Volunteer Fire Council (Fletcher, 2001).

This fear of legal liability was not limited to this group. Rukavina gave this concern some measure of support. He felt that a community that did not operate according to 1710 assumed some additional legal risk. In any negligence lawsuit against a city, part of the legal battle would involve defining what a "reasonable" fire officer, fire chief, or community would have done. In following this path, lawyers would ultimately look to the fire service at large to see if there were general agreement on relevant standards of behavior. NFPA standards would be among those cited as representative of a fire service standard of behavior. So if a local fire department had no standard or differed from 1710, a litigant could argue that a relevant NFPA standard should be admitted into evidence so the jury could "benchmark" the fire department's act or omission against the relevant NFPA standard to help it make a decision (2001).

The literature search considered other sources of financing. One such possibility was the federal government. In October of 2001, Senate Bill 1617 was introduced to the public as the "Staffing for Adequate Fire and Emergency Response (SAFER) Fire Fighter Act." Under its provisions, if enacted, SAFER provided the funds for municipalities to hire additional fire service personnel. Federal money would pay up to 75 percent or $30,000 of the salary and benefits of new firefighters for a maximum period of three years. Communities would be required to fund that firefighter for a fourth year. It was claimed that the program could pay for as many as 75,000 new firefighters. The program, modeled after the federal community policing initiative, would require $1 billion annually for seven years ("Bill Would Pay," 2001). There were of course questions that arose with this solution. The most obvious was that the bill would have to pass both houses of Congress. In light of September 11, 2001, such passage might be more likely than not. However, there was yet another question that Garland faced. Could Garland, in light of its economic position, have afforded any federally funded firefighters after the federal money was gone?

Literature Review Summary

The literature review provided the basic framework for the three research questions. These included 1710's time and staffing objectives as well as Garland's directives and SOPs that dealt with these areas. The literature that was reviewed for the third research question focused on possible solutions to 1710 compliance but also on the feasibility of adopting 1710, the liabilities of ignoring 1710, and the economic questions that arose from 1710.

1710 established the time objectives for both fire and EMS response. In the case of fire it was an either/or proposition as to first unit arriving or the last unit arriving. On the EMS side there was no such discretion (2001). Garland Fire Department Directive 212 set response times as a function of gpm (1990). Directive 203 stressed reductions to Code 1 in size-ups of nothing showing (1996). Directive 237 set a response time goal of 5 minutes without much elaboration

beyond that goal (1999). Garland Fire Department SOP 227 determined enroute times based on the time of day (1998).

Concerning the issue of staffing, 1710 was reviewed to give the initial alarm assignment and their functions. It also stated that four firefighters were necessary on each engine and truck company. For an ALS response it mandated a minimum of two paramedics and two EMT-basics (2001). Garland Fire Department Directive 143 defined the staffing levels for engines, ambulances, and trucks. It defined Garland's concept of an ALS engine, and allowed overtime to be used, as needed to maintain the staffing outline in the directive (2001c). Perry's observation though served as a reminder that the overtime stipulation was sometimes more paper tiger than a hard-nosed reality (Personal communication, December 4, 2001). Directive 610 defined major and minor medical emergencies (1993). Garland's dispatch policy was reviewed to obtain the initial alarm assignment for house fires (Garland Fire Department, 2001b).

Research Question Number Three generated comments that encompassed various aspects of the adoption question. The question itself, by the nature of its format, assumed adoption was a positive, beneficial act. Some of the literature questioned adoption, whether from a philosophical point of view or a reality-based economic point of view. NFPA 1710 offered some leeway into implementation by its definition of a company, by the use of the term of equivalency, and by its allowance of mutual aid to meet certain objectives (2001). An example of equivalency was explored with the *Oregon Fire Resource Deployment Standard* (2001).

Of particular importance was the needs assessment study undertaken by Chief Grammer in 1996. It focused on EMS response, not fire response. Its analysis gave way to the concept of 11 fire stations in Garland, whose existence was based on the analysis of EMS response (1996). A side product of this report was that its basic findings and assumptions could form the basis of a solution to 1710 compliance. Some of the literature moved into the more subjective field of the wisdom of using 1710 at all. IAFF admitted that cost would be the reason behind a lot of opposition ("IAFF Developing Plan," 2001). Oriole quoted others as to the wisdom of actually adopting the standard (2001). Bruno made reference to the opposition to the standard by several local government bodies (2001b). Rukavina pointed out possible legal traps with 1710 (2001). Sales tax reports generated by the State Comptroller painted a dismal economic picture for Garland ("Allocation Historical Summary," 2002, pp. 1-2). Finally, Senate Bill 1617 provided an insight into what might become a more active federal role in funding the local fire services in the United States ("Bill Would Pay," 2001).

PROCEDURES

Definition of Terms

Command Technician. Firefighter assigned to a shift Battalion Chief in the capacity of an assistant for such matters as incident command at emergencies and the routine management of the battalion (Garland Fire Department, Sec. 143.2, 2001).

International Association of Fire Chiefs (IAFC). Organization of fire officers of the rank of chief throughout the United States and other countries. Purpose is to further the professional advancement of the fire service (Klinoff, 1997, p. 105).

International Association of Fire Fighters (IAFF). The largest union organization in the Northern Hemisphere, which represents firefighters in the United States and Canada (Klinoff, 1997, p. 105).

National Fire Protection Association (NFPA). Private organization whose members come from the fire service and private organizations. The NFPA is recognized for its efforts in developing standards on firefighter safety, equipment, and professional standards (Klinoff, 1997, p. 107).

Mobile Intensive Care Unit (MICU). A vehicle that is designed for transporting the sick or injured and that meets the requirements of the advanced life support vehicle and has sufficient equipment and supplies to provide cardiac monitoring, defibrillation, cardioversion, drug therapy, and two-way communication (Emergency Services Act, Sec. 773.043, 1989).

Emergency Medical Technician (EMT). An individual who is certified by the state as minimally proficient to perform emergency prehospital care that is necessary for basic life support and that includes the control of hemorrhaging and cardiopulmonary resuscitation (Emergency Services Act, Sec. 773.047, 1989).

Emergency Medical Technician-Paramedic (EMT-P). An individual who is certified by the state as minimally proficient to provide emergency prehospital care or interfacility care by providing advanced life support that includes initiation and maintenance under medical supervision of certain procedures, including intravenous therapy, endotrachael or esophageal intubation or both, electric cardiac defibrillation or cardioversion, and drug therapy (Emergency Services Act, Sec. 773.049, 1989).

Research Methodology

This research project employed evaluative research to examine the Garland Fire Department's degree of compliance with the response time and staffing objectives of NFPA 1710. The literature search included a review of fire journals and magazines at the Learning Resource Center (LRC) of the National Fire Academy (NFA) in Emmitsburg, Maryland. This review was supplemented by similar literature at the training library of the Garland Fire Department. Additional discovery was accomplished through analysis of those department directives and SOPs that dealt with the topics addressed by 1710. A copy of NFPA 1710 was copied from the department's CD-ROM library for reference, and a copy of a 1710 implementation guide was downloaded off the Web site of the IAFC. Sales tax data was downloaded from the Texas' State Comptroller's Web site.

Another phase of the research effort was composed of three interviews conducted for the project. The first interview was carried out with Cortez Lawrence, Director of the Auburn, Alabama Department of Public Safety. Chief Lawrence's selection was due to two factors. He was an instructor in the *Executive Planning* class which the researcher attended in August, 2001. Second, he was a member of the NFPA 1710 Technical Committee. The interview took place on August 14, 2001 in a classroom on the campus of the NFA. The interview lasted about 20 minutes as Chief Lawrence gave lengthy responses to two questions:

1. What is your general view of NFPA 1710?

2. Why did you oppose 1710's adoption?

His interview was sought because as a member of the Committee, he was knowledgeable about the thought processes and deliberations that shaped the final document. Such insights could prove valuable in formulating a strategy in lobbying Garland's City Council to support implementation of 1710 or to design an equivalent system based on Chief Lawrence's criticisms.

The other two interviews involved retired Garland firefighters. Leonard Corcoran, a retired Lieutenant, was interviewed in the office of the researcher on November 6, 2001 for about one hour. There were no interview questions per se. Rather Lieutenant Corcoran was asked to recount the history of the Garland Fire Department through his personal memories and the scrapbooks he kept which detailed much of Garland's history from about 1915 to the 1990's. He was an invaluable source for the history of the departments' staffing polices, which were unwritten well into the eighties. The third and final interview involved retired Battalion Chief Jerry Perry. He was interviewed at his home in Garland for about one hour on December 4, 2001. His first task was to confirm the recollections of Lieutenant Corcoran. He was then asked three specific questions:

1. Why was there seeming emphasis on reduction to code one in Directive 203?

2. What was the impact of Directive 212?

3. How well did Directive 143 work in actual practice?

His answers were sought to these questions because he was a Captain and Battalion Chief when the directives were drafted and he was aware of the institutional history involved in their development.

Statistical analysis of department response times was another component of the research. The period of time selected for analysis was October 1, 2000 to September 30, 2001, which coincided with Garland's fiscal budget year. This part of the research ran into difficulties in collecting the necessary data for analysis. These difficulties will be reviewed in detail later in this project. For structure fire incidents, all 219 responses in the selected time period were reviewed. Due to software problems, the procedure had to be developed of printing the report, taking the dispatch time, adding one minute for turnout time, then subtracting that time from the scene arrival time to obtain a response time. The response times from each incident were

initially recorded in Excel spreadsheets. The 219 incidents were then ranked on another spreadsheet to determine in which incidents the department met the 1710 standard of a 4-minute response for the first arriving company. Those results are found in Table A1 of Appendix A. The next step was to examine those incidents that did not meet the 4-minute standard, and determine which of those met the 8-minute standard for the last arriving unit of the initial alarm. These results were recorded in Table A2. A final total was then tabulated of all fire response times that met either the 4- or 8-minute standards of 1710. In those instances where the first unit on scene disregarded all other units enroute, the incident was not considered in Table A2.

The analysis of EMS response times presented a greater challenge due to the fact that in the time period of October 1, 2000 to September 30, 2001, there were 9,733 EMS incidents to which the Garland Fire Department responded. It was necessary to select a random sampling of the EMS incidents for study. The seventh edition of *Practical Research* by Paul Leedy and Jeanne Ormrod guided the research in sample selection. The sample size selected for such a large body of data was 400 (Leedy & Ormrod, 2001). Each of the 12 months was included so as to ensure a more representative sample. A group of 34 medical incidents would be selected from each month to obtain a total of 408, which met the need for a sample group of 400. The actual process of selecting the monthly samples was derived from page 212 of *Practical Research* and the random numbers in Table 9.2 of *Practical Research*. Entry numbers were found for each month in the table by the use of dollar bills taken from the researcher's wallet. The first two digits of each bill's serial number would be the entry numbers. For each month a coin was flipped to determine which number was the horizontal digit and which number was the vertical digit. Once that was determined for each month, the digital block location was established in Table 9.2. The selection started in the upper left-hand digits in the designated block and worked downward through the column in the rest of the table until 34 numbers had been selected for that month (Leedy & Ormrod, 2001). Once the numbers were selected, they were matched with the corresponding EMS incident for that month. For example, if 052 were selected from the table, then the 52nd incident for that month was selected for response time analysis. As with fire responses, each individual incident report had to be analyzed. The dispatch time was obtained, one minute was added for turnout time, and then that time was subtracted from the arrival time to obtain the response time for each unit.

Once there was a statistical body of 408 incidents, each response time was initially recorded on an Excel spreadsheet. It was necessary to remember that Garland had two categories of EMS response. There were the minor medical emergencies to which only a MICU was dispatched. If this minor emergency occurred in District 8 or 9, the ALS engine was initially dispatched and it would call for a MICU if transport were necessary. The other category was major medical emergencies, which dictated the response of a MICU and a BLS/ALS engine (Garland Fire Department, 1993). The MICU response times were recorded in Table B1 of Appendix B. The response times of the engines were recorded in Table B2. If only a MICU was sent on the incident, there would be no engine response time recorded in Table B2.

A final piece of the research puzzle was to survey neighboring suburban departments. The purpose of the survey was to gauge opinions of the fire departments of Garland's sister suburbs as they related to NFPA 1710. These opinions were sought due to the fact that the Dallas suburbs formally and informally benchmarked themselves to each other in such matters as

fire ground strategy, budget, and innovation. The survey audience was defined by surveying the membership of the Dallas County Fire Chiefs Association membership roster. The city of Dallas and all of the volunteer departments were excluded from the survey, leaving the suburbs of Dallas that maintained paid departments. This group numbered 12. A survey was e-mailed to each of the Chiefs of the 12 departments along with an explanation for the survey, and a request that it be returned by e-mail or fax. If a common belief emerged, it might influence the manner in which Garland would proceed with 1710. The survey was limited to three questions due to the simplicity of the survey's purpose and also to encourage a response. The return rate on the survey was 8 of 12 (66 percent). There was no follow-up reminder sent to the respondents, and this omission might have affected the return rate. Fortunately, the three cities with which Garland shared most of its city limits returned the survey. It was with these three cities that the department had the most interaction. A copy of the survey and a table of the results are contained in Appendix C of this research paper. The results can be found in Table D in the Appendix.

Assumptions and Limitations

It was assumed that all literary resources reviewed for this project were produced with objectivity and unbiased research. As to the interviews, it was assumed that all interviewees were truthful to the best of their memory. Regarding 1710's ALS staffing and response standards, it was assumed that Garland's use of MICU ambulances would take the place of the standard's ALS response, since MICU was a level of response above that of ALS in the State of Texas. Another assumption, due to the computer problems that will be detailed, was the entire one-minute for turnout time was allotted for each incident studied.

The noting of limitations for this research started with the department's computer system. The system's software as it was constituted, could not filter the response times into a format compatible with the demands of 1710. The system had several flaws. On emergency responses the dispatcher contacted the units via radio after sending out the alarm (Garland Fire Department, 2001b). The system software began tracking the response time from the moment the dispatcher contacted the unit and placed that time in the computer system. The problem was that the dispatchers didn't uniformly contact units at the same time. The dispatchers' wait for contacting the responding units could range anywhere from 30 seconds to 2 minutes 30 seconds after sending out the alarm. This variation in dispatching was due to many reasons. The dispatcher might be handling another call or there was a problem with the system, or sometimes the dispatcher simply forgot to type the times into the system (R. Knight, personal communication, November 5, 2001). Because of the disparities, the response times produced from this system contained numerous inaccuracies. This situation was exacerbated by the fact that for both fire and EMS incidents, the system could only print a report that listed the response time of the first arriving unit on scene. The system's filters could not produce the response times for any other unit arriving on scene after the first one. Although the system could produce an inaccurate response time for the first unit to arrive, it could not even identity this first unit. There was also no way to easily identify units that had been disregarded or reduced to code one response. If a second alarm was called, the system could not separate the units of the second alarm from those of the initial alarm. On each individual report, which contained several pages, the system could

not even list the units in order of arrival. The first unit on scene might be on the last page of the report. It was a frustrating, time-consuming process. All of these shortcomings forced the researcher to print every fire and EMS report that was examined for this project. Each report had to be read page by page to obtain the necessary data.

Another limitation was the painstaking process of poring over the incident reports. Every effort was made to accurately record the data from the reports, but it cannot be claimed that the transferal was without clerical error. The pace was never hurried though in an attempt to keep such errors to a minimum. A final limitation was the researcher's inexperience with statistics. The research came to depend heavily on *Practical Research* as the basis of sampling the EMS response times.

RESULTS

Research Question 1

Does the Garland Fire Department meet NFPA 1710 response time objectives for fire and emergency medical incidents?

From October 1, 2000 to September 30, 2001, the department met the objective of 1-minute turnout time and the 4- and/or 8-minute response time in 78 percent of the fire incidents (171 of 219). The final conclusion was that the department did not meet 1710's time objective of 90 percent compliance for fire response on the initial alarm.

From October 1, 2000 to September 30, 2001, the department met the objective of 1-minute turnout time and 8-minute response time for ALS units in 93 percent of the sample of medical incidents. The final conclusion was that the department met 1710's time objective of 90 percent compliance for the ALS unit response.

From October 1, 2000 to September 30, 2001, the department met the objective of 1-minute turnout time and 4-minute response time for the BLS (first responder) unit in 66 percent of the sample of medical incidents. The final conclusion was that the department did not meet 1710's time objective of 90 percent compliance for the BLS (first responder) response.

Research Question 2

Does the Garland Fire Department meet NFPA 1710 assignment staffing objectives?

As per Directive 143, the department only staffs four firefighters at single engine stations. This was only two of the eight engine companies. The four truck companies were staffed with three firefighters each. The MICU units were staffed with two paramedics each (Garland Fire Department, 2001c). All firefighters assigned to engine or truck companies, who were not paramedics, were certified as EMT's (Garland Fire Department, 2001a). On the initial response to a fire alarm, Garland sent two engines, one truck company, one IRIC, one MICU, the EMS-1

Lieutenant, and a Battalion Chief with a command technician (Garland Fire Department, 2001b). At a minimum this totaled 17 firefighters. On responses to ALS medical emergencies, the department sent one MICU with two paramedics and an engine or truck company staffed by either paramedics or EMT's (Garland Fire Department, 1993).

The following conclusions were made on department staffing policies. The department did not meet the 1710 staffing objective of four firefighters assigned to engine and truck companies. The department met the staffing standard for ALS units with two paramedics assigned to an MICU. The department met the staffing standard for responding to ALS incidents with its paramedic MICU's and engine/truck companies composed of paramedics and EMT's. The department met the staffing objective for initial alarm response to fires with a minimum of 17 firefighters responding to the scene.

Research Question 3

What actions can the Garland Fire Department take if such compliance is lacking?

This question allowed for a wide variety of answers. 1710 itself allowed some options of meeting compliance through its definition of a company, the use of equivalency, and the allowance for the use of mutual aid (NFPA, 2001). Moreover, with its requirement for annual data gathering and evaluation, and the production of a quadrennial report, the standard envisioned obtaining compliance as a process over a period of time. Garland could gather and evaluate 1710 data over the next four years and use that to slowly build support among the community for a plan to achieve compliance over a period of several years.

The basis of a possible implementation plan was the needs assessment published by Chief Grammer in 1996. The basis of his research was quicker responses to cardiac arrests. He eventually developed the model of the 11-station concept where units responded to an emergency in 5 minutes or less, 90 percent of the time (1996). While this concept did not completely address the original paradigm of avoiding brain damage to patients in cardiac arrest, the 5 minute response could directly correspond to 1710's 1-minute turnout time and 4-minute response for the first unit arriving on a fire scene. There was the additional advantage of not having to purchase new apparatus. Engines transferred from two-engine stations could staff the new stations. A weakness in the plan was that the study envisioned the continuation of Directive 143 as it related to staffing. Only single-company stations would have four firefighters assigned. Under the present version of the plan, 7 of the 11 stations would still have fire companies staffed by only three firefighters as these stations contained combinations of engines, trucks, or ambulances. To completely staff all nine engine companies and four truck companies with four firefighters, a total of 36 firefighters would have to be hired, which would initially cost $1.98 million. If the needs assessment formulated a compliance plan, the costs would have to be taken into effect. Further adaptation was also necessary due to the population growth in north Garland due to highway construction. The location of existing and new stations in north Garland would have to be reconsidered in light of the population growth.

Unexpected findings occurred with the interview of Cortez Lawrence. In his response to how he generally saw NFPA 1710, he felt that the purpose of 1710 was to hire firefighters. He made particular note of the IAFF actions both in public and behind-the-scenes meetings, which he felt was heavy-handed and intimidating. One example he cited was a threat made against the representative of the International Fire Service Training Association (IFSTA). The IFSTA representative was told a no vote on adoption would result in unions opposing the use of IFSTA manuals on promotion tests (C. Lawrence, personal communication, August 14, 2001). In his response to the second question of why he opposed 1710's adoption, he referred to the lack of reliable science behind the staffing and response objectives, and the overriding of local control. He felt the fire propagation curve cited in 1710's annex was inaccurate, especially when it stated that flashover occurred at about the 8 to 10 minute mark Chief Lawrence claimed National Fire Incident Reporting System statistics showed only 5 percent of the fires being in flashover stage upon fire department arrival. 95 percent were limited to room and contents. He felt this was in conflict with the assumptions made in the standard's annex (C. Lawrence, personal communication, August 14, 2001). The depth of his opposition would not necessarily mean dropping efforts to meet 1710 objectives. Rather it allowed for the possibility that someday, reliable scientific inquiry could lead to other means of 1710 compliance through the use of equivalent systems. Given Garland's poor computer system and the city's economic weakness, such scientific inquiry was beyond Garland's capability at the moment.

The interview results of Lieutenant Corcoran will be mentioned briefly in this section. The intent of his interview was not to provide answers for the research questions, but rather to provide historical facts for the Background and Significance section of this research project. The two main points he provided was that until the seventies, Garland staffed four firefighters on every piece of equipment. As the department grew in the seventies, there were not enough new personnel hired, and the practice of shutting down engines or staffing an engine with two firefighters came into being (L. Corcoran, personal communication, November 6, 2001).

Chief Perry confirmed the recollections of Lieutenant Corcoran as to the departments' history. Of the three other questions he was asked, Chief Perry began with Directive 203 and its seeming emphasis on all units responding to a fire reducing to code one of if the first size-up was nothing-showing. He related that in Garland there had always seemed to be a large fear of apparatus accidents. There had been no single incident that had caused this mind set among the chief officers. There was a general feeling that the chances of an accident with all its attendant legal and economic problems was more likely than a reduction to code one causing a structure fire to get out of control. As to the ignorance concerning Directive 212, he explained that the directive had been the handiwork of the Department's Chief of that time who had fallen out of favor with both the firefighters and the Garland's City Council. This Chief soon left for another job. As Directive 212 was the creation of an unpopular former chief, it was simply ignored. As to the creation of overtime and minimum staffing in Directive 143, there was the expectation that the money budgeted would always be large enough. However, this calculation proved incorrect, and additionally, the use of sick time by firefighters grew in the nineties. Due to Garland's low base of sales tax allocations, the council never committed to a large increase in the overtime budget. As a result, the practice evolved of maintaining minimum staffing with the use of overtime personnel only as long as the money held out. Once it was close to exhaustion, engines were taken out of service (J. Perry, personal communication, December 4, 2001).

The survey of suburban fire departments conducted for this research revealed a general consensus on NFPA 1710. All the departments surveyed had studied 1710, and at the very least were going to use it as a planning resource. None of the chiefs who responded indicated that 1710 would be ignored. Only one department was currently meeting 1710 objectives, but two others planned on implementing the applicable provisions in the next four years. The survey was limited by the fact that only 8 of 12 departments responded. Yet in a positive note, three of the eight that responded were the suburbs with which Garland had the most interaction due to physical proximity. Of these three, the city of Plano was in compliance, Richardson planned on gaining compliance, while Mesquite only committed to using 1710 as a planning resource over the next four years. Having two nearby suburbs that had met 1710 objectives could prove to be a valuable lobbing tool with Garland city officials. As had already been mentioned, the sister suburbs of Dallas both formally and informally benchmarked against each other on a variety of issues. The IAFF alluded to this concept in one of its arguments for adoption of the standard ("IAFF Developing Plan," 2001). It was a reasonable expectation that 1710 could join these benchmarks based on the survey results, especially since no city indicated complete rejection of 1710. Such a consensus could also lead to mutual aid agreements as a temporary or permanent means of meeting 1710 objectives. Garland already had executed such an agreement with Richardson, one of Garland's neighboring suburbs. Garland provided a MICU to respond to northeast Richardson while Richardson provided an engine to respond to areas of northwest Garland (Grammer, personal communication, October 11).

The economic position of Garland could not be ignored when results were discussed. It was shown that Garland had a relatively low sales tax allocation when compared to other suburbs ("Allocation Historical Summary," 2002, pp. 1-2). For many cities in Texas the sales tax allocation was a major source of finance. There was one possible financial avenue reviewed in the research. That was Senate Bill 1617, "Staffing for Adequate Fire and Emergency Response Fire Fighter Act." Federal aid under this bill would allow the city to hire firefighters for three years with the city picking up the tab for the fourth year. In year five, the onus was on the city ("Bill Would Pay," 2001). Such a strategy could allow the city to begin an implementation process over a period of time. The statistical evaluation and quadrennial report required in the standard certainly supported the idea that implementation was more of a long journey than a short trip. The federal bill, if it passed, could not be considered a panacea. At some point the federal money would disappear. But the federal aid would allow the city to begin the journey towards 1710 compliance while it sought to get its economic house in order. As to possible political controversy which could erupt over 1710, it should be the department's task to show where it fell short of 1710 and determine the solutions with associated costs. It was the responsibility of the city officials to make the budget decisions (Oriole, 2001).

Among the final conclusions reached for Research Question Three were: to use Chief Grammer's need assessment of 1996 as a blueprint for implementing 1710, utilize the general consensus of sister suburbs towards 1710 to formulate mutual aid agreements, and seek federal aid to hire firefighters to begin a process of implementation.

DISCUSSION

The first two research questions dealt with areas that could reasonably be described as quantifiable, black-and-white issues. The literature of 1710 and other authors basically agreed with what 1710 mandated in the way of assignment staffing and response time objectives. There was no real disagreement on what the standard meant. 1710 allowed leeway in the methods used to achieve compliance. For example, the definition of company allowed the members of a company to arrive on the scene in different vehicles (NFPA, 2001). In practical terms however, a minimum staffing of four firefighters would be needed on most engine companies in order to meet the standard (Bruno, 2001a).

The Garland Fire Department's literature that addressed the objectives of 1710 was centered in its directives and SOPs. Directive 212 seemingly addressed response times by tying response times into gpm requirements for fire extinguishment in certain buildings (Garland Fire Department, 1990). Yet the research revealed that it had been basically ignored (J. Perry, personal communication, December 4, 2001). In seeming opposition to 212 and 1710, Directive 203 contained the admonition on reductions to code one response if the first size-up at the scene was nothing showing (Garland Fire Department, 1999a). This part of the directive was well known to all personnel. It was not to disagree with the concept of safety that this comparison was made. Rather it was indicative that the bias would always be towards a slower, safer response (J. Perry, personal communication, December 4, 2001). That worked against meeting the standard's time objectives. The department addressed turnout time although it was referred to as enroute time in SOP 227. These times were based on the time of day and on the necessity of donning turnout gear. It allowed an enroute time of 1 minute, 30 seconds at night, which exceeded 1710's turnout time of 1 minute (Garland Fire Department, 1998). Garland also officially set a response time of five minutes in Directive 237 (1999b). The spirit of the directive was that five minutes was always the desired goal to work towards. However, the directive offered no corrective actions if the goal were not met, nor did it commit the department to taking steps to monitor response times.

The manner in which the necessary data was gathered produced great insight. The plain facts were that Garland met 1710 response time objectives in 78 percent of the fire responses, 66 percent of the first responder (BLS) responses, and 93 percent for the MICU (ALS) response. While these identified shortcomings were important, what was equally important was the inadequacy of Garland's computerized dispatch system. The system's software could not produce the type of reports needed to gauge 1710 compliance. It was necessary to print every individual report to obtain response time data. Reports produced from this system only indicated when the first unit checked on scene. It could not identify that unit. As to the response times listed on the report, problems were discovered there as well. Alarm dispatch procedures called for a station to receive the alarm, and at some point later, the dispatcher would contact the responding unit via radio to check for its response. It was at this point of contact that the dispatcher would record that unit as being enroute from the station. The problem was that some dispatchers, for varying reasons, would make this first contact at varying times. Sometimes it was 30 seconds; sometimes it was two or three minutes. Any uniformity in recording response times was destroyed. The only manner in which accurate data could be obtained for this reseasrch was to obtain the dispatch time from each report, add one minute for turnout time, and

then subtract that from the arrival time listed on the report. This painstaking procedure had to be repeated for every fire and EMS incident reviewed in this project. An implication of this finding for Garland was that a better method must be developed for accurately computing response times and identifying units with their corresponding arrival times. This must be accomplished if 1710's response time objectives are ever to be achieved. Supplementing this opinion was the fact that the research had to rely on the memories of retired firefighters to get the institutional history of the department. Perhaps the implication was that the entire recordkeeping system needed overhaul.

While Garland only staffed 2 of 13 engine and truck companies with four firefighters, it was interesting to note that the department exceeded 1710 objectives in the concept of the 2-person IRIC. As part of the initial alarm response, Garland dispatched either a three- or four-person IRIC to the fire scene (Garland Fire Department, 2001b). Garland also met the staffing requirements for the total number of firefighters on the initial alarm, as the department sent a minimum of 17 firefighters on the response, more if it involved either of the two four-person engine companies (Garland Fire Department, 2001b). Another area where Garland maintained a high standard was in its EMS Division. It staffed its MICUs with two paramedics and certified the ambulances as MICU's, a level higher than ALS. It maintained two ALS engines that had to be staffed with two paramedics among the crew (2001c). All firefighters were certified as either paramedics or EMT's (2001a).

Every fire company except for the two paramedic units carried automatic external defibrillators. The implication for the department in the case of EMS was mostly positive. While the first responder engine did not meet the 90th percentile in response times, practically everything else about the EMS Division met or exceeded 1710 objectives. In the time period covered by this research, almost 80 percent of the emergency responses were EMS related. Both Chief Perry and Lieutenant Corcoran confirmed that the EMS incidents had always outnumbered the fire incidents since the inception of the ambulances in the department in 1977 (personal communications, 2001). It was the EMS Division that was called upon the most by its citizens, and that was precisely the area where Garland maintained a strong record of achievement, and had done so for almost 25 years.

Research Question Three produced conflicting opinions. The question itself presumed 1710 adoption as a positive force. Perhaps the reason for conflict arose because the research attempted to quantify answers that also involved subjective opinions. Expanded mutual aid offered Garland one of the more economical ways to improve response times. There was already a history of mutual aid with Richardson, one of Garland's neighbors. The survey results revealed Richardson was planning to implement 1710 objectives, and neighboring Plano was already in compliance. The commonality of beliefs could provide a basis for increased use of mutual aid. Mutual aid would be appealing to Garland, particularly in light of the economic costs of staffing all companies with four firefighters that could cost almost $2 million. There might be a need to examine the department's use of mutual aid. Garland was not a frequent user of mutual aid. A department of medium size like Garland preferred to think of itself as self-sufficient, asking only for help in unusual cases, Garland's poor sales tax allocation had to be considered. The department would enter any city debate over 1710 implementation with a very short economic

stick. The financial implications of 1710 for Garland could not be ignored. There might come a time when a little less pride might be necessary as additional mutual aid agreements were sought.

Chief Grammer's needs assessment study published in 1996 was forward-looking in its use of EMS response as the paradigm to which a fire department should focus its service delivery objectives. This flew against the fire service's grand tradition of responding to and extinguishing the large structure fires. The main implication of his study was its potential of becoming a blueprint for the department to meet 1710 response time objectives. It would require modification as in the intervening period, growth in north Garland had exceeded expectations. This was due to the earlier than expected construction of a state highway. It still fell short in the assignment staffing objective. It asked for personnel to only staff 4 of the 13 fire companies with four firefighters. It maintained Directive 143's requirement of only three firefighters staffing units located at multiple-unit stations (1996). It fell short of 1710's staffing objective by 36 firefighters.

Oriole and Lawrence both staked out contrary positions to 1710. Oriole quoted Rukavina and Hull that the wisest course of action was to collect data under 1710 auspices and in four years show city officials where a department fell short and how much it would cost to fix the problem. He stressed that the ultimate decision on 1710 was budgetary, and that such a decision lay in the hands of city officials, not the fire department. It was an unwise decision to formally adopt 1710 because of the legal liabilities that could ensue (2001). Lawrence felt the entire process had been hijacked by the IAFF as a means of hiring more firefighters. He did not mince words when describing the "lobbying" efforts put on the IFSTA representative by the IAFF to prevent a no vote on adoption of 1710 (personal communication, August 14, 2001). Chief Lawrence supported a staffing and response time standard based on scientific evidence. He disagreed with the time temperature curve cited in the annex of 1710, feeling it to be inaccurate in that it overestimated how quickly flashover occurred in a building fire (personal communication, August 14, 2001). With such strong feeling existing against 1710, the implication for Garland was that there were political issues beneath the surface of 1710 adoption. The department was quantifying something with a subjective, political side. In order for the objective side to be addressed, the political side might have to be addressed as well. The political side might be the in form of budget battles in the city council or a fight for the hearts and minds of the community. It might involve overt political activity by Garland's branch of the IAFF. How active a role the department should take in such political fights would be debatable, as the question was of a subjective nature. It would be difficult for any chief to stake out a position contrary to that held by a council or city administration.

The financial implication for the department posed perhaps the largest obstacle to full implementation. As the sales tax data revealed, Garland was at an economic disadvantage ("Allocation Historical Summary," 2002, pp. 1-2). The cost of hiring the 36 firefighters to staff four personnel on each company was almost $2 million. Garland simply did not have the money to do this, and probably would not for the foreseeable future. The implication was that lacking an economic miracle, SB 1617 with its $7.6 billion over seven years was a gambit the department had to pursue. It could result in the hiring of 75,000 firefighters in the United States over the next seven years ("Bill Would Pay," 2001). Admittedly, the bill had to be enacted into law. In the wake of September 11, 2001, one would expect its prospects of passage would be

good. Even if this event came to pass, the federal government only picked up the tab for the first three years of paying the firefighters, with the local government legally bound to pay the salaries of the firefighters in the fourth year ("Bill Would Pay," 2001). Garland would have three years to get its economic house in order if it pursued this option. Ultimately, it came down to the action that Oriole mentioned in his article as he referenced Chief Hull. The department can only collect the statistics, determine where it fell short of 1710, determine the costs of compliance, and then tell the city government. It would be up to city officials make the budgetary decisions (2001). If the answer was no, then there was always the expanded use of mutual aid.

RECOMMENDATIONS

Based on the research, the following recommendations are made:

1. The Garland Fire Department should implement an updated version of the 11-station concept developed by Chief Grammer in his needs assessment. This would include obtaining council support for the necessary financing. 11 stations placed strategically through Garland could deliver the necessary response times mandated by 1710.

2. The Garland Fire Department should seek council approval of a plan to implement four-firefighter staffing on every fire company over a period of years. This will enable the department to meet 1710 staffing objectives.

3. The Garland Fire Department must upgrade its computer dispatch system so it can produce accurate data necessary for data collection, data evaluation, and the quadrennial report mandated by NFPA 1710. Of particular importance is to devise an accurate means of tracking unit response times and reconciling the use of code one reductions vis-à-vis 1710 response time objectives.

4. The Garland Fire Department should aggressively seek federal financing to hire more firefighters. Prior to this pursuit, the department must undertake an education campaign of city officials and the general public as to the nature of 1710, its importance to the fire safety of the community, and its associated costs.

5. Personnel assigned to administration, including those of chief rank, should enroll in statistics courses in local colleges. Much of 1710 involves crunching numbers, which is facilitated by knowledge of and proficiency in, statistical analysis.

For other departments which might seek to evaluate their degree of compliance with NFPA 1710, some general observations are recommended. First, a detailed needs assessment, with 1710 as the backdrop, is a vital component. Part of this assessment should involve the computer dispatch system, if one exists. The system must be developed wherein it can accurately record response times and then produce those response times in an easily acquired, easily read format. Secondly, the economic strength of the community must be examined. Much of the opposition to 1710's adoption was based on cost. That is the probable direction from

which opposition will come. Any lobbying for 1710 must address these economic concerns. Thirdly, a different attitude towards mutual aid must be developed. It is no longer the province of small, volunteer departments. Larger departments may find it quite useful in meeting 1710 response time objectives.

For the first time in its long history, the fire service in the United States has a national standard covering the deployment and staffing of fire companies on career departments. It will take time for the full impact of NFPA 1710 to make itself felt. Many understaffed fire departments will be unable to meet the new standard for several years, and some may never achieve these goals (Bruno, 2001b). The road towards compliance for the Garland Fire Department is no less challenging. In the field of EMS and initial fire alarm staffing, the department had already met many of the standard's objectives. Yet there were also areas where the department fell decidedly short, and the cost of addressing those shortcomings was decidedly expensive. Success in those areas must involve a long-term process buttressed by an overall vision of the future that allows for the financial curves to be negotiated, accepts the assistance of neighbors, sets its economic house in order, seeks its share of the federal pie, and constantly educates the community it serves on the necessity of the best fire and EMS service available.

REFERENCES

Allocation historical summary: Local sales and use tax. (2002). Retrieved January 3, 2002 from http://www.window.state.tx.us/cgbin/allochist

Anderson & Associates. (1988, March 9). City of Garland: Fire department transition study. Dallas, TX: Author.

Bill would pay for 75,000 new fire fighters. (2001, October). *Fire Service Labor Monthly, 15*, 1-2.

Bode Research Group. (1994). *FLAME user manual* (Version 2.0) (Brochure). Wichita, KS: Author.

Bruno, H. (2001a). Labor & management cooperate on NFPA 1710 staffing standard. *Firehouse, 26* (1), 14.

Bruno, H. (2001b). NFPA approves 1710 standard for staffing career units. *Firehouse, 26* (6), 16.

Bruno, H. (2001c). NFPA 1710: The fight's not over. *Firehouse, 26* (7), 20.

Coleman, R. (1998). Does one size fit all? *Sprinkler Age, 17* (5), 42-43.

Emergency Services Act, Acts 1989, 71st TX. St. Legislature, ch. 678, 1, Sec. 773, eff. September 1, 1989.

Fletcher, J. (2001, July 16). National coalition protests fire, ems, staffing mandate. *Nation Cities Weekly*. Retrieved November 9, 2001 from http://www.nlc.org

Garland Fire Department. (1990). *Level of demand* (Directive 212). Garland, TX: Author.

Garland Fire Department. (1993). *Expanding ambulance area* (Directive 610). Garland, TX: Author.

Garland Fire Department. (1996). *Fire department safety officer* (Directive 126). Garland, TX: Author.

Garland Fire Department. (1999a). *Driving* (Directive 203). Garland, TX: Author.

Garland Fire Department. (1998). *Response standards* (SOP 227). Garland, TX: Author.

Garland Fire Department. (1999b). *Response time goals* (Directive 237). Garland, TX: Author.

Garland Fire Department. (2001a). *(The) Emergency medical services division* (Directive 601). Garland, TX: Author.

Garland Fire Department. (2001b). *Radio communications* (Directive 401). Garland, TX: Author.

Garland Fire Department. (2001c). *Staffing policy* (Directive 143). Garland, TX: Author.

Goodstein, L.D., Nolan, T.M., & Pfeiffer, J.W. (1992). *Applied strategic planning: An overview*. San Diego: Pfeiffer & Company.

Grammer, Dan. (1996, October). *Garland fire department needs analysis.* Paper presented at city council work session in Garland, Texas.

Houston death forces minimum staffing issue. (2001, October). *Fire Labor Service Monthly, 15,* 2-3.

International Association of Fire Chiefs. (2001). *NFPA 1710: A decision guide.* Fairfax, VA: Author.

IAFF developing plan for NFPA 1710 standard. (2001, September/October). *International Fire Fighter, 84,* 8.

Klinoff, R. (1997). *Introduction to fire protection.* Albany, NY: Delmar.

Leedy, P.D., & Ormrod, J.E. (2001). *Practical Research,* (7th ed.). Upper Saddle River, NJ: Merrill Prentice-Hall.

Manning, B. (1997). The proposed 1200 standard: What nerve! *Fire Engineering, 150* (6), 6.

National Fire Protection Association. (2001). *Standard for the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments* (NFPA 1710). Quincy, MA: Author.

Oregon Fire Chiefs Association (2001). *Oregon fire resource deployment standard process.* Salem, Or: Author.

Oriole, K. (2001). *NFPA 1710: An implementation decision.* Retrieved November 6, 2001 from http://www.firefighting.com

Rubin, D.L., & Foley, S.N. (1993). The evolution of NFPA 1500. *Firehouse, 18* (5), 46.

Rukavina, J. (2001). 1710 legal questions answered. *Fire Chief, 45* (2), 76-79.

Thorp, F. (1997). What's right with NFPA 1200. *Responder, 4* (8), 7-8.

Appendix A

Table A1
Fire Responses for First Unit on Scene in Four Minutes or Less

INCIDENT #	FIRST	Rank	Percent
1438	8:33	1	100.00%
1963	8:21	2	99.00%
2529	8:21	2	99.00%
9833	8:11	4	98.60%
7370	7:38	5	98.10%
1468	7:07	6	97.70%
1062	6:48	7	97.20%
4330	6:47	8	96.70%
17867	6:41	9	96.30%
14575	6:37	10	95.80%
518	6:35	11	95.40%
16853	6:34	12	94.90%
17441	6:29	13	94.40%
15936	6:15	14	94.00%
759	5:59	15	93.50%
16225	5:47	16	93.10%
17127	5:31	17	92.60%
3655	5:29	18	91.70%
9720	5:29	18	91.70%
3436	5:28	20	91.20%
15503	5:26	21	90.30%

Table A1. (continued)

Incident #	First	Rank	Percentile
16146	5:26	21	90.30%
1802	5:23	23	89.90%
16968	5:20	24	89.40%
17549	5:18	25	88.90%
2056	5:11	26	88.50%
186	5:10	27	88.00%
1920	5:07	28	87.60%
14492	5:05	29	87.10%
17888	5:04	30	86.60%
1227	4:50	31	86.20%
3932	4:49	32	85.70%
3321	4:47	33	84.80%
5308	4:47	33	84.80%
2203	4:46	35	84.40%
1509	4:44	36	83.90%
3688	4:43	37	82.50%
5721	4:43	37	82.50%
8330	4:43	37	82.50%
17930	4:40	40	82.10%
297	4:37	41	81.10%
7637	4:37	41	81.10%
1604	4:36	43	80.70%
1858	4:34	44	80.20%
2780	4:33	45	78.80%

Table A1. (continued)

Incident #	First	Rank	Percentile
3138	4:33	45	78.80%
7139	4:33	45	78.80%
3250	4:32	48	77.90%
7429	4:32	48	77.90%
15368	4:31	50	77.50%
8098	4:28	51	77.00%
1216	4:23	52	75.60%
1824	4:23	52	75.60%
3649	4:23	52	75.60%
13918	4:14	55	74.70%
9214	4:14	55	74.70%
739	4:13	57	74.30%
2149	4:09	58	73.30%
3633	4:09	58	73.30%
1516	4:06	60	72.40%
2764	4:06	60	72.40%
14582	4:05	62	72.00%
14821	4:03	63	70.10%
8211	4:03	63	70.10%
2200	4:03	63	70.10%
3499	4:03	63	70.10%
931	4:02	67	69.20%
3269	4:02	67	69.20%
16088	4:01	69	68.30%

Table A1. (continued)

Incident #	First	Rank	Percentile
5762	4:01	69	68.30%
2831	4:00	71	67.40%
3417	4:00	71	67.40%
570	3:58	73	66.50%
9588	3:58	73	66.50%
2604	3:57	75	66.00%
5447	3:56	76	65.50%
9471	3:55	77	65.10%
15535	3:52	78	63.30%
16937	3:52	78	63.30%
276	3:52	78	63.30%
3530	3:52	78	63.30%
16849	3:51	82	61.90%
1113	3:51	82	61.90%
6825	3:51	82	61.90%
16477	3:48	85	60.50%
16692	3:48	85	60.50%
6325	3:48	85	60.50%
2350	3:47	88	60.00%
9078	3:44	89	59.60%
211	3:43	90	59.10%
2525	3:40	91	57.30%
3125	3:40	91	57.30%
6684	3:40	91	57.30%

Table A1. (continued)

Incident #	First	Rank	Percentile
9225	3:40	91	57.30%
15030	3:39	95	56.80%
14435	3:38	96	56.40%
1164	3:37	97	55.50%
3414	3:37	97	55.50%
3028	3:36	99	54.50%
3478	3:36	99	54.50%
3280	3:35	101	54.10%
1556	3:34	102	53.20%
1467	3:34	102	53.20%
17895	3:33	104	52.70%
2503	3:32	105	52.20%
6934	3:30	106	51.80%
9485	3:29	107	51.30%
7336	3:27	108	50.90%
9503	3:26	109	50.40%
2817	3:24	110	49.50%
519	3:24	110	49.50%
1078	3:21	112	49.00%
5979	3:18	113	48.10%
5996	3:18	113	48.10%
6569	3:17	115	47.70%
17107	3:16	116	46.70%
9676	3:16	116	46.70%

Table A1. (continued)

Incident #	First	Rank	Percentile
4419	3:14	118	46.30%
9930	3:13	119	45.80%
2824	3:12	120	44.90%
2836	3:12	120	44.90%
2702	3:11	122	44.00%
2969	3:11	122	44.00%
14654	3:10	124	43.10%
5904	3:10	124	43.10%
15990	3:08	126	40.80%
16642	3:08	126	40.80%
372	3:08	126	40.80%
1984	3:08	126	40.80%
9632	3:08	126	40.80%
15103	3:07	131	40.30%
14818	3:05	132	38.50%
16391	3:05	132	38.50%
224	3:05	132	38.50%
4588	3:05	132	38.50%
1878	3:04	136	38.00%
5883	3:01	137	37.60%
388	2:59	138	36.20%
78	2:59	138	36.20%
2889	2:59	138	36.20%
15659	2:58	141	35.70%

Table A1. (continued)

Incident #	First	Rank	Percentile
5126	2:56	142	35.30%
9262	2:55	143	34.80%
7310	2:54	144	34.40%
281	2:53	145	33.40%
959	2:53	145	33.40%
15264	2:52	147	32.10%
2366	2:52	147	32.10%
5877	2:52	147	32.10%
2020	2:50	150	31.10%
3171	2:50	150	31.10%
7268	2:49	152	30.70%
2391	2:48	153	30.20%
260	2:46	154	29.30%
9677	2:46	154	29.30%
6032	2:45	156	28.80%
4268	2:44	157	27.90%
2748	2:44	157	27.90%
17189	2:43	159	27.50%
442	2:42	160	26.10%
4386	2:42	160	26.10%
6189	2:42	160	26.10%
14509	2:41	163	25.20%
4401	2:41	163	25.20%
17169	2:40	165	24.30%

Table A1. (continued)

Incident #	First	Rank	Percentile
6205	2:40	165	24.30%
7425	2:39	167	23.80%
3565	2:38	168	22.90%
7152	2:38	168	22.90%
3517	2:37	170	22.40%
5026	2:36	171	22.00%
14676	2:35	172	21.50%
18	2:33	173	21.10%
6611	2:29	174	20.60%
5483	2:28	175	19.70%
1631	2:28	175	19.70%
5649	2:27	177	18.80%
116	2:27	177	18.80%
6820	2:23	179	18.30%
17918	2:22	180	17.80%
278	2:19	181	16.50%
939	2:19	181	16.50%
14	2:19	181	16.50%
2782	2:17	184	16.00%
3946	2:16	185	15.10%
6836	2:16	185	15.10%
3326	2:13	187	14.60%
8436	2:12	188	14.20%
1991	2:11	189	13.70%

Table A1. (continued)

Incident #	First	Rank	Percentile
15607	2:10	190	13.30%
8406	2:09	191	12.80%
13825	2:06	192	12.30%
1466	2:02	193	11.90%
7081	1:59	194	11.40%
1132	1:56	195	11.00%
17469	1:55	196	10.50%
8887	1:52	197	10.00%
2288	1:51	198	9.60%
8136	1:48	199	8.70%
2664	1:48	199	8.70%
13926	1:46	201	8.20%
16173	1:42	202	7.70%
1531	1:37	203	7.30%
8289	1:35	204	6.80%
5704	1:33	205	5.90%
7141	1:33	205	5.90%
975	1:31	207	5.00%
6920	1:31	207	5.00%
1115	1:23	209	4.50%
14410	1:18	210	4.10%
5602	1:17	211	3.60%
13806	1:14	212	3.20%
3313	1:13	213	2.70%

Table A1. (continued)

Incident #	First	Rank	Percentile
14316	1:09	214	2.20%
4872	1:06	215	1.80%
1749	1:05	216	1.30%
6601	0:55	217	.90%
6829	0:38	218	.40%
8515	0:33	219	.00%

Note. 149 of 219 fire responses met or exceeded NFPA 1710's 4-minute response time objectives.

Table A2
Fire Responses for Last Unit on Scene in Eight Minute or Less

Incident #	Last	Rank	Percentile
3688	15:23	1	100.00%
1509	15:18	2	98.10%
3633	13:41	3	96.20%
1227	13:12	4	94.40%
3499	12:57	5	92.50%
1438	11:50	6	90.70%
3649	11:24	7	88.80%
14821	11:05	8	87.00%
2203	10:29	9	85.10%
16088	10:07	10	83.30%
17441	10:06	11	81.40%
2529	10:01	12	79.60%
3655	9:58	13	77.70%
7370	9:48	14	75.90%
15503	9:22	15	74.00%
759	9:20	16	72.20%
14492	9:19	17	70.30%
3321	9:13	18	68.50%
1604	9:10	19	66.60%
2780	9:08	20	64.80%
15936	9:00	21	62.90%

Table A2. (continued)

Incident #	Last	Rank	Percentile
5721	8:51	22	61.10%
16146	8:46	23	59.20%
2764	8:41	24	57.40%
7429	8:40	25	55.50%
17867	8:36	26	53.70%
9833	8:34	27	51.80%
15368	8:32	28	50.00%
1468	8:30	29	48.10%
1824	8:28	30	46.20%
1858	8:24	31	44.40%
8098	8:13	32	42.50%
1516	8:06	33	40.70%
8330	7:25	34	38.80%
1802	7:11	35	37.00%
3436	7:06	36	35.10%
7139	7:00	37	33.30%
518	6:54	38	29.60%
17930	6:54	38	29.60%
17127	6:52	40	27.70%
5762	6:49	41	25.90%
17888	6:44	42	24.00%
17549	6:36	43	22.20%
16853	6:26	44	20.30%
9720	6:12	45	18.50%

Table A2. (continued)

Incident #	Last	Rank	Percentile
7637	6:05	46	16.60%
3269	5:57	47	14.80%
16968	5:37	48	12.90%
5308	5:32	49	11.10%
1920	5:31	50	9.20%
13918	5:27	51	7.40%
9214	4:42	52	5.50%
1216	4:36	53	3.70%
931	4:29	54	1.80%
2200	4:18	55	.00%

Note. 22 of the 70 responses that did not meet the 4-minute objective met 1710's 8-minute response objective for the last unit of the initial alarm response.

Appendix B

Table B1
ALS Response Times

Incident#	ALS	Rank	Percentile
6112	17:35	1	100.00%
3640	13:43	2	99.70%
9259	12:08	3	99.50%
4602	11:55	4	99.20%
6044	11:51	5	99.00%
473	10:02	6	98.50%
6053	10:02	6	98.50%
1409	9:41	8	98.20%
5774	9:36	9	98.00%
6142	9:26	10	97.70%
2247	9:24	11	97.50%
2356	9:15	12	97.30%
4872	9:12	13	97.00%
4215	9:02	14	96.80%
6102	8:55	15	96.50%
5136	8:40	16	96.30%
4026	8:38	17	96.00%
6261	8:37	18	95.80%
807	8:36	19	95.50%
9305	8:32	20	95.30%
722	8:30	21	95.10%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
5423	8:28	22	94.80%
6066	8:27	23	94.60%
6796	8:22	24	94.10%
9278	8:22	24	94.10%
7920	8:14	26	93.60%
687	8:14	26	93.60%
5277	8:10	28	93.30%
3287	8:03	29	93.10%
766	7:55	30	92.90%
3216	7:54	31	92.60%
2733	7:52	32	92.40%
765	7:47	33	92.10%
6493	7:43	34	91.90%
3976	7:22	35	91.60%
776	7:20	36	91.40%
6865	7:15	37	90.90%
4884	7:15	37	90.90%
839	7:14	39	90.70%
2254	7:13	40	90.40%
6459	7:11	41	89.90%
790	7:11	41	89.90%
4580	7:09	43	89.70%
961	7:04	44	89.40%
6292	7:01	45	89.20%

Table B1. (continued

Incident #	ALS	Rank	Percentile
4433	6:57	46	88.90%
3915	6:55	47	88.70%
4129	6:54	48	88.20%
4529	6:54	48	88.20%
9175	6:48	50	88.00%
5130	6:43	51	87.50%
3323	6:43	51	87.50%
7674	6:42	53	87.00%
4114	6:42	53	87.00%
8060	6:41	55	86.70%
3571	6:37	56	86.30%
728	6:37	56	86.30%
5986	6:33	58	86.00%
793	6:31	59	85.80%
281	6:29	60	85.50%
2547	6:27	61	85.30%
796	6:26	62	85.00%
805	6:25	63	84.80%
4132	6:23	64	84.50%
3322	6:20	65	84.30%
4719	6:15	66	84.10%
6005	6:14	67	83.80%
2911	6:11	68	83.60%
5227	6:09	69	83.30%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
4604	6:08	70	82.60%
2587	6:08	70	82.60%
3501	6:08	70	82.60%
725	6:05	73	82.30%
1138	6:02	74	82.10%
5328	6:01	75	81.90%
5410	6:00	76	81.10%
5632	6:00	76	81.10%
6016	6:00	76	81.10%
6277	5:59	79	80.90%
1003	5:58	80	80.60%
810	5:57	81	80.40%
5241	5:53	82	80.10%
435	5:51	83	79.70%
1958	5:51	83	79.70%
3253	5:49	85	79.40%
5200	5:44	86	79.20%
9034	5:42	87	78.90%
6027	5:40	88	78.70%
5820	5:36	89	78.20%
1183	5:36	89	78.20%
7232	5:35	91	77.70%
7259	5:35	91	77.70%
6201	5:34	93	77.50%

Table B1. (continued

Incident #	ALS	Rank	Percentile
3771	5:32	94	76.70%
9123	5:32	94	76.70%
2462	5:32	94	76.70%
2571	5:29	97	76.20%
9168	5:29	97	76.20%
6808	5:28	99	76.00%
8229	5:26	100	75.70%
102	5:25	101	75.00%
3434	5:25	101	75.00%
5992	5:25	101	75.00%
3611	5:23	104	74.50%
2543	5:23	104	74.50%
1333	5:21	106	74.00%
2503	5:21	106	74.00%
2902	5:20	108	73.80%
5940	5:19	109	73.50%
2160	5:16	110	73.30%
2528	5:14	111	73.10%
6386	5:12	112	72.80%
1198	5:08	113	72.30%
6057	5:08	113	72.30%
4596	5:07	115	72.10%
3906	5:06	116	71.60%
4349	5:06	116	71.60%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
4046	5:05	118	71.30%
1982	5:04	119	71.10%
401	5:03	120	70.40%
4901	5:03	120	70.40%
6059	5:03	120	70.40%
5865	5:02	123	70.10%
4758	5:00	124	69.90%
381	4:58	125	69.10%
5515	4:58	125	69.10%
7679	4:58	125	69.10%
3289	4:51	128	68.90%
8890	4:50	129	68.40%
2471	4:50	129	68.40%
9033	4:48	131	68.20%
9115	4:47	132	67.70%
3369	4:47	132	67.70%
7129	4:46	134	66.70%
8807	4:46	134	66.70%
9239	4:46	134	66.70%
9294	4:46	134	66.70%
3686	4:45	138	66.20%
3773	4:45	138	66.20%
103	4:44	140	65.50%
8861	4:44	140	65.50%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
818	4:44	140	65.50%
9209	4:43	143	65.20%
828	4:42	144	65.00%
6408	4:40	145	64.70%
4903	4:39	146	64.50%
7201	4:37	147	64.30%
4757	4:36	148	63.50%
1829	4:36	148	63.50%
5013	4:36	148	63.50%
4988	4:34	151	63.00%
3037	4:34	151	63.00%
7179	4:33	153	62.30%
4630	4:33	153	62.30%
9274	4:33	153	62.30%
3550	4:32	156	62.10%
6844	4:31	157	61.80%
7939	4:28	158	61.60%
5831	4:25	159	60.60%
6362	4:25	159	60.60%
6478	4:25	159	60.60%
6781	4:25	159	60.60%
441	4:24	163	60.10%
726	4:24	163	60.10%
3570	4:23	165	59.90%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
834	4:20	166	59.40%
2749	4:20	166	59.40%
6079	4:19	168	59.10%
5542	4:15	169	58.90%
778	4:13	170	58.60%
3604	4:12	171	58.40%
3170	4:11	172	58.10%
4336	4:10	173	57.70%
6108	4:10	173	57.70%
3144	4:09	175	57.20%
6091	4:09	175	57.20%
5663	4:08	177	56.70%
3743	4:08	177	56.70%
1056	4:07	179	55.90%
4604	4:07	179	55.90%
9233	4:07	179	55.90%
5355	4:05	182	55.20%
6041	4:05	182	55.20%
2992	4:05	182	55.20%
5339	4:04	185	55.00%
6861	4:02	186	54.50%
4027	4:02	186	54.50%
6462	4:01	188	53.70%
844	4:01	188	53.70%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
2803	4:01	188	53.70%
77	4:00	191	53.00%
2850	4:00	191	53.00%
4354	4:00	191	53.00%
4781	3:59	194	52.30%
4177	3:59	194	52.30%
7874	3:59	194	52.30%
749	3:58	197	51.80%
2570	3:58	197	51.80%
3536	3:57	199	51.50%
8946	3:56	200	51.30%
4552	3:55	201	50.80%
7651	3:55	201	50.80%
1910	3:54	203	50.10%
7886	3:54	203	50.10%
773	3:54	203	50.10%
8172	3:53	206	49.80%
3514	3:52	207	49.60%
6088	3:51	208	49.30%
9196	3:49	209	48.80%
9216	3:49	209	48.80%
3162	3:48	211	48.60%
4947	3:47	212	48.40%
6245	3:46	213	47.40%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
1550	3:46	213	47.40%
1628	3:46	213	47.40%
9206	3:46	213	47.40%
5745	3:45	217	46.90%
2067	3:45	217	46.90%
3377	3:44	219	46.20%
8976	3:44	219	46.20%
2594	3:44	219	46.20%
3922	3:43	222	44.90%
606	3:43	222	44.90%
2693	3:43	222	44.90%
7696	3:43	222	44.90%
9219	3:43	222	44.90%
3361	3:42	227	44.00%
6192	3:42	227	44.00%
982	3:42	227	44.00%
4368	3:42	227	44.00%
5455	3:41	231	43.70%
6640	3:40	232	42.20%
776	3:40	232	42.20%
2065	3:40	232	42.20%
2664	3:40	232	42.20%
6062	3:40	232	42.20%
9311	3:40	232	42.20%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
8528	3:39	238	42.00%
2280	3:38	239	41.80%
5218	3:37	240	41.50%
2101	3:36	241	41.30%
5799	3:35	242	41.00%
8936	3:34	243	40.30%
2487	3:34	243	40.30%
3308	3:34	243	40.30%
5691	3:33	246	39.30%
7659	3:33	246	39.30%
8591	3:33	246	39.30%
3446	3:33	246	39.30%
6489	3:32	250	39.10%
911	3:31	251	38.80%
3956	3:30	252	38.60%
6294	3:28	253	38.30%
1248	3:27	254	38.10%
3931	3:26	255	37.40%
4861	3:26	255	37.40%
7640	3:26	255	37.40%
3008	3:24	258	37.10%
2250	3:23	259	36.40%
3747	3:23	259	36.40%
9180	3:23	259	36.40%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
5997	3:22	262	36.10%
5086	3:21	263	35.90%
988	3:20	264	34.90%
8795	3:20	264	34.90%
9324	3:20	264	34.90%
2421	3:20	264	34.90%
7635	3:19	268	34.40%
9317	3:19	268	34.40%
453	3:18	270	33.70%
5990	3:18	270	33.70%
6021	3:18	270	33.70%
3101	3:17	273	33.00%
5059	3:17	273	33.00%
8576	3:17	273	33.00%
5920	3:15	276	32.70%
1709	3:14	277	32.20%
2315	3:14	277	32.20%
4172	3:12	279	31.70%
9310	3:12	279	31.70%
9201	3:11	281	31.50%
6089	3:10	282	31.20%
4426	3:08	283	31.00%
1758	3:07	284	30.80%
2371	3:06	285	30.30%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
2580	3:06	285	30.30%
6028	3:03	287	30.00%
7592	3:02	288	29.50%
9267	3:02	288	29.50%
5255	3:01	290	29.00%
789	3:01	290	29.00%
6472	2:59	292	28.60%
5524	2:59	292	28.60%
6115	2:58	294	28.30%
2515	2:57	295	28.10%
9163	2:55	296	27.80%
2205	2:53	297	27.60%
9292	2:52	298	27.30%
8443	2:51	299	27.10%
595	2:50	300	26.80%
9306	2:48	301	26.40%
770	2:48	301	26.40%
6134	2:44	303	25.90%
9075	2:44	303	25.90%
3933	2:43	305	25.10%
5083	2:43	305	25.10%
9251	2:43	305	25.10%
682	2:41	308	24.90%
1417	2:40	309	24.40%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
5171	2:40	309	24.40%
4581	2:39	311	24.20%
6450	2:38	312	23.40%
4338	2:38	312	23.40%
4843	2:38	312	23.40%
2772	2:37	315	23.20%
2901	2:35	316	22.90%
4802	2:34	317	21.70%
7492	2:34	317	21.70%
2231	2:34	317	21.70%
5993	2:34	317	21.70%
2485	2:34	317	21.70%
9312	2:33	322	21.50%
5655	2:32	323	21.00%
6061	2:32	323	21.00%
1262	2:30	325	20.70%
6064	2:28	326	20.50%
4827	2:27	327	20.20%
5838	2:26	328	19.80%
3474	2:26	328	19.80%
1527	2:25	330	19.50%
6125	2:24	331	19.30%
3102	2:23	332	19.00%
7995	2:22	333	18.50%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
695	2:22	333	18.50%
274	2:21	335	18.00%
6076	2:21	335	18.00%
5147	2:18	337	17.80%
3830	2:17	338	17.30%
832	2:17	338	17.30%
7080	2:15	340	16.80%
3849	2:15	340	16.80%
9178	2:13	342	16.60%
8238	2:05	343	16.30%
3392	2:03	344	15.10%
3760	2:03	344	15.10%
8987	2:03	344	15.10%
716	2:03	344	15.10%
772	2:03	344	15.100%
3968	2:02	349	14.40%
3540	2:02	349	14.40%
9167	2:02	349	14.40%
2158	1:59	352	13.90%
2306	1:59	352	13.90%
9290	1:58	354	13.60%
5235	1:57	355	13.40%
4982	1:56	356	12.90%
6055	1:56	356	12.90%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
7913	1:54	358	12.70%
1060	1:52	359	11.90%
1639	1:52	359	11.90%
8595	1:52	359	11.90%
5048	1:50	362	11.40%
679	1:50	362	11.40%
3390	1:49	364	11.00%
3334	1:49	364	11.00%
6051	1:48	366	10.50%
690	1:48	366	10.50%
5437	1:45	368	10.00%
9313	1:45	368	10.00%
3507	1:42	370	9.50%
777	1:42	370	9.50%
3492	1:40	372	9.20%
689	1:39	373	9.00%
814	1:38	374	8.80%
4728	1:37	375	8.50%
9285	1:36	376	8.00%
2335	1:36	376	8.00%
4679	1:34	378	7.80%
6095	1:33	379	7.30%
733	1:33	379	7.30%
6917	1:30	381	7.00%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
5672	1:29	382	6.80%
5340	1:26	383	6.60%
387	1:25	384	6.10%
2695	1:25	384	6.10%
6101	1:17	386	5.80%
8617	1:15	387	5.60%
4915	1:09	388	5.30%
5750	1:05	389	5.10%
4127	1:02	390	4.60%
6126	1:02	390	4.60%
4224	1:00	392	4.40%
9246	0:55	393	4.10%
6128	0:54	394	3.90%
798	0:39	395	3.60%
5655	0:38	396	3.40%
5705	0:36	397	3.10%
5733	0:22	398	2.90%
9229	0:21	399	2.40%
826	0:21	399	2.40%
5412	0:20	401	2.20%
1393	0:13	402	1.90%
9296	0:11	403	1.70%
1681	0:10	404	.90%
5228	0:10	404	.90%

Table B1. (continued)

Incident #	ALS	Rank	Percentile
5281	0:10	404	.90%
197	0:08	407	.70%
3918	0:05	408	.40%
9203	0:03	409	.20%
7015	0:02	410	.00%

Note. Garland MICU's achieved a compliance rate of 93% for 1710's ALS response time objective.

Table B2

First Responder (BLS) Response Times

Incident #	Engine	Rank	Percentile
9259	14:43	1	100.00%
8861	14:31	2	99.50%
9311	12:10	3	99.10%
6865	9:22	4	98.70%
4215	9:05	5	98.30%
6796	8:30	6	97.90%
4336	7:56	7	97.40%
2733	7:52	8	97.00%
4026	7:43	9	96.60%
6844	7:28	10	96.20%
2160	6:47	11	95.80%
2356	6:41	12	95.30%
5831	6:38	13	94.90%
2503	6:18	14	94.50%
6386	6:16	15	94.10%
805	6:14	16	93.70%
5227	6:09	17	93.30%
722	6:03	18	92.80%
8987	6:01	19	92.40%
6462	5:43	20	92.00%
5136	5:37	21	91.60%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
6142	5:36	22	91.20%
776	5:32	23	90.70%
6201	5:31	24	90.30%
2543	5:23	25	89.90%
2850	5:20	26	89.50%
7874	5:15	27	89.10%
4046	5:13	28	88.70%
6493	5:09	29	88.20%
1982	5:08	30	87.40%
2587	5:08	30	87.40%
9305	5:07	32	87.00%
6478	5:06	33	86.60%
401	5:05	34	85.70%
4529	5:05	34	85.70%
2371	5:03	36	84.90%
2902	5:03	36	84.90%
796	5:02	38	84.50%
381	4:58	39	83.60%
3037	4:58	39	83.60%
4552	4:55	41	83.20%
8528	4:52	42	82.80%
1829	4:50	43	81.50%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
2471	4:50	43	81.50%
2749	4:50	43	81.50%
3773	4:48	46	81.10%
8807	4:46	47	80.70%
5920	4:45	48	79.90%
2250	4:45	48	79.90%
3686	4:44	50	79.00%
4129	4:44	50	79.00%
2911	4:42	52	78.60%
4872	4:40	53	78.20%
6079	4:37	54	77.40%
765	4:37	54	77.40%
103	4:36	56	76.50%
682	4:36	56	76.50%
9274	4:33	58	76.10%
3550	4:32	59	75.70%
1628	4:31	60	75.30%
6102	4:29	61	74.80%
9233	4:26	62	74.40%
7679	4:24	63	73.60%
726	4:24	63	73.60%
988	4:23	65	73.20%
6192	4:22	66	72.80%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
5048	4:21	67	71.50%
1183	4:21	67	71.50%
793	4:21	67	71.50%
4368	4:18	70	71.10%
6016	4:14	71	70.70%
4758	4:13	72	70.20%
5542	4:12	73	69.40%
3906	4:12	73	69.40%
6108	4:11	75	69.00%
5663	4:09	76	68.20%
6041	4:09	76	68.20%
3144	4:08	78	67.70%
9180	4:07	79	67.30%
2803	4:01	80	66.90%
3536	4:00	81	66.10%
4354	4:00	81	66.10%
839	3:59	83	65.60%
1550	3:57	84	65.20%
7651	3:55	85	64.80%
8890	3:54	86	64.40%
9216	3:52	87	64.00%
5171	3:51	88	63.50%
4338	3:50	89	63.10%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
9292	3:49	90	62.30%
3446	3:49	90	62.30%
435	3:48	92	61.90%
9206	3:46	93	61.50%
9239	3:45	94	61.00%
1198	3:44	95	60.60%
3976	3:43	96	59.80%
8976	3:43	96	59.80%
8591	3:42	98	59.40%
3931	3:41	99	57.30%
3933	3:41	99	57.30%
4947	3:41	99	57.30%
5410	3:41	99	57.30%
9168	3:41	99	57.30%
5218	3:40	104	56.90%
3922	3:39	105	56.00%
9313	3:39	105	56.00%
2772	3:38	107	55.60%
3308	3:37	108	55.20%
2101	3:36	109	54.80%
818	3:34	110	54.30%
3956	3:33	111	53.10%
1758	3:33	111	53.10%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
4827	3:33	111	53.10%
3830	3:32	114	52.70%
3747	3:29	115	52.30%
4861	3:27	116	51.80%
453	3:25	117	51.40%
4843	3:22	118	50.20%
6021	3:22	118	50.20%
8795	3:22	118	50.20%
3289	3:21	121	49.70%
4172	3:20	122	48.10%
5339	3:20	122	48.10%
77	3:20	122	48.10%
2462	3:20	122	48.10%
6472	3:19	126	47.20%
5200	3:19	126	47.20%
5059	3:17	128	46.00%
9324	3:17	128	46.00%
810	3:17	128	46.00%
3434	3:16	131	45.10%
5235	3:16	131	45.10%
9201	3:11	133	44.70%
7080	3:10	134	44.30%
6808	3:08	135	43.90%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
4177	3:06	136	43.50%
689	3:03	137	43.00%
5328	3:02	138	42.20%
3102	3:02	138	42.20%
5691	3:00	140	41.80%
2664	2:59	141	40.50%
5524	2:59	141	40.50%
8060	2:59	141	40.50%
1138	2:58	144	40.10%
6261	2:57	145	39.30%
7696	2:57	145	39.30%
3334	2:55	147	38.90%
9310	2:54	148	38.40%
9251	2:53	149	37.60%
2205	2:53	149	37.60%
6005	2:52	151	37.20%
6115	2:51	152	36.80%
6134	2:47	153	36.40%
1958	2:46	154	35.90%
6064	2:45	155	35.50%
4982	2:44	156	35.10%
4132	2:43	157	34.30%
1060	2:43	157	34.30%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
281	2:42	159	33.40%
1417	2:42	159	33.40%
3968	2:40	161	32.60%
9163	2:40	161	32.60%
3492	2:39	163	32.20%
2231	2:37	164	31.30%
2901	2:37	164	31.30%
9290	2:35	166	30.50%
3170	2:35	166	30.50%
2594	2:34	168	30.10%
4802	2:33	169	29.70%
3323	2:30	170	29.20%
6125	2:29	171	28.80%
3540	2:28	172	28.40%
5013	2:26	173	28.00%
814	2:25	174	27.60%
4728	2:24	175	27.10%
832	2:23	176	26.70%
3216	2:22	177	25.90%
789	2:22	177	25.90%
7201	2:21	179	25.50%
777	2:20	180	24.60%
2570	2:20	180	24.60%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
6044	2:18	182	24.20%
441	2:17	183	23.40%
1333	2:17	183	23.40%
3849	2:16	185	22.50%
7659	2:16	185	22.50%
3514	2:13	187	22.10%
7015	2:10	188	21.30%
6112	2:10	188	21.30%
2306	2:08	190	20.90%
772	2:06	191	20.50%
7913	2:04	192	19.60%
9246	2:04	192	19.60%
3390	2:03	194	19.20%
778	2:02	195	18.80%
2158	2:01	196	17.90%
3743	2:01	196	17.90%
4604	1:57	198	17.50%
9203	1:55	199	17.10%
6051	1:50	200	16.70%
9033	1:49	201	16.30%
6362	1:46	202	15.40%
2571	1:46	202	15.40%
7640	1:43	204	15.00%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
1262	1:42	205	14.60%
5672	1:39	206	14.20%
3501	1:38	207	13.80%
9034	1:36	208	13.30%
2695	1:34	209	12.50%
5355	1:34	209	12.50%
4915	1:30	211	11.20%
6126	1:30	211	11.20%
766	1:30	211	11.20%
9175	1:27	214	10.80%
9306	1:23	215	10.40%
6408	1:16	216	10.00%
3474	1:10	217	8.70%
9219	1:10	217	8.70%
790	1:10	217	8.70%
4127	1:09	220	8.30%
5083	1:07	221	7.90%
4224	1:06	222	7.10%
5412	1:06	222	7.10%
3611	1:03	224	6.60%
5750	1:02	225	6.20%
8229	1:00	226	5.80%
3760	0:56	227	5.40%

Table B2. (continued)

Incident #	Engine	Rank	Percentile
6128	0:51	228	5.00%
6294	0:47	229	4.10%
606	0:47	229	4.10%
6861	0:42	231	3.70%
5705	0:41	232	2.90%
9167	0:41	232	2.90%
798	0:39	234	2.50%
982	0:33	235	2.00%
826	0:23	236	1.60%
8595	0:15	237	1.20%
695	0:13	238	.80%
7995	0:03	239	.40%
6101	0:02	240	.00%

Note. Garland's engines achieved a compliance rate of 66% of 1710's first responder response time objectives.

Appendix C

Table C
Suburban Fire Department 1710 Survey

Question 1

Regarding NFPA 1710, *Standard for the Deployment of Fire Suppression Operations, Emergency Medical Operations, and special Operations to the Public by Career Fire Departments*, has your department conducted any type of internal evaluation to determine its degree of compliance with the standard?

Question 2

If yes to Q #1, is your department in, what you consider to be, compliance with the staffing and response time requirements of the standard? If no to Q #1, does your department plan to conduct such an evaluation?

Question 3

Regarding your department's overall view of the new standard, which of the following is the most accurate?

A. Already in compliance in those areas that pertain to us.

B. Not in compliance, but will implement applicable provisions in the next four years.

C. Will use NFPA 1710 only as a resource in planning for future needs.

D. Will not use/consider NFPA 1710 in any shape or form.

Appendix D

Table D
Department Answers to Survey

City	Question 1	Question 2	Question 3
Addison	Yes	No	Will use NFPA 1710 only as a resource in planning for future needs.
Carrollton	Yes	No	Will use NFPA 1710 only as a resource in planning for future needs.
Cedar Hill	Yes	No	Not in compliance, but will implement applicable provisions in the next four years.
Grand Prairie	Yes	No	Will use NFPA 1710 only as a resource in planning for future needs.
Irving	Yes	No	Will use NFPA 1710 only as a resource in planning for future needs.
Mesquite	Yes	No	Will use NFPA 1710 only as a resource planning for future needs.
Plano	Yes	Yes	Will use NFPA 1710 only as a resource in planning for future needs.
Richardson	Yes	No	Not in compliance, but will implement applicable provisions in the next four years.