# Will the Adoption of the Transitional Fire Attack Improve the Safetyof the Firefighters of the City of Fairborn Fire Department?

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## CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

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## ABSTRACT

NIST and UL have recently completed studies on Modern Fire Behavior. From the completion of these studies the Transitional Fire Attack has been introduced. This tactic involves applying water to a fire from a safe distance to cool off the atmosphere before firefighters enter the structure to fully extinguish the fire.

The Purpose of this study is to determine if the lack of understanding and implementation of the Transitional Fire Attack could be causing the firefighters of the City of Fairborn to be accepting more risk and placing them at a higher risk for injury.

An evaluative research method was chosen to research this topic with the following research questions:

1. How many departments that are aware of the UL & NIST Modern Fire Behavior studies have implemented the Transitional Fire Attack due to the studies?
2. Why have some of the department's that have adopted the Transitional Fire Attack met firefighter resistance to the changes?
3. How many of the departments that have adopted the Transitional Fire Attack have noticed a reduction of injuries since its implementation?

The procedures used to evaluate this APR were to research the topic and develop a survey to examine the experiences of other fire departments.

The survey showed that most departments were implementing the Transitional Fire Attack due to the studies done by NIST and UL. The results also showed that most departments did not experience resistance to the implementation of the Transitional Fire Attack but some did for a multitude of reasons. It was also determined that it is too early to determine to what extent the change will have on the number of firefighter deaths and injuries.

It is recommended that all departments become familiar and train on the Modern Fire Behavior studies and implement the Transitional Fire Attack when appropriate.

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# INTRODUCTION

## Statement of the Problem

The fire service experienced 97 firefighter deaths (Fahy, LeBlanc and Molis, 2014) and 65,880 firefighter injuries (Karter, Molis, 2014) across the country in 2013. Underwriters Laboratory (Kerber, 2013) have performed detailed studies to examine the fire services ventilation and suppression practices to see if current tactics and how fires are fought are the safest and most effective. The fire service has been taught over the years that the best way to extinguish most fires is by placing firefighters inside of the structure. The fire service has also been taught that fire can be pushed throughout a structure with hose lines if not deployed correctly. Most of the tactics used today are based on an individual experiences or "this is how we have always done it" and not on scientific data. The conclusion of the studies completed by UL (Underwriters Laboratory) has shown how the fire service has been trained to attack fires by immediately placing firefighters inside of the structure has been putting our firefighters in more danger than necessary to accomplish the task. The studies have also shown that you cannot push fire with a hose line. The application of water does not push the fire but actually puts the fire out. With the information that has been compiled from the UL studies, the Transitional Fire Attack has been introduced to the fire service. If the fire service changes that way it attacks fires by adopting what has been learned in the UL studies, how many firefighter fatalities and injuries would be reduced?

The problem the study addressed was to determine if the lack of understanding and implementation of the Transitional Fire Attack could be causing the firefighters of the City of Fairborn Fire Department to be accepting more risk than they should on the fire ground. This risk could be leading to more injuries to our firefighters. Although the Fairborn Fire Department has

not experienced a large number of fire ground injuries or deaths, could the way they are attacking fires be putting firefighters at more risk of injuries or even death? Could simply changing fire ground tactics reduce the numbers even more not just for the Fairborn Fire Department but for the fire service across the country?

## Purpose of the Study

The purpose of this study was to determine if our initial fire ground tactics and lack of implementation of the Transitional Fire Attack could be causing an increase in injuries in the City of Fairborn Fire Department as well as in the fire service across the country. There are many NIOSH reports that show that many fire department fatalities were due to mistakes with fire ground tactics and UL studies clearly show that you cannot "push" fire with a hose line. How many fire ground fatalities / injuries could have been prevented in the past if the fire service we had changed tactics on how they fight fires? What could the changes to our department be in the future in regard to the safety of firefighters if the Transitional Fire Attack was fully implemented? Would injuries on the fire ground decrease?

The evaluative research method was chosen as the method for this applied research project. The research questions this project will investigate are:

1. How many departments that are aware of the UL and NIST Modern Fire Behavior studies have implemented the Transitional Fire Attack due to the information in the studies?

2. Why have some of the departments that have adopted the Transitional Fire Attack met firefighter resistance to the changes?

3. How many of the departments that have adopted the Transitional Fire Attack have noticed a reduction of injuries since its implementation?

## Research Questions

The following questions were answered by this evaluative research:

2. How many departments that are aware of the UL and NIST Modern Fire Behavior studies have implemented the Transitional Fire Attack due to the information in the studies?

2. Why have some of the departments that have adopted the Transitional Fire Attack met firefighter resistance to the changes?

3. How many of the departments that have adopted the Transitional Fire Attack have noticed a reduction of injuries since its implementation?

## BACKGROUND AND SIGNIFICANCE

The Fairborn Fire Department is located in Greene County, Ohio. Fairborn is the home to approximately 32,000 residents and 13.17 sq. miles in size. Fairborn is also the home for Wright State University and Wright Patterson Air Force Base. The fire department has fifty-four members and operates out of four fire stations. The department is a full time career department that provides fire and EMS protection to the residents of the City of Fairborn as well as Bath Township. All firefighters are trained as Paramedics. The department operates 4 ALS medic units as well as two ALS Quints and two ALS Engines. The department averages approximately 6000 calls for service each year, consisting of 80% EMS responses and 20% fire responses (Fairborn Fire Department Annual Report, 2013).

Every year the NFPA (National Fire Protection Association) collects information on all firefighter deaths and injuries that occur in the United States. In 2013 the fire service experienced 97 firefighter fatalities (Fahy, LeBlanc and Molis, 2014). Of these fatalities 58% occurred on the fire ground. 27 occurred at 15 different structures fires. 31% occurred from rapid fire spread, 3% were from structural collapse and 3% occurred while getting lost inside of a structure.

The fire service has also experienced 65,880 firefighter injuries in 2013 (Karter, Jr., Molis, 2014). 45.2% or 29,760 of the injuries occurred during fire ground operations. 1,530 of the injuries occurred from burns, 1,475 from smoke inhalation, and 4,115 from wounds, cuts, bleeding or bruising.

Could these deaths or injuries been prevented with the information that has been provided from the studies completed by UL (Underwriters Laboratory)? UL has examined how the fire service uses ventilation and suppression practices to extinguish fires (Kerber, 2013). UL studied the changes in how homes are built, including floor plans and the increases use of synthetic fuels.

The investigations examined how those changes influenced the fire behavior and the impact on our current fire fighting tactics in regard to ventilation and fire suppression. One of the biggest outcomes of the study was related to the application of water on a fire from a safe location. It was determined that flowing water on the fire from the exterior for approximately 15 seconds increased the survivability of potential victims as well as improved conditions for firefighters. The majority of firefighters that have been in the fire service for twenty years or more were taught that the application of water from the outside will "push" the fire throughout the structure. With these tactics in mind, the majority of the time, the best way to attack the fire was by making an interior attack prior to the introduction of water from the outside.

The completion of the studies by UL has shown that when water is applied from outside of the structure, the fire is not "pushed" throughout the structure; the fire is extinguished. The interior temperatures are greatly reduced, making the transition to an interior attack safer for firefighters and improves conditions for trapped occupants. The studies have caused the fire service to rethink current firefighting tactics.

Because of the studies performed by UL, the Transitional Fire Attack has been introduced to the fire service. This fire attack is performed by cooling down the interior of a structure from the outside prior to entering.

This is a new concept for the Fairborn Fire Department as well. With any change in the fire service, there is always some resistance. As with most fire departments, the Fairborn Fire Department has experienced injuries and near misses on the fire ground. Injuries are costly to the employee as well as to the city.

The potential impact this study could have on the City of Fairborn Fire Department is a reduction of injuries on the fire ground by changing the tactical approach to fires. Risk vs.

benefit has always been evaluated prior to introducing our firefighters into a hazardous environment. With the information provided in the UL study (Kerber, 2013), fire departments may have the ability to control more of the "risk" aspect of the risk vs. benefit scale. The fears of doing more harm by the possibility of pushing fire throughout the structure by hose lines have been proven false. Due to the information that has been provided, fire departments may be more effective on preserving life and property by attacking the fire from the outside of the structure first, when possible. This approach may improve firefighter safety as well as minimize property loss through a quicker fire extinguishment.

## LITERATURE REVIEW

Karter and Molis (2014) reviewed all the data that was received at the National Fire Protection Association on firefighter injuries in 2013. In 2013, NFPA estimated that there were 65,880 firefighter injuries across the country. Of the 65,880 injuries, 29,760 (45.2%) occurred during fire ground operations, 1,530 occurred from burns, 1,475 from smoke inhalation, and 4,115 from wounds, cuts, bleeding or bruising. The authors found that the leading type of injury received on the fire ground were sprains, strains and muscular pain that accounted for 53% of the injuries.

Fahy, LeBlanc and Molis (2014) reviewed data on the number of firefighter fatalities across the country. The information was pulled together with data that was received at the National Fire Protection Association in 2013. From this data, it was determined that there were 97 on duty firefighter deaths in the United States in 2013. Fifty eight percent of the deaths occurred on the fire ground.

Fahy, LeBlanc and Molis (2015) reviewed data on the number of firefighter fatalities for the year 2014. The information was complied with data that was received by the National Fire Protection Association in 2014. This data indicated that there were 64 firefighter deaths in the United States in 2014. This number represents a significant decrease from the 97 firefighter deaths that occurred in 2013.

Kerber (2013), with Underwriters Laboratory, completed studies on how the fire service uses ventilation and fire suppression practices as well as the impact of changes in modern house geometry. The study looks at how the residential fire environment has changed over the years. The study examined how these changes influenced the fire behavior and our current firefighter tactics in regard to how fire departments use horizontal, vertical ventilation and suppression.

There were a number of reasons that the study was performed. They included: improving firefighting tactics and decision making to reduce the amount of firefighter injuries and deaths across the country, improving firefighter safety to demonstrate the impact of the changes in residential construction on fire behavior, increasing firefighter knowledge of the impact on different firefighting techniques and developing tactical guidelines based on scientific data and incorporate them into firefighting SOGs.

Areas of the study included research in the following areas:

**Today's firefighter workplace:** This area of the study looked at what homes are currently furnished with today. Also, it compared the heat release rates and the time fires reached flashover in legacy homes and modern homes. The time to flashover in legacy homes was determined to be approximately 8 minutes and 2 minutes in the modern home.

**Control the access door:** This area of the study looked at limiting the air intake when entering a structure to attack a fire. It was determined that by controlling the entry door to the fire by closing the door as much as possible once the fire fighters have entered and limiting the amount of air that is introduced will help slow the growth of the fire. This also helped slow the time to flashover. It was determined that the door should be controlled until water is being applied to the fire.

**How big of a hole:** This area of the study evaluated the size of vertical ventilation openings over a ventilation limited fire. It was determined that a 4 ft x 8ft opening did not allow more smoke and hot gases to exit the structure. It was determined that the 4 ft x 8 ft hole did not improve conditions.

**Where do you vent?:** It was determined in the study that ventilating over the fire is the best choice if the fire attack is coordinated. The closer the source of air was to the seat of the fire,

the quicker the fire increases in size. It was also determined that if you ventilate in coordination with the attack crew, it doesn't matter where you ventilate, but the closer to the seat of the fire, the more efficient ventilation will be in removing heat and smoke.

**Stages of fire growth and flow paths:** It was determined that firefighters operating in the flow path of the fire are at significant risk due to the increased flow of fire, heat, and smoke toward their position.

**Timing is everything:** It was determined that the timing of the ventilation opening was extremely important. If the vent opening is not done at the right time, it will have a negative impact on the fire. Ventilating does not always lead to cooling; well-timed and coordinated ventilation will lead to improved conditions.

**Reading smoke:** It was determined that reading smoke was an important component of the size up of a fire. It is easy to get complacent when firefighters have nothing showing when they arrive. This does not necessarily mean that there is not a fire but there may be ventilation limited or fuel limited fire.

**Impact of shut door on victim tenability and firefighter survivability:** It was determined that in every experiment a victim in a bedroom with the door closed was able to survive and function well through the experiment and well after the fire department arrived. In a bedroom with an open door, open potential victims would be unconscious or deceased prior to the fire department’s arrival.

**Softening the target:** It was determined that applying water into the fire compartment as quickly as possible, regardless of where it was applied, can make conditions better in the entire structure. During size-up, firefighters should assess the fastest and safest way to apply water to

the fire. This could be by applying water through a window, through a door, from the exterior or from the interior.

**You can't push fire:** It was determined that applying water to a fire will not push the fire.

**Big volume, apply water to what is burning:** It was determined that in large volume spaces, it is important to put water on what is burning. In modern home floor plans, there are large open spaces. This makes the application of water not the same as a legacy home with smaller rooms. In legacy construction, it is easier to apply water to the burning surfaces due to the smaller rooms. With modern floor plans, the stream of water can end up several rooms away from the room that has flashed over. The same open floor plans can allow water to flow beyond the fire room and can allow for fire suppression of a fire that is several rooms away. The reach of the fire stream can be beneficial in modern floor plans where the reach in legacy homes can be divided due to the lack of open spaces.

National Institute for Occupational Safety and Health. (2015). *Two Career Fire Fighters Die in a Rapid Fire Progression While Searching for Tenants - Ohio* (NIOSH Report # F2014-02) studied the deaths of two career Ohio firefighters who died in a rapid fire progression while searching for tenants. It was determined that there were multiple factors that contributed to the deaths. These factors included Arson, Risk Assessment and Scene Size Up, Resource Deployment, Inadequate Water Supply, Crew Staffing, No Full Time Safety Officer, No Sprinkler System in the Building and Fire Ground Tactics.

One of the key recommendations of the NIOSH report stated that fire departments should integrate current fire behavior research findings developed by the National Institute of Standards and Technology (NIST) and Underwriter's Laboratories (UL) into operational procedures by

developing standard operating procedures, conducting live fire training and revising foreground tactics.

The report also discusses that over the past few years, fire departments have adopted an acronym that details the steps to take when confronted with a fire. The acronym is SLICE-RS. SLICE-RS stands for:

- S - Size Up
- L - Locate the Fire
- I - Identify and control the flow path
- C - Cool the heated space from a safe location
- E - Extinguish the Fire
- R - Rescue
- S - Salvage

The Rescue and Salvage area of the acronym are actions of opportunity. These actions can happen at any time during the fire.

The NIOSH report also discussed the Transitional Fire Attack. The report discusses that previous research of line-of-duty deaths have shown that ventilation events occurring with firefighters inside the structure prior to suppression have led to tragic results. The NIOSH report states that one means of eliminating the possibilities of injury and death would be the Transitional Fire Attack. The NIOSH reports states that the transitional fire attack directs water into the structure from the exterior to cool the fore gases and reduce the heat release of the fire prior to firefighters entering the building.

Hill, (2009, October 1) Risk Management on the Fire ground. *Fire Engineering* discussed the importance of a risk analysis on the fire ground. Hill stated that life-and-death decisions involve a risk/benefit analysis based on two primary goals: the protection of life (civilian and firefighter) and the protection of property. Hill stated that the acceptable level of risk is directly related to the potential benefit of saving life and property. Hill stated that there are four principles of risk management. They are: identification, evaluation, prioritization, and control. When there is no possibility of saving lives, you must evaluate the risk to fire department personnel. Acceptable risks are those in which the positive benefit has a higher value than the negative possibilities posed by the risk. Hill stated that where there is no possibility of saving lives or property, there is no justification for exposing firefighters to any avoidable risk. For these situations, tactics should change from an interior hose line attack to an exterior or defensive fire suppression operation.

David Schottke (2016). Evidence - *Based Practices for Strategic and Tactical Firefighting.* Jones and Bartlett Learning was referenced for this applied research project. This book reviews some of the studies done by the National Institute of Standards and Technology (NIST) as well as the Underwriters Laboratories (UL). The discussion covered (historically) the principle means of developing firefighting strategy and tactics has been based on observations and experiences of firefighters. These observations are called experience-based techniques. These techniques do not provide the means to fully measure and understand the actual progression of fire and the impact of each action taken at the fire scene. Because of these limits, inaccurate conclusions have been drawn. These conclusions have sometimes resulted in ineffective and counterproductive courses of action. Under the *Applying Water: Coordinating Fire Attack* area of the book it discusses that the ability to push fire with a hose stream is not

true. The NIST and UL studies measured the movement of fire and determined in no case was it possible to push the fire with a stream of water. Hose streams do not push fire or other gases. It was determined the movement of fire was dependent on the flow path of heated smoke and gases. The studies determined water being introduced from the outside of the structure produced amazing cooling, not just in the fire compartment, but also in other areas of the fire building.

The transitional fire attack was also discussed. It stated that the Transitional Fire Attack can often put water more effectively on the seat of the fire and sooner, thus making conditions better throughout the building for any trapped occupants. The results of the experiments conducted by NIST and UL require fire departments to reconsider long-standing approaches to ventilation and the application of water into the fire building.

## PROCEDURES

The topic that was chosen for this applied research project is fairly new to the fire service. With the topic being so new, not a great deal of information has been published.

The procedures used to conduct this applied research project started with searching the internet on related topics. Research was done to locate information on departments that have implemented the Transitional Fire Attack. Some of the words used in the search included: Transitional Fire Attack, Fire Service Risk vs. Benefit, Implementing the Transitional Fire Attack, Underwriters Laboratory, and NIST. A great deal of information was found on the Transitional Fire Attack and the studies done by UL and NIST. The majority of the information found online was very positive about the study and the changes happening to the fire service. There are still those that state that this is not new to the fire service and that this has been done for a long time; we have just called it something different. Articles were found that stated that the only way to truly attack a fire was to attack the seat of the fire through the interior. As with most changes in the fire service, there is still controversy about it on the internet.

Multiple NIOSH firefighter fatality reports were reviewed to find related information on what caused the firefighter fatality. In these articles a number of the reports stated that one of the contributing factors was fire ground tactics.

Again, with this change in the fire service so new, it was difficult to find research information on the reduction of injuries or deaths due to changing the way we are starting to attack fires with the Transitional Attack. A great deal of information was found in regards to teaching, training and the benefits of the Transitional Fire Attack, but no real factual numbers on how this change in the fire service has had an impact on firefighting. Although, a number of articles were found that shared a great deal of opinion on the subject.

Several other training manuals and magazine articles were also researched to find information on the applied research topic.

The final step in the research was to send out a survey to a number of departments across the country. This research survey was sent out using Survey Monkey. A large email distribution was generated using the Ohio Fire Chiefs, Greene County Fire Chiefs, and Clark County Fire Chiefs email distribution system. An attempt was made to distribute the survey across the county. The size of the department surveyed was not believed to be significant in regards to the subject that was being researched. The survey was anonymous.

The purpose of the data collection instruments was to see if there are departments across the country that may have implemented the Transitional Fire Attack and have they seen a reduction in injuries. Another area of interest in the study relates to the implementation of the Transitional Fire Attack. Did the departments implementing the Transitional Fire Attack have difficulty in doing so due to resistance from the members?

The survey consisted of 8 multiple choice questions. The questions were designed to be clear and concise in order to be answered quickly. A copy of the survey form is attached as Appendix A. Below is a list of the questions that were asked in the survey. The questions were added to show that there is limited information at this time due to the newness of the subject of this study.

1. Are you aware of the research on the Modern Fire Behavior done by UL and NIST?
2. Has your department changed firefighting tactics as a result of the UL and NIST Modern Fire Behavior studies?
3. What reasons influenced your department's decision to adopt the practices identified in the UL and NIST Modern Fire Behavior studies?

4. Has your department implemented the Transitional Fire Attack?
5. Did your department meet resistance with the implementation of the Transitional Fire Attack?
6. If your department met resistance with the implementation of the Transitional Fire Attack, what were the reasons?
7. Would you agree that the implementation of the Transitional Fire Attack would make the fire ground safer for your firefighters?
8. Has your department seen a reduction of injuries since the adoption of the Transitional Fire Attack?

**Definition of Terms**

NIST- National Institute of Standards and Technology

UL- Underwriters Laboratory

NIOSH - National Institute for Occupational Safety and Health

NFPA - National Fire Protection Association

**Limitations of the Study**

Data on fire ground injuries from structure fires in the city of Fairborn was not readily available. There was no collective data that I could associate with this paper. The city of Fairborn has been fortunate that we have not had many fire ground injuries. The lack of this information makes it difficult to compare what effect the implementation of the Transitional Fire Attack has had on fire ground injuries in Fairborn.

# RESULTS

The results of this applied research project were derived by analyzing the information obtained in the survey that was sent out.

## Research Question 1

How many departments that are aware of the UL and NIST Modern Fire Behavior studies have implemented the Transitional Fire Attack due to the information in the studies?

According to my literature review, the implementation of the Transitional Fire Attack is definitely a topic of discussion within the fire service.

A survey instrument was developed and distributed to departments across the country. Of the surveys sent out, 61 departments responded to the survey. Based on the survey information received, 85% (47) of the survey responses indicated that they have changed their firefighting tactics as a result to the UL and NIST studies; 15% (8) of the survey responses indicated that they have not changed their practices due to the studies; 10% (6) of the survey responses indicated that they were not aware of the UL studies; 56% (31) responses indicated that they have implement the use of the Transitional Fire Attack; 31% (17) responses indicated that they have always used the Transitional Fire Attack and; 13% (7) responses indicated that they have not implemented the Transitional Fire Attack.

Another area of the survey asked the question, “What reasons influenced your department’s decision to adopt the practices identified in the NIST and UL Modern Fire Behavior studies?” The available responses were Firefighter Safety, Proven Scientific Method, Limited Staffing, and lastly, Common Sense. The leading responses in this area were Firefighter Safety 75% (40) responses and Proven Scientific Method (38) responses. Limited Staffing had a response of 45% (24) responses and Common Sense 42% (22) responses.

Firefighter Safety (75%) and Proven Scientific Method (72%) were the top choices.

**Research Question 2**

Have the department's that have adopted the Transitional Fire Attack met firefighter resistance to the changes?

According to the survey that was sent out, 77% (41) responses indicated that they did not meet resistance to the implementation of the Transitional Fire Attack; 23% (12) responses indicated that they did meet some resistance to the implantation of the attack.

With any change in the fire service, there is going to be some resistance to it. This can be for a multitude of reasons. The question asked in the survey that was sent out was, “If your department met resistance with the implementation of the Transitional Fire Attack, what were the reasons?” The choices that were available to respond to were: Issue with Change; Not the Correct Way to Fight Fire; In Conflict with Current Culture and Traditional Practices; Not an Aggressive Enough Fire Attack; and Our Department Did Not Meet Resistance. Sixty nine percent (27) responses indicated that they did not meet resistance to the implementation of the Transitional Fire Attack; 25% (10) responses indicated that the reason for the resistance was due to the attack being in conflict with current culture and traditional practices; 21% (8) responses indicated the resistance was due to an issue with change; 18% (7) responses indicate the resistance was due to the Transitional Fire Attack not being aggressive enough; and 3% (1) response indicated that the Transitional Fire Attack was not the correct way to fight fire.

**Research Question 3**

What departments that have adopted the Transitional Fire Attack noticed a reduction of

injuries since its implementation?

The main reason for the implementation and adoption of the Transitional Fire Attack is to increase the safety to the firefighters across the country. The question asked in the survey wa,s "Has your department seen a reduction of injuries since the implementation of the Transitional Fire Attack?" The available answers to the survey were: Yes, No, and Too Early to Make a Decision; 85% (45) responses indicated that they believed that it was too early to make a decision as to the extent the change will have on firefighter safety; 11% (6) responses indicated that they have not seen a reduction of injuries; and 4% (2) indicated that they have.

Another question asked to get a more detailed view of the fire service was, "Would you agree that the implementation of the Transitional Fire Attack would make the fire ground safer for your fighters?" The available choices for this question were: Agree, Somewhat Agree, Not Sure, Somewhat Disagree, and Disagree; 80% (43) responses indicated that they agreed with the question; 9% (9) indicated that they somewhat agreed; and 4% (2) responses indicated that they were not sure. There were no responses to "Somewhat Disagree and Disagree".

## DISCUSSION

Since the start of this applied research project, t the city of Fairborn Fire Department has started to train on the NIST and UL (Kerber, 2013) Modern Fire Behavior studies. When applicable, the Transitional Fire Attack is also starting to be used during the initial fire ground operations.

The survey results and information reviewed in the literature review indicate that the research completed by NIST and UL are being taken very seriously across the country's fire services. The NIST and UL studies are making a large impact on the current firefighting practices of the fire service. The studies have shown that the way we have been taught to attack fires in the past have been placing our firefighters in more danger than is needed. The UL studies have stated that, "You cannot push fire with water" (Kerber, 2013) and that "applying water to the fire as quickly as possible, regardless of where it is from, can make conditions in the entire structure better." (Kerber, 2013). The NIST and UL studies have shown that we can accomplish the same task of extinguishing the fire and keep our firefighters as safe as possible at the same time. This past practice of firefighting techniques has been taught due to experiences, "This is how we have always done it" and not based on scientific data. This information certainly shows that not implementing and training on the information provided in the NIST and UL studies, could definitely be placing our firefighters in more danger than may be required to obtain the desired result of life, safety and fire extinguishment.

The survey results data indicates that most departments are aware of the NIST and UL studies; 90% of those that participated in the online survey indicated that they were aware of the studies conducted by NIST and UL and 10% indicated that they were not. Of the 90% that indicated that they were aware of the studies, 85% indicated that they had changed the way they

are attacking the fire due to the studies. From the research that has been done on this topic, the Transitional Fire attack is one of the biggest topics of change recently in the fire service.

The survey results also indicated that there are still fire departments that are not aware of the studies. Although the percentage was low, this is still concerning with the importance of the information to the safety of firefighters. We must make sure to be aware of this critical information. Fire departments need to not just understand the Transitional Fire attack, but they need to understand the "why" in how it is being taught. Departments must understand why the change in tactics is so important, not that this is just another baseless change being pushed out to the fire service.

The survey results have also shown that as with any change in the fire service, there is sometimes resistance to it. The survey showed that 23% of the results indicated that the implementation of the Transitional Fire Attack was met with some resistance. There were a number of reasons that the departments met resistance. The change being in conflict with current culture and traditional practices was the top survey result with 26%. This can be for a number of reasons. The fire service has been built on tradition, “This is how we have always done it". It is sometimes difficult to get departments to change it practices. The way they have done it in the past has worked up to this point. Has the approach worked because they have just been "lucky"? It has been taught that the best way to extinguish a fire is to directly attack the fire from the inside. This approach was to prevent the firefighters from "pushing" the fire throughout the structure. Now, changing tactics and telling firefighters to now knock down the fire from the outside and "reset" the fire does not sound aggressive enough. The fire service has been built on the tough, aggressive interior firefighter. The new Transitional Fire Attack does not seem aggressive enough to some due to the current culture of some of our fire departments.

The survey results have also shown that it may be too early to determine if the deployment of the Transitional Fire Attack will decrease the amount of injuries or deaths in the fire service. With this being a fairly new change to the fire service, there is not a great deal of data to show true statistics to the change. Fahy, LeBlanc and Molis (2015) reviewed data on the number of firefighter fatalities across the county for 2014. The report indicated that in 2014, 64 firefighters died while on-duty in the U.S. This number represents a significant decrease from the 97 firefighter deaths that occurred in 2013. Is this decrease in firefighter deaths a result of the changes in firefighting tactics due to the NIST and UL studies? The survey results indicate that it may take some time to get a good picture of how this change is affecting the fire service.

# RECOMMENDATIONS

Although it may be too early to show the statistics on how the Transitional Fire Attack is affecting the safety of firefighters, it is this writer's opinion that not training on and implementing the information provided by NIST and UL will do more harm to our firefighters.

Since this study began, the city of Fairborn Fire Department has spent time teaching the members of the department the NIST and UL study findings. Not providing this information to our members would be negligent on our part. The fire service changes often and it is our responsibility to make sure that our firefighters are the most informed and up to date on the current firefighting trends and practices.

Our department has also been informed of the use of the Transitional Fire Attack. The members of our department have been informed of the myth of pushing fire with our hose lines. Our members have been taught that it is appropriate to cool down a structure from the outside before we enter.

This writer's recommendations echo what has been written above. The first step in the process is to stay up to date on the changes that are happening in the fire service. The fire service is a rapidly changing environment due to changes in technology and science. This takes the effort of all members of a department. Some of this information can be obtained just by searching the internet and joining different fire service educational forums. Another important aspect of staying up to date is getting outside of your department and attending training provided by other departments or companies. It is very easy to become static if departments don't make it a priority to get outside of their departments to see what is going on outside of "their" world.

Another recommendation is to make sure that departments train and inform all of the members of their department on the information being provided by NIST and UL. This is not just by having them read the studies, but to also make available all of the training materials that are out there on the subject. There are a number of videos that break down the study into smaller portions to make the information easier to process. Our firefighters must understand the "why" in what is being taught by the studies. Much of the current firefighting practices are taught because "This is how we have always done it", as well as from past experiences. There has not been much, if any, scientific data to back up the opinions. The fire service has the opportunity now with the studies to show "why" these changes are being taught and has the information to back it up with fact. The ability to see this data allows the firefighters to see the facts behind what is being taught. This will make it much easier for them to implement it in the field.

Practical, hands-on training is also an important portion of the implementation process for the Transitional Fire Attack. As with any other skill in the fire service, it is equally important to do hands on training. While we can learn a great deal of information by reading and watching power point presentations, nothing will reinforce what has been learned better than doing practical evolutions on the learned material. This is the area where it is all put together to help make everything make sense.

In this writer's opinion, the culture of the fire service has always been that we need to get as close as we can to the fire and the hotter we can get, the better. This culture has certainly placed our firefighters in much more danger than needed to extinguish the fire. This culture exists because of our past practices of teaching. For years, it has been taught that we don't throw water from the outside if we have intentions of making an interior attack. Therefore, the majority of fire attacks were interior attacks, battling through the heat and smoke. This is the image of the

American firefighter. Now getting this mindset to change causes a great deal of conflict within our departments. Being taught that it is good to cool a structure from the outside before we enter causes some stress to the firefighters. Teaching the NIST and UL information will hopefully take away the fear of not being aggressive enough and show that they are a better trained and educated firefighter and able to accomplish the same task and keep themselves and their crews safer. This is the most important part of our job.

In regards to implementing policy for the Transitional Fire Attack, this would be up to the individual departments. The Transitional Fire Attack is a tool in our toolbox that will certainly keep our firefighters safer and at less risk for death and injury when used properly. The Transitional Fire Attack is not always an option. To write policy would be difficult. Guidelines would be a more appropriate document. Every fire that we deal with is different from the last. A document that would address every possible encounter would be quite a lengthy document.

In conclusion, preventing injuries and deaths to our firefighters is the most important aspect of our job. Not listening and learning from those that have taken the time to study the science of fire for the purpose of protecting our firefighters would be negligent, at best. It will take time to change the “macho” culture of the fire departments across the country to fully embrace the modern fire studies and to implement them 100%. It is this writer’s opinion, the fire service will certainly see a decrease in the number of firefighter injuries and deaths as a result.

# REFERENCES

Karter and Molis (2014) *U.S. Firefighter Injuries - 2013.* National Fire Protection Association, Fire Analysis and Research Division, Retrieved from http://www.nfpa.org/research/reports-and-statistics/the-fire-service/fatalities-and-injuries/firefighter-injuries-in-the-united-states

Fahy, LeBlanc and Molis (2014) *Firefighter Fatalities in the United States - 2013,*National Fire Protection Association, Fire Analysis and Research Division, Retrieved fromhttp://www.nfpa.org/research/reports-and-statistics/the-fire-service/fatalities-and-injuries/firefighter-fatalities-in-the-united-states

Fahy, LeBlanc and Molis (2015)*Firefighter Fatalities in the United States - 2014,*National Fire Protection Association, Fire Analysis and Research Division, Retrieved fromhttp://www.nfpa.org/research/reports-and-statistics/the-fire-service/fatalities-and-injuries/firefighter-fatalities-in-the-united-states

Kerber (2013) *Study of the Effectiveness of Fire Service Vertical Ventilation and Suppression Tactics in Single Family Homes,* UL Firefighter Safety Research Institute, Retrieved from http://ulfirefightersafety.com/wp-content/uploads/2013/07/UL-FSRI-2010-DHS-Report_Comp.pdf

National Institute for Occupational Safety and Heath. (2015) *Two Career Fire Fighters Die in a Rapid Fire progression While Searching for Tenants - Ohio* (NIOSH Report No. F2014-02) Retrieved from http://wwwn.cdc.gov/NIOSH-fire-fighter-face/Default.cshtml?state=OH&Incident_Year=2014&Medical_Related=ALL&Trauma_Related=ALL&Submit=Submit

Hill, (2009,October 1) Risk Management on the Fireground. *Fire Engineering,* Retrieved fromhttp://www.fireengineering.com/articles/print/volume-162/issue-10/features/risk-management-on0.html

Schottke, D (2016) *Evidence -Based Practices for Strategic and Tactical Firefighting.* Jones and Bartlett Learning

## APPENDIX 1 – SURVEY RESPONSES

**Question 1)**

Are you aware of the research on Modern Fire Behavior that has been conducted by NIST and UL? If the answer is "No", please do not complete the rest of the survey.

Yes - 90.16% 55 Responses

No - 9.94% 6 Responses

**Question 2)**

Has your department changed fire fighting tactics as a result of the NIST and UL Modern Fire Behavior studies (i.e.: Transitional Fire Attack, Controlling the Flow Path etc.)?

Yes - 85.45% 47 Responses

No - 14.55% 8 Responses

**Question 3)**

What reasons influenced your department's decision to adopt the practices identified in the NIST and UL Modern Fire Behavior studies?

Firefighter Safety - 75.47% 40 Responses

Proven Scientific Method - 71.70% 38 Responses

Limited Staffing - 45.28% 24 Responses

Common Sense - 41.51% 22 Responses

**Question 4)**

Has your department implemented the Transitional Fire Attack?

Yes - 56.36% 31 Responses

No - 12.73% 7 Responses

We have always used the Transitional Fire Attack - 30.91% 17 Responses

**Question 5)**

Did your department meet resistance with the implementation of the Transitional Fire Attack?

Yes - 22.64% 12 Responses

No - 77.36% 41 Responses

**Question 6)**

If your department met resistance with the implementation of the Transitional Fire Attack, what were the reasons?

Issue with change - 20.51% 8 Responses

Not the correct way to fight fire - 2.56% 1 Response

In conflict with current culture and traditional practices - 25.64% 10 Responses

Not an aggressive enough fire attack - 17.95% 7 Responses

Our department did not meet resistance - 69.23% 27 Responses

**Question 7)**

Would you agree that the implementation of the Transitional Fire Attack would make the fire ground safer for your firefighters?

Agree - 79.63% 43 Responses

Somewhat Agree - 16.67% 9 Responses

Not Sure - 3.70% 2 Responses

Somewhat Disagree - 0.00% 0 Responses

Disagree - 0.00% 0 Responses

**Question 8)**

Has your department seen a reduction of injuries since the implementation of the Transitional Fire Attack?

| | |
|---|---|
| Yes - 3.77% | 2 Responses |
| No - 11.32% | 6 Responses |
| Too early to make a decision - 84.91% | 45 Responses |