Surviving the Crash

The Need to Improve Lifesaving Measures at Our Nation's Airports

Coalition for
Airport and Airplane Passenger Safety

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Table of Contents

List of Figures and Tables iii

Coalition for Airport and Airplane Passenger Safety Member Organizations iv

Executive Summary 1

Glossary of Acronyms 4

Section 1, Introduction 5

Section 2, Background 7
- Aviation Accident Survival Rates 7
- Current Post-Crash Protection at Airports 9

Section 3, Updating Aircraft Rescue and Fire Fighting Standards 11
- Reducing Post-Impact Fatalities 12
- Expanding ARFF Personnel's Mission 13
  - NFPA Recommendations 14
  - DOD Regulations 14
  - ICAO Recommendations 15
- Reducing Response Times 15
- Limitations of Mutual Aid and Joint Response 16
- Setting Appropriate Staffing Levels 19
  - OSHA Regulations 24
  - DOD Regulations 24
  - NFPA Recommendations 26
- Determining the Quantity of Water, Apparatus, and Agents 28

Section 4, Preparing for Other Emergency Incidents 31
- Fighting Structural Fires and Providing Emergency Medical Services 32

EMS Recommended Guidelines 33
AHA, NIH Guidelines 34
Responding to Hazardous Material Incidents 35
DOD Regulations 35
OSHA Regulations 35
NFPA Regulations 36
Requiring Terrorism Response And Consequence Training 37

SECTION 5, CONCLUSION: CHALLENGES FOR THE FAA 39

ENDNOTES 43

List of Figures and Tables

Figures

Figure 1, Location of Landing and Takeoff Accidents 18

Tables

Table 1, Total Fatalities in Survivable Aviation Accidents, 1970-1995 8

Table 2, Table Comparison of Response Times of FAA Part 139, NFPA 403, DODI 6055.6, and ICAO Recommendation 9.2.19 and 9.2.20 17

Table 3, Index of ARFF Protection by Airport Size 21

Table 4, Remission Factor ARFF Protection for Airport Size Category 22

Table 5, Staffing Requirements for Fire Apparatus 25

Table 6, Extinguishing Agents Required by Part 139 28

Table 7, Extinguishing Agents Required by NFPA 403 28

Table 8, Extinguishing Agents Required by DODI 6055.6 29

Table 9, Extinguishing Agents Required by ICAO Chapter 9 29

Table 10, DODI 6055.6 Maximum Response Times for Structural Fire Pumpers 33

Coalition for Airport and Airplane Safety Member Organizations

- International Association of Fire Fighters
- International Association of Fire Chiefs
- National Fire Protection Association
- International Brotherhood of Teamsters
- Transport Workers Union
- National Air Traffic Controllers Association
- Air Line Pilots Association
- Association of Flight Attendants
- International Union of Police Associations
- International Association of Machinists and Aerospace Workers
- Transportation Trades Department, AFL-CIO

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Executive Summary

Take a few hundred people, put them in a long, narrow, aluminum tube, seat them closely together, surround them with thousands of gallons of jet fuel, give them only a few exits to use, and you have what may be a fire safety official's worst nightmare.

—Jeffrey A. Marcus, Civil Aeromedical Institute of the FAA

Today many airports across the United States are completely unprepared to respond in the first few vital minutes after an airplane crashes and fires ignite, when lives hang in the balance.

Most airplane crashes occur during takeoffs and landings, and when airport fire fighters can reach crash victims in those first minutes, the survival rate is near 100 percent. Unfortunately, too many airports do not have the capability to respond that quickly because they lack the necessary fire fighting personnel and equipment. This shortfall places the lives of passengers and fire fighters in jeopardy.

With more than 530 million passengers and crew flying in and out of our nation's airports each year, the potential for a disaster today is greater than ever.

Current Federal Aviation Administration (FAA) regulations do not provide for fire fighters to rescue passengers or extinguish fires inside an airplane. So, when aviation accidents do occur at

airports, the results are more devastating and the loss of life is greater than necessary. The FAA continues to enforce outdated safety regulations that fail to require steps necessary to increase the chances of aircraft passengers surviving a crash.

These outdated FAA regulations also do not recognize a host of risk factors involved in the complex world of our nation's airports, including the heavy concentration of passengers in terminals; emergency medical needs; hazardous materials; and threats from terrorists using weapons of mass destruction. The result of this policy is that hundreds of thousands of airline passengers and crew members face unnecessary dangers on the runways and in the terminals of many airports because emergency response capabilities fall below accepted standards.

Current FAA airport safety regulations offer less protection to the travelling public than those to those prescribed by the Department of Defense (DOD) for their installations and personnel. FAA regulations also fall well below the recommendations of national standard-setting bodies such as the National Fire Protection Association (NFPA), the Occupational Safety and Health Administration (OSHA), and the International Civil Aviation Organization (ICAO). These organizations recommend regulations that increase crash survival through improved emergency response by fire fighters to such accidents.

Compliance is a serious problem. A survey of airport emergency services conducted by the International Association of Fire Fighters in 1993 found that existing FAA regulations are often ignored when it comes to passenger safety. For example, the FAA requires airports to suspend air operations when fire protection falls below prescribed minimum levels. However, 66 percent of the survey respondents reported that even when fire protection was below the FAA minimum, airplanes continued to land and takeoff.

Recognizing the potential for disaster and using the criteria of the above organizations as a model, the FAA must revise its airport rescue and fire fighting regulations to maximize the chances of survival for passengers and crew involved in an airplane crash at an airport.

Because the existing regulations are outdated and do not reflect today's airport safety needs, the Coalition for Airport and Airplane Passenger Safety (CAAPS) recommends the following changes to the existing FAA regulations (14 CFR §139).

RECOMMENDATIONS

- Assign ARFF personnel the mission for initiating exterior and interior aircraft fire suppression, and rescuing aviation crash victims who cannot escape on their own.
- Adopt standards that set a minimum number of ARFF stations and staffing levels necessary to meet reduced minimum response times.
- Set staffing levels to ensure the highest degree of ARFF protection, modeled on staffing levels of other federal agencies and private sector standards-setting organizations.
- Revise the amount of fire extinguishing agents and vehicles specified so they are adequate to extinguish both interior and exterior aviation fires.
- Require ARFF personnel to respond to airport structural fires and medical emergencies.
- Assign ARFF personnel the responsibility for airport HAZMAT incidents.
- Require ARFF personnel to participate in planning for terrorist incidents and to adequately train and equip their personnel to manage the consequences of a terrorism attack.

The FAA must update its regulations to keep pace with the impact of ever-expanding air traffic and the critical safety needs at our nation's airports. The more than 530 million airline passengers and crew members who use our airports each year deserve no less. The organizations that belong to CAAPS (listed on page iv) urge the FAA to move quickly to implement the modern airport safety regulations outlined in this report.

Glossary of Acronyms

AFA	Association of Flight Attendants
AHA	American Heart Association
ALPA	Air Line Pilots Association
ARFF	Airport Rescue and Fire Fighting
CAAPS	Coalition for Airport and Airplane Passenger Safety
DOD	Department of Defense
DDI	Department of Defense Instruction
EMS	Emergency Medical Service
FAA	Federal Aviation Administration
HAZMAT	Hazardous Materials
IAFC	International Association of Fire Chiefs
IAFF	International Association of Fire Fighters
IBT	International Brotherhood of Teamsters
ICAO	International Civil Aviation Organization
IDLH	Immediately Dangerous to Life and Health
IAM	International Association of Machinists and Aerospace Workers
IUPA	International Union of Police Associations
NATCA	National Air Traffic Controllers Association
NFPA	National Fire Protection Association
NIH	National Institutes of Health
NTSB	National Transportation Safety Board
OSHA	Occupational Health and Safety Administration
TTD	Transportation Trades Department, AFL-CIO
TWU	Transport Workers Union

SECTION 1
INTRODUCTION

[T]he interior of the plane began to fill with intense, heavy black smoke, which was extraordinarily painful to breathe and very toxic. . . . It quickly became pitch black in the cabin from the heavy smoke, in spite of the bright light from the fire on the left side of the plane. I could only make out the vague outlines of people directly in front of me. As I moved down the aisle, I encountered a mob of fighting, frenzied people jamming the aisle trying like myself to get out of the burning aircraft.

By this time, I was feeling very faint and I later guessed I only had about 15 to 30 seconds of consciousness left. Every breath caused me to convulse and was extremely painful.

I crawled and stumbled away from the plane and ran about 30 yards before stopping. My lungs hurt terribly and I coughed and choked badly for about 5 minutes before I could breathe normally again.[1]

David H. Koch, USAir Flight 1493 Survivor

Aviation safety is a top concern of the public as air transportation continues to attract an increasing number of travelers. Since 1960, air travel and air traffic have steadily increased. From 1960 to 1996, the number of passengers on U.S. airlines has increased more than tenfold, from 52 million in 1960 to 530 million in 1996.[2] Forecasters believe this trend will continue well into the next century. The Federal Aviation Administration (FAA) predicts that, in the year 2008, commercial air carriers will fly nearly a billion passengers.[3]

Air travel is unique among other transportation modes because aviation accidents—even relatively minor ones—can result in mass casualties due to the unique nature of aviation and commercial airplanes. When automobiles collide, trains derail, or ships sink, passengers may face the triple threat of blunt trauma, fire, and smoke. However, these accidents do not deteriorate at a lightning pace as often happens when an airplane crashes at an airport at approximately 150 mph. The plane often ignites a fire that produces black toxic smoke, engulfing the cabin within seconds.

Essentially, a commercial airplane is like a crowded office building, occupied by as many as 600 people. But unlike the spacious high-ceiling suites of a skyscraper, passengers are crowded into a tightly confined cabin. Thus, even a small fire in one end of the cabin will produce blinding, toxic smoke that will engulf every passenger almost instantly. In the ensuing panic, passengers must then try to navigate the tight confines of a narrow aisle and reach one of the few emergency exits.

Because of these unique features, air travel receives a tremendous amount of attention from government regulators, and aviation accidents receive considerable media attention.

The potential for disaster has increased significantly in recent years because more planes are carrying larger numbers of passengers, often flying to and from facilities not equipped or staffed to handle this increased traffic. More specifically, these facilities are ill prepared to respond to aviation accidents because they are operating under outdated regulations designed when fewer travelers were flying in smaller aircraft landing at facilities handling far less traffic than is the case today.

To bring attention to this situation and to recommend ways of solving these problems, the Coalition for Airport and Airplane Passenger Safety (CAAPS), which includes several organizations representing aviation safety interests, is publishing this document. CAAPS' goal is to explain why the federal government must review and upgrade its aviation regulations if it is to improve lifesaving measures at the nation's airports.

SECTION 2
BACKGROUND

SUMMARY: The FAA, the federal agency responsible for regulatory oversight of commercial aviation in the United States, establishes and promulgates regulations for airport rescue and fire fighting operations. Although air travel is a relatively safe transportation mode, post-impact aviation accident fatalities can be reduced through improved safety standards.

To ensure safety in air transportation, government officials have implemented two types of regulations: those designed to prevent accidents and those designed to optimize passengers' and crews' chances of survival when an accident occurs. This document addresses those regulations concerning accident survival.

Aviation Accident Survival Rates

Most air safety regulations governing aviation were first developed decades ago by the FAA, the agency that, as part of the Department of Transportation (DOT), is responsible at the federal level for ensuring safety at airports in this country. The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation (railroad, highway, marine, and pipeline). The NTSB's mission is to determine probable cause of transportation accidents and to issue safety recommendations aimed at preventing accidents. Despite the best efforts of the FAA, NTSB, and other federal, state, and local regulatory and

safety authorities, accidents still occur. Evidence shows, however, that most commercial aviation accidents are survivable.

The commonly held belief that any aircraft mishap spells certain doom for its occupants is unsupported by the government's records. Short of a catastrophic incident when a plane explodes or slams into the earth, most aviation accidents are survivable because the vast majority occur on or near airports during takeoffs and landings.

Although takeoff, initial climb, approach, and landing account for only 18 percent of flight time, they account for 79.9 percent of all accidents.[4] Takeoffs and landings place passengers and crew in circumstances most vulnerable to accidents; the lower speeds and angles, however, generally result in noncatastrophic accidents and provide the best chance for survival. Additionally, newer designs used in aircraft construction are more durable, significantly increasing the crash worthiness of airplanes. Taken together, these factors have dramatically raised survival rates.

A review of 60 NTSB reports of survivable aviation accidents (accidents in which conditions would allow for the possibility of survivors) from 1970 to 1995 shows that the survival rate was better than 16 survivors for every person killed.[5] As Table 1 illustrates, these accidents resulted in 452 fatalities.

The NTSB reports classified fatalities in three categories: during the impact, post-impact, and those that occurred at an undeterminable time. Excluding undeterminable fatalities, 78 percent of all fatalities occurred post-impact; almost all (95.4 percent) resulted from smoke inhalation and/or burns. If the 327 people who died during post-impact accidents had been rescued, the survival rate for the 7,488 people involved would have been 98.3 percent.

The FAA can increase the rate of post-impact crash survivors. This life-saving effort can be accomplished by revamping its regulations to upgrade fire fighter response to accidents, thus ensuring better protection for aircraft occupants.

	Impact		Post-Impact		Undeterminable		Total	
	No.	%	No.	%	No.	%	No.	%
Fatalities	92	20.4	327	72.3	33	7.3	**452**	100

Table 1, Total Fatalities in Survivable Aviation Accidents, 1970-1995
Source: National Transportation Safety Board

Current Post-Crash Protection at Airports

In 1993, the International Association of Fire Fighters (IAFF) conducted a survey of airport rescue and fire fighting protection (ARFF) at 147 major U.S. airports. Forty ARFF departments from some of the nation's largest airports responded to the survey. The survey reveals the risk aviation passengers unknowingly take every day when they fly because understaffed airport fire fighters are overwhelmed by the volume of emergency calls and cannot protect the public as they expect and deserve.

The survey revealed that in 1993 these airports had an average of:

- 8.1 million passengers,
- 440,000 aircraft takeoffs and landings,
- 5.8 square miles,
- 708 accidents and/or incidents (an occurrence other than an accident associated with the operation of an aircraft, which affects or could affect the safety of operations), and
- as few as 5 ARFF fire fighters posted in 1.2 fire stations.

The FAA requires airports to suspend air operations when ARFF protection falls below prescribed levels. However, 66 percent of the survey respondents reported that even when ARFF protection was below the FAA minimum, airplanes continued to land and takeoff.

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SECTION 3
UPDATING AIRCRAFT RESCUE AND FIRE FIGHTING STANDARDS

SUMMARY: The FAA must acknowledge the need for new rescue and fire fighting regulations that recognize the safety challenges of modern aircraft. Models for updated response times, staffing levels, and vehicles already exist in the standards used by the military and recommended by private standards-setting organizations.

Current ARFF regulations at U.S. airports are defined in 14 CFR §139, *Certification and Operations: Land Airports Serving Certain Air Carriers* (referred to as Part 139). These regulations are integral to promoting aviation safety and minimizing post-accident consequences. However, the current regulations provide inadequate protection to the traveling public. Since the regulations were first written decades ago, airplanes have been redesigned with different seating configurations and greater capacity for both passengers and fuel. Today, Part 139 fails to recognize the environment in which fire and rescue personnel must operate:

> *Take a few hundred people, put them in a long, narrow, aluminum tube, seat them closely together, surround them with thousands of gallons of jet fuel, give them only a few exits to use, and you have what may be a fire safety official's "worst nightmare."*[6]
>
> *—Jeffrey A. Marcus, Civil Aeromedical Institute of the FAA*

The FAA has recognized the need to increase accident survival rates, requiring materials with reduced flammability. The FAA, however, must ensure that everyone who can survive an aviation

accident does survive. The FAA partially updated Part 139 in 1988, but these regulations are less stringent than those now in use at DOD air facilities and those recommended by private standards-setting organizations.

Reducing Post-Impact Fatalities

The FAA can make several specific changes to Part 139 to reduce aviation accident fatalities. As indicated in the previous section, the best opportunity for increasing aviation survival rates lies in improving the response to post-impact survivors. In most accidents, crash survivors immediately face the dangers of fire and smoke inhalation; those who cannot exit quickly are killed by toxic smoke. This toxic smoke contains deadly compounds, such as hydrogen chloride, hydrogen fluoride, cyanide, and carbon monoxide that can cause unconsciousness in only one or two breaths.

To reduce fatalities from post-impact fire and smoke inhalation, Part 139 must be revised to mandate victim rescue and interior fire suppression as part of the airport fire service's mission. Part 139 must include more stringent response time requirements, increase ARFF staffing for a comprehensive response capability, and improve extinguishing agent requirements. The NTSB's chairman agrees that these regulations must be revised, and notes that DOD standards offer a good model for the FAA to follow:

> *[T]he current mission set forth in 14 CFR, Part 139 to "provide an escape path from a burning airplane" no longer suffices. The [National Transportation] Safety Board supports a full study of the mission statement by the FAA with a view towards providing adequate Aircraft Rescue and Fire Fighting resources to rapidly extinguish aircraft interior fires and to extricate aircraft occupants from such interior fires. All aspects of this issue including staffing, equipment, extinguishing agents, firefighter training, and response time should be evaluated and compared with DOD standards to develop a broader mission statement that includes interior cabin fire suppression and extrication of aircraft occupants.*[7]
>
> *–Jim Hall, NTSB chairman*

The task of improving federal aviation regulations does not need to be a difficult one. Adopting more effective and stringent regulations would improve aviation safety. In fact, much of the work and research to improve Part 139 has been done by other agencies and organizations. These include the National Fire Protection Association (NFPA),[8] Department of Defense (DOD), and the International Civil Aviation Organization (ICAO).[9] The NFPA, DOD, and ICAO guidelines share a common approach to aircraft rescue and fire fighting. They acknowledge that a quick response by adequately staffed fire fighters who have the mission of rescuing victims and fighting interior cabin fires with appropriate equipment and extinguishing agents saves lives.

Expanding ARFF Personnel's Mission

The FAA is the only standard setting body in the United States that does not recognize victim rescue and interior fire fighting as an integral part of the fire fighter's job description. Unlike aviation accidents depicted in the movies, when an airplane crashes, the runway is not lined with flashing lights from fire trucks occupied with fire fighters ready to take whatever action is necessary to rescue victims and fight interior cabin fires. In reality, Part 139 instructs fire fighters to provide only enough fire protection to ensure a single path through burning jet fuel for those fortunate passengers who can escape on their own.

Under FAA rules, flight crews—not airport fire fighters—evacuate passengers from airplanes.[10] The crew members' primary duty is to ensure passenger safety. But in spite of the training or the experience of flight crews, it is unrealistic to assume that they would be unaffected by the chaotic effects of a crash landing, or the toxic fumes of an on-board fire. Even low-velocity automobile accidents leave the occupants disoriented. An airplane crash is much more extreme—especially if the situation deteriorates quickly as smoke and fire fill the cabin and the shock of the crash turns to panic. The abilities of any person to assist others in such a situation could be diminished.

Fire fighters' primary duty is to preserve life. However, the ARFF regulations do not specifically address airport fire fighters' abili-

ties to rescue victims and fight interior fires. The FAA's limited mandate results in limited staffing and response capabilities. The FAA requires fire fighters only to provide one escape path from burning airplanes. The agency does not require fire fighters either to help evacuate passengers or conduct aircraft cabin fire suppression.

When a home catches fire and lives are in danger, fire fighters rescue the home's occupants and put out the fire. They do more than provide an escape path from a burning home. Yet, this is precisely the direction FAA regulations give ARFF departments. At an aircraft accident, Part 139 merely requires responding ARFF teams to discharge extinguishing agents around the exterior of the downed aircraft and to provide a single path through burning fuel for passengers and crew to escape. This limited ARFF mission, and the resulting staff limitations, inadequately use ARFF capabilities and restricts fire and rescue workers' ability to save lives. The American public rightfully expects and deserves better protection while flying.

NFPA Standards

NFPA 402, "Guide for Aircraft Rescue and Fire Fighting Operations," addresses ARFF rescue teams' procedures and equipment for evacuating airplanes.[11] Essentially, the NFPA recommends that ARFF personnel refrain from entering an aircraft until individuals who are able to self-evacuate exit the cabin. Then fire fighters can enter the cabin to help the others and begin interior fire suppression.

DOD Regulations

Under the Department of Defense Instruction (DODI) 6055.6, "DOD Fire and Emergency Services Program" (the regulation that governs the fire protection program at DOD installations), each military airport is required to have a dedicated rescue team composed of trained fire fighters whose mission includes specific aircraft rescue tasks.[12] Military airports are equipped with rescue vehicles staffed by ARFF personnel using state-of-the-art rescue tools.

ICAO Standards

ICAO recommends that ARFF responsibilities encompass rescuing victims. "The principle objective of a rescue and fire fighting service is to save lives. . . . This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following an aircraft accident or incident, or at any time during ***rescue*** operations"[13] (emphasis added).

To mitigate the harrowing experience of David H. Koch, USAir Flight 1493 survivor, and other aviation accident victims, the FAA must assign ARFF personnel the mission of fighting interior fuselage fires—a practice not currently included in Part 139—and rescuing trapped victims.

RECOMMENDATION

Amend 14 CFR §139 so that ARFF personnel have the mission of initiating exterior and interior aircraft fire suppression, and extricating trapped victims.

Reducing Response Times

Whatever the role of ARFF personnel at an aviation accident, there is ample evidence to verify that they must arrive at the accident scene in less than three minutes if they are to save lives. Observing this response-time threshold is critical because ARFF fire fighters have a very small window of opportunity in which to respond.

In aborted takeoffs, violent braking and other stresses may severely damage the landing gear and cause it to collapse. As a plane topples to its belly, fuel tanks are likely to rupture, spilling thousands of gallons of flammable aviation fuel. In nearly all such cases, the fuel ignites from either sparks caused by metal skidding against the runway or by snapped electrical wires. An intense inferno, reaching temperatures of 2,500 F, quickly engulfs the

airplane. The airplane's aluminum skin may burn through in one minute, and in another two to three minutes the inside temperature reaches a lethal 1,800 F. The total elapsed time from beginning of a fuel fire until conditions become fatal is three to four minutes. Therefore, ARFF personnel must arrive at the accident within three minutes if they are to have any chance of rescuing passengers and crew.

Even though the FAA's own tests show that the conditions in the fuselage of a downed airplane may become deadly within three to four minutes, the FAA's response times for fire apparatus at crash scenes are three minutes for the first apparatus, four minutes for the remaining apparatus.[14] As Table 2 shows, NFPA, DOD, and ICAO minimum response times are more rigorous than the FAA's. Of equal concern is the FAA's obsolete regulation concerning where the first apparatus must be in three minutes. NFPA, DOD and ICAO regulations all require that the first apparatus arrive at the accident within a shorter period of time—no mater where the accident occurs, on or off the runway. The FAA regulation does not require the first apparatus to arrive at the accident in three minutes; the regulation only requires that the first apparatus arrive at the midpoint of the farthest runway in three minutes—even though the accident may be much farther away, such as beyond the end of the farthest runway.

Accident records compiled by the Air Line Pilots Association show that most accidents occur at either end of the runway. Figure 1 shows the locations of over 500 aviation accidents occurring during landing and takeoff.[15]

The FAA's response time problem cannot simply be corrected by lowering response times. The response time to an accident is a function of staffing and location. ARFF staffing levels are a major concern of CAAPS because staffing affects both the response times to accidents, it affects the character of an accident response.

Limitations of Mutual Aid and Joint Response

In determining staffing and equipment needs for civilian airports, the FAA consistently relies on two approaches involving off-airport fire fighters: mutual aid and joint response. Mutual aid is the support an airport receives from fire departments in surrounding jurisdictions. Joint response refers to support from fire fight-

REGULATION	LOCATION	FIRST APPARATUS IN MINUTES	ALL OTHER APPARATUS IN MINUTES
FAA Part 139	Midpoint of the farthest runway	3	4
NFPA 403	Any point on the operational runways (Any point up to 1650 ft. off the end of runway)	2 (2.5)	2.5 (3)
DODI 6055.6	Any point on the operational runways or overruns	3	3
ICAO 9.2.19 and 9.2.20	Any point on the operational runways, as well as any other part of the movement area	2	3

Table 2, Comparison of Response Times of FAA Part 139, NFPA 403, DODI 6055.6, and ICAO Recommendation 9.2.19 and 9.2.20
Source: FAA, NFPA, DOD, ICAO

ers located outside the boundaries of an airport, but who are part of the same fire department. The FAA's mutual aid and joint response expectations are unrealistic and constitute a loophole in its ARFF policy.

As detailed in the next section, FAA regulations currently permit staffing ratios of as few as one ARFF fire fighter for 280 passengers. The FAA justifies these levels in part because the ARFF personnel at airport premises are viewed as just the first element that responds to aviation accidents. To the FAA, mutual aid with off-airport fire departments represents the complete fire fighting response capabilities of airports. The FAA considers mutual aid and joint response fire teams as part of the first line of defense, even though the ARFF station should by itself be the first line of defense, with comprehensive response capabilities. Although mutual aid is necessary, the way it is practiced has two major flaws.

First, as explained previously, responding to aircraft accidents in less than three minutes is essential to reducing post-impact fatalities.

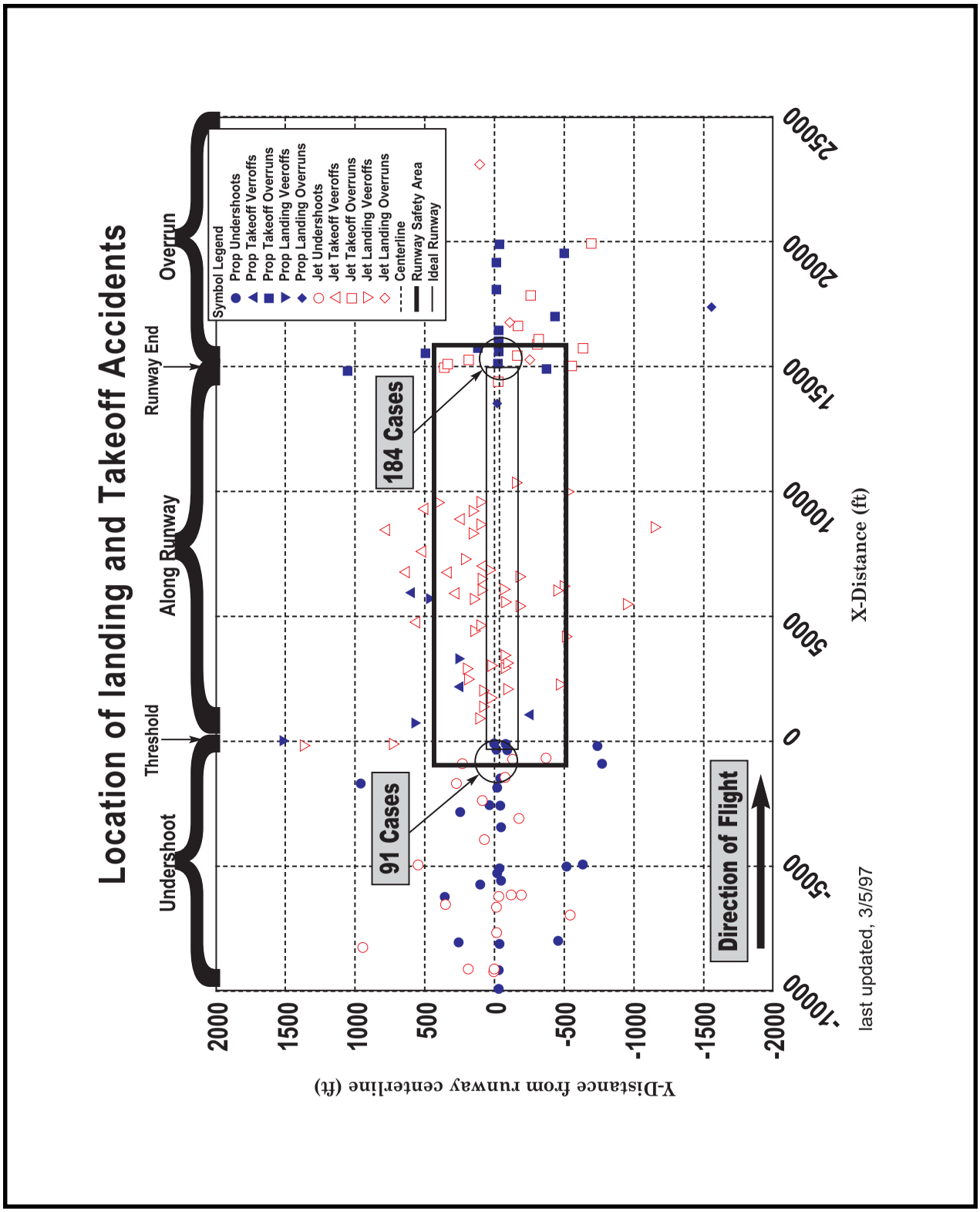

Figure 1, Location of Landing and Takeoff Accidents
Source: Air Line Pilots Association

At most airports, however, it is virtually impossible for mutual aid units to respond to an accident within four minutes. An initial ARFF truck would expend its extinguishing agent well before mutual aid or joint response fire fighters reach the scene. Only fully-staffed ARFF stations with comprehensive response capabilities would be capable of timely exterior and interior fire fighting and rescue.

Second, mutual aid units' lack of specialized ARFF training and aircraft familiarization compromises their effectiveness. The FAA requires these fire fighters to conduct an Airport Emergency Preparedness Exercise, the sole activity comparable to joint training between on-airport and off-airport fire departments, only once every three years. This training, however, has two flaws. First, it occurs too infrequently. Second, instead of unannounced drills that would simulate real emergencies, the FAA conducts exercises that allow for an unrealistic level of preparation.

RECOMMENDATION

Amend 14 CFR §139 so that it explicitly adopts NFPA 403 response time standards, recognizing that ARFF response times to incidents are a function of fire station location and staffing levels.

Setting Appropriate Staffing Levels

Because Part 139's staffing levels are based on the policy that flight crews are responsible for evacuating passengers and ARFF fire fighters are responsible for providing one escape path, it permits airports to staff skeleton ARFF stations. In fact, some airports have difficulty maintaining even one adequately staffed ARFF station. This ARFF worker's comments illustrate the problem:

[O]ur main concern has to do with our manpower situation. . . . It appears that we are willing to sacrifice the safety of our men not to mention the lives of those who are depending on us. . . . It seems that the attitude of some airport management teams is to provide the minimum protection without regard to the safety of those utilizing air service or for those charged with the responsibility of protecting those customers. It is unfortunate that once again we see how the dollar sign can control and out prioritize the safety of our fellow citizens and our brother fire fighters.[17]

—John J. Demyan
ARFF Fire Fighter
Lehigh-Northampton Airport, PA

To correct this situation, the FAA must recognize that responding to aircraft crashes is inherently dangerous. When ARFF personnel respond to air crashes they provide structural fire fighting in an environment classified in government regulations as being "immediately dangerous to life and heath" (IDLH). The FAA must ensure the health and safety of victims and ARFF personnel by establishing safety procedures for structural fire fighting in IDLH environments like those required by the Occupational Safety and Health Administration (OSHA), the DOD, and the NFPA. The FAA must revise ARFF staffing requirements, detailed in Part 139, to establish minimum staffing levels that allow ARFF crews to comply with these existing federal regulations and industry consensus standards.

Part 139 stipulates the minimum number of fire fighting vehicles required at each size airport, identified on an FAA Airport Index by letter designations from "A" (the smallest) to "E" (the largest), but fails to address the minimum number of ARFF personnel for each vehicle (see Table 3). Unlike DOD's ARFF staffing requirements, nowhere in Part 139 does the FAA address the minimum number of ARFF personnel that must be on duty during airport operations for the proper staffing of fire apparatus.

Because Part 139 lacks this minimum, airport authorities assume the FAA requires only enough rescue and fire fighting personnel be available during all air carrier operations to operate the vehicles and to meet the response times and the minimum fire fighting agent discharge rates. So without the FAA's objection, airports have interpreted Part 139 to mean that a single fire fighter in a fire truck can do the job of a whole ARFF department: drive the apparatus to the scene

and then conduct enough fire fighting to provide an escape path. Examining each airport's size and its apparent staffing requirements and showing the minimum number of personnel for each vehicle, as depicted in Table 3, reveals the inadequacy of the FAA staffing requirements.

Airport authorities have further reduced staffing levels through what is termed the "remission factor." The remission factor is based on the assumption that the chance of an accident occurring is directly proportional to the number of operations of the aircraft into the airport. This factor allows airports to drop to the next lower category in the index if the largest aircraft does not use the airport more than five times a day.[18] Table 4 shows the ARFF protection at each airport for the largest airplanes.

Airport Index	A	B	C	D	E
Max. Aircraft Length (ft.)	<90	90<126	126<159	159<200	>200
Largest Aircraft	BAe 146-100-30	B-737-400	Airbus A310	L-1011-500	B-747-400
Max. Fuel Capacity	3,127 gal./ 20,640 lbs.	6,120 gal./ 40,400 lbs.	16,431 gal./ 108,444 lbs.	23,812 gal./ 157,159 lbs.	53,984 gal./ 356,294 lbs.
Max. Seating Capacity	86	170	280	400	592
Number of Fire Fighting Vehicles	1	1 or 2	2 or 3	3	3
Total Fire Fighting Agent Required	500 lb. DC/ Halon 1211 or 450 lb. DC and 100 gal. of H_2O	Same as A and 1,500 gal. of H_2O	Same as A and 3,000 gal. of H_2O	Same as A and 4,000 gal. of H_2O	Same as A and 6,000 gal. of H_2O
Apparent ARFF Staffing Requirement/ Source	1 §139.317(a)	1 §139.317(b)	2 §139.317(c)	3 §139.317(d)	3 §139.317(e)

Table 3, Index of ARFF Protection by Airport Size
Source: FAA Part 139

Airport Index	A	B	C	D	E
Largest Aircraft	BAe 146-100-30	B-737-400	Airbus A310	L-1011-500	B-747-400
Max. Seating Capacity	86	170	280	400	592
Number of Fire Fighting Vehicles	1	1	1 or 2	2 or 3	3
Total Fire Fighting Agent Required	500 lb. DC/ Halon 1211 or 450 lb. DC and 100 gal. of H_2O	Same as A	Same as A plus 1,500 gal. of H_2O	Same as A plus 3,000 gal. of H_2O	Same as A plus 4,000 gal. of H_2O
Apparent ARFF Staffing Requirement	1	1	1	2	3
Effect of Remission	No change: minimum standard under regulations	Causes loss of 1,500 gal. of H_2O	Causes loss of 1,500 gal. of H_2O and 1 ARFF staff	Causes loss of 1,000 gal. of H_2O and 1 ARFF staff	Causes loss of 2,000 gal. of H_2O

Table 4, Remission Factor ARFF Protection for Airport Size Category
Source: FAA Part 139

Clearly, one fire fighter cannot protect the lives of as many as 280 people. Yet current FAA regulations allow airport authorities to provide such minimal staffing at our airports. The benefits of adequate staffing have already been experienced at one of the nation's largest airports: Miami International Airport in Dade County, FL.

Fine Airlines Flight 101 crashed after takeoff from Miami International on August 7, 1997. The response to this situation clearly demonstrates the benefits of having more than one ARFF fire fighter on each fire-fighting vehicle. The Fine Air DC-8 crashed about 3,000 feet from the end of the departure runway in a busy industrial complex. The cargo plane, with 5,700 gallons of fuel, immediately burst into flames just yards from a warehouse and retail stores. The four-member crew and one person on the ground were killed on impact. Five Metro Dade County ARFF vehicles and one rescue unit responded in two and a half minutes. Another 10 fire fighting vehicles and 9 rescue units arrived minutes later. In

all, more than 100 emergency response personnel were involved. As a result of the quick and adequate response in the first two and a half minutes, the fuel-fed fire was brought completely under control within 15 minutes without any additional injuries or fatalities.

The success of the Miami emergency call can be traced directly to having multiple ARFF personnel in the first four vehicles. Because each vehicle was adequately staffed, there were enough fire fighters to battle the blaze while others were free to run hoses to fire hydrants. The four ARFF vehicles had a continuous flow of extinguishing agents—a critical factor in limiting injuries and deaths. If Metro Dade had responded with one ARFF fire fighter in each vehicle, the results could have been disastrous. The first four responding vehicles would have exhausted their extinguishing agent within minutes and could not have replenished their supply. Consequently, the later arriving fire fighters would have faced an uncontrolled fire, resulting in more deaths, injuries, and property damage. By responding with adequate personnel, the fire department prevented injury to ARFF personnel and minimized property damage.

Interestingly, the FAA has taken more of a safety-first approach when it comes to cabin safety and airline flight attendant staffing. The FAA requires a minimum of one flight attendant for every 50 passenger seats.[19] In comparison, the possible ratio of the number of passenger seats one fire fighter is expected to handle is set much higher:

- 86 passenger seats in Index A airports,
- 170 passenger seats in Index B,
- 280 passenger seats in Index C,
- 200 passenger seats in Index D,
- 197 passenger seats in Index E.

The FAA contends that because it charges air carriers with the evacuation responsibility, it requires a lower flight attendant to passenger seats ratio. However, if the FAA believes flight attendants will receive any meaningful assistance from the responding ARFF personnel, it is dangerously mistaken. When one fire fighter is responsible for as many as 280 passengers, it will be impossible for a fire fighter to conduct any sort of effective emergency response, let alone rescue victims and fight interior cabin fires. Such minimal standards are not allowed outside

airports where OSHA standards are mandatory when fire fighters respond to structural fires.

OSHA Regulations

Not all airports follow OSHA regulations, the safety standards followed by municipal fire departments. OSHA defines interior structural fire fighting as the act of providing fire suppression or rescue inside of a building or other enclosed structure.[20] Recognizing the hazards of such conditions, all DOD air facilities observe OSHA's requirement that fire fighters entering an aircraft operate in teams of two or more. This deployment pattern, commonly called "two in/two out," ensures the health and safety of fire fighters. Those teams must be in direct voice or visual contact at all times. Furthermore, two in/two out requires that a standby team of two equivalently trained and equipped fire fighters be present outside the hazard area for assistance or rescue at emergency operations where entry into the danger area is required.[21] The standby team is responsible for maintaining an awareness of the identity, location, and status of fire fighters working in the IDLH area.

DOD Regulations

In contrast to Part 139, the DOD has a more strict staffing regulation. DODI 6055.6 Enclosure 3 regulates ARFF staffing at all military airports and "establish[es] and maintain[s] an installation fire fighting, fire prevention, and emergency services program as an element of the overall DOD accident prevention program. . . ." [22]

Unlike Part 139, which is silent on ARFF rescue mission and staffing levels, DODI 6055.6 clearly enumerates personnel requirements to protect the welfare of military personnel and fire fighters. Table 5 compares the DODI's explicit staffing requirements with the FAA's Part 139.

Additionally, the DOD has adopted OSHA's two in/two out fire ground safety regulations and has expanded the definition of IDLH environment to include all areas within 75 feet radius of the downed airplane.[23]

The higher priority that DOD places on the health and safety of the people under its jurisdiction is best illustrated at over 100 airports that serve dual roles as civilian and military facilities. At these airports there are two ARFF staffing requirements, one for civilian flights and another for military flights. For commercial flights Part 139 requires only minimal ARFF protection. However, for military flights the ARFF staffing is increased to the level prescribed in DODI 6055.6. Once the military concludes its operation, the airport reduces ARFF personnel on duty to Part 139 prescribed levels.

The FAA justifies the disparity between its staffing regulations and the DOD's because of the alleged uniqueness of military airports. In a report to Congress, FAA officials said that "[u]nlike its civil counterpart, the military airfield or installation must be self-reliant" because of security issues and geographic isolation.[24] FAA officials also said that the military cannot employ mutual aid because off-base fire fighters, who lack security clearance, might be delayed or prevented from entering a military airport. Yet the

Fire Apparatus Identifiers	DOD Positions Required Per Vehicle	FAA Positions Required Per Vehicle
ARFF fire fighting apparatus	3	N/A
ARFF rescue apparatus	3	N/A
ARFF tanker and/or resupply apparatus	1	N/A
ARFF twinned agent apparatus	2	N/A
Structural pumpers	4	N/A
Aerial ladders	4	N/A
Structural rescue apparatus	2	N/A
HAZMAT apparatus	2	N/A
Structural tanker and/or resupply apparatus	2	N/A

Table 5, Staffing Requirements for Fire Apparatus [25]
Source: DOD, FAA

FAA ignores geographic isolation and the time required to respond from off-airport fire stations to an airport accident when defending its mutual aid and joint response policy. Like the military, civilian airports must have fully-staffed, self-sufficient ARFF stations with comprehensive response capabilities.

NFPA Standards

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, defines "structural fire fighting" to be the following:

> *"The activities of rescue, fire suppression, and property conservation in buildings, enclosed structures, aircraft interiors, vehicles, vessels, or like properties that are involved in a fire or emergency situation."*[26]

At these scenes, NFPA also requires the two in/two out safety procedures.[27]

The FAA is the nation's only regulatory agency and standard setting body that does not explicitly recognize victim rescue and fire suppression as central to in the job description of ARFF personnel.

The lack of adequate FAA ARFF staffing requirements at civil airports is perhaps the greatest factor limiting the ability of ARFF teams to save lives. Not only does this lack of specificity understate what is actually necessary—because a single fire fighter is unlikely to create an exterior escape path—it completely ignores the need for an aggressive interior attack to rescue passengers and crew. Furthermore, airport fire departments find their resources, personnel, and organization dangerously stretched as medical emergencies and hazardous material (HAZMAT) incidents command more of their time. Indeed, it is questionable whether some airports can adequately respond to a single airplane crash, let alone handle simultaneous emergency incidents occurring on the airport premises.

A systematic method of determining an ARFF presence with comprehensive response capabilities would be to identify all airport incident risk factors. These risk factors include the following:

- the physical size of the airport,
- the number of passengers each day,
- the number of daily operations,

- the number of runways simultaneously in use,
- the size of the largest aircraft,
- location of the fire station(s),
- location of water supply,
- the multiple duties assigned to the ARFF department, and
- the availability and timeliness of mutual aid.

Analyzing these risk factors to determine ARFF staffing would ensure that there are sufficient ARFF personnel to fight fires, rescue victims, treat medical emergencies, and respond to hazardous material releases.

RECOMMENDATION

Amend 14 CFR §139.319(j)(5) so that it adopts 29 CFR §1910.134, OSHA's two in/two out fire ground safety regulation to ensure appropriate staffing levels for comprehensive response capabilities to provide the highest degree of ARFF protection (similar to staffing levels specified by the DOD), and incorporates by reference NFPA standards 1500, 414,[28] 1976,[29] and 1981.[30]

Determining the Quantity of Water, Apparatus, and Agents

When airplanes crash, the FAA requires that a certain amount of water be delivered to the burning aircraft in a specified time. Although this is a common-sense approach to fire fighting, the times specified are inadequate for the designated aircraft. The quantities of extinguishing agents required by Part 139 are inadequate to extinguish a modern aircraft heavy with fuel. As Tables 6-9 demonstrate, the FAA's prescribed quantities are lower than those of the NFPA, DOD, and ICAO.

FAA Airport Size Category	A	B	C	D	E
Length of Aircraft (ft.)	<90	90<126	126<159	159<200	>200
ARFF Vehicles Required	1	1 or 2	2 or 3	3	3
Total Fire Fighting Agent Required	500 lb. DC/Halon 1211 or 450 lb. DC and 100 gal. of H_2O	Same as A and 1,500 gal. of H_2O	Same as A and 3,000 gal. of H_2O	Same as A and 4,000 gal. of H_2O	Same as A and 6,000 gal. of H_2O

Table 6, Extinguishing Agents Required by Part 139 [31]
Source: Part 139

NFPA Airport Size Category	5	6	7	8	9
Length of Aircraft (ft.)	<90	<126	<160	<200	<250
ARFF Vehicles Required	2	2	3	3	4
Total Fire Fighting Agent Required	450 lb. DC/Halon 1211 and 2700 gal. of H_2O	Same as 5 and 3450 gal. of H_2O	Same as 5 and 4550 gal. of H_2O	900 lb. DC/Halon 1211 and 7300 gal. of H_2O	Same as 8 and 9000 gal. of H_2O

Table 7, Extinguishing Agents Required by NFPA 403 [32]
Source: NFPA 403

DOD Airfield Size Category	A	B	C	D	E
Length of Aircraft (ft.)	Small Craft/ Helicopters	<75	<100	<175	>175
ARFF Vehicles Required	Individual Components Decide	2	3	3	4
Total Fire Fighting Agent Required	Individual Components Decide	2,000 gal. Of H_2O	3,000 gal. Of H_2O	9,000 gal. Of H_2O	12,000 gal. Of H_2O

Table 8, Extinguishing Agents Required by DODI 6055.6 [33]
Source: DODI 6055.6

ICAO Airport Size Category	5	6	7	8	9
Length of Aircraft (ft.)	79<92	90<128	128<161	161<200	200<249
ARFF Vehicles Required	1	2	2	3	3
Total Fire Fighting Agent Required	1,427 gal. of H_2O	2,087 gal. of H_2O	3,196 gal. of H_2O	4,808 gal. of H_2O	6,419 gal. of H_2O

Table 9, Extinguishing Agents Required by ICAO Chapter 9 [34]
Source: ICAO Chapter 9

A study by a Dallas Fire Department ARFF officer contains evidence that Part 139 is outdated. The study suggests that the FAA's recommended quantities are lower than the actual amounts of water used at recorded accidents.[35] Additionally, the FAA's minimum discharge rates are designed so that fire fighters can provide only an "escape path" for evacuating passengers and crew. Consequently, the FAA fails to specify adequate extinguishing agent quantities to extinguish either aircraft interior or exterior fires.

RECOMMENDATION

Amend 14 CFR §139.317 by adopting NFPA 403 and 414 so that the fire extinguishing agent amounts specified and vehicles specified are adequate to extinguish both interior and exterior aviation fires.

SECTION 4
PREPARING FOR OTHER EMERGENCY INCIDENTS

SUMMARY: To reflect the increasing responsibilities assigned to ARFF personnel, and the accompanying danger, the FAA should revise its regulations and mandate new training to address exterior and interior structural fire fighting techniques, emergency medical services, and HAZMAT/ terrorism response and consequence management.

The job of ARFF fire fighters in recent years has become more complex and difficult. In addition to their long-standing responsibilities for responding to aircraft accidents, ARFF personnel today must be prepared to respond in many other types of situations, such as fighting structural fires and delivering emergency medical services. Additionally, fire fighters increasingly are faced with incidents involving hazardous materials. Those situations may be the result of accidental spills or the deliberate actions of terrorists.

FAA regulations assign responsibility for some of these activities to local communities and ignore the increasing complexity of managing such situations, not to mention the significant growth in the size of modern airport facilities. To be prepared for these new challenges, ARFF personnel must receive new and more targeted training to prepare them for the full range of emergencies that can arise on airport premises.

Fighting Structural Fires and Providing Emergency Medical Services

To advance the welfare of the traveling public, the FAA, state, and local governmental authorities must recognize that airport fire fighters face new challenges because of the significant increase in the size of airport terminals and the accompanying increase in passenger traffic. According to FAA statistics, in 1997 more than 641 million passengers used our nation's airports. This number does not include visitors who use the dozens of shops and restaurants found at most airports. Yet the FAA does not require ARFF personnel to respond to structural fires or to provide emergency medical services (EMS).

Structural fires and medical emergencies can occur anywhere on airport property. At the nation's largest airports these facilities may involve several square miles of concourses, terminals, and parking structures. As with aviation accidents, response time is critical when responding to these emergency incidents. A fire in a busy terminal could cause mass casualties if not quickly contained. Similarly, a heart attack experienced by a passenger or visitor to an airport may not be fatal if ARFF personnel provide timely medical attention.

Yet, as with the FAA's outdated response times and staffing levels, current regulations do not even recognize ARFF personnel as the logical first responders to a structural fire or EMS response. Part 139 does not require airport ARFF departments to respond to structural or medical emergencies unrelated to aviation accidents. Lacking a regulation mandating an airport medical emergency response policy, airports have implemented ad hoc emergency response measures. This situation has led to wide disparities in the delivery of emergency services where some airports have excellent emergency response plans that save lives, while others have poor plans.

Structural Fires

To ensure that ARFF personnel are prepared to respond to structural fires, the FAA must require that airport fire fighters receive

appropriate training, and follow related OSHA regulations. These include the two-in/two-out fire ground safety regulation.[36] This OSHA standard is one of the most important safety advances for fire fighters in this decade, and is the first federal standard that links fire ground staffing with fire fighter safety. Two-in/two-out requires that a minimum of two fire fighters work as a team inside the structure and a minimum of two fire fighters be on standby outside the structure to provide assistance or perform rescue.

DOD Regulations

DODI 6055.6 requires the installation's ARFF station to respond to on-site structural fires. Table 10 shows the maximum response times for select structures on military airports.[37]

Description	First 50% of Required Response (minutes)	Remaining 50% of Required Response (minutes)
Shops and Industrial Buildings	5	10
Hangars	5	10
Warehouses	5	10
Technical Facilities	5	10
Hospitals	5	10
Administrative	7	14

Table 10, DODI 6055.6 Maximum Response Times for Structural Fire Pumpers
Source: DOD

EMS Recommended Guidelines

It is estimated that 1,000 people die each year worldwide from heart attacks suffered on commercial flights. To limit these tragic deaths, Congress approved and President Bill Clinton signed P.L. 105-170, which directs the FAA to study whether commercial airplanes should be equipped with and flight attendants trained in the use of automatic external defibrillators.

Beyond the 1,000 who die during commercial fights, there are thousands of additional medical emergencies occurring annually

at U.S. airports, including many heart attacks. However, the FAA has yet to respond with comparable regulations that would improve responses to airport medical emergencies by giving ARFF personnel access to and training in defibrillators or other equipment now being given to some flight attendants.

AHA, NIH Guidelines

In a seminal 1992 medical journal article, the American Heart Association (AHA) stressed the importance of quick medical intervention for surviving out-of-hospital heart attacks.[38] The AHA emphasized that for cardiac arrests, the highest survival rates occur when patients receive CPR within four minutes of the heart attack, and advanced cardiac life support within eight minutes.[39]

A year later the National Institutes of Health (NIH) issued staffing guidelines for EMS systems that echo the same need for quick response. The NIH guidelines recommend that "[a] first responder should arrive at [a medical emergency] scene less than five minutes from the time of dispatch in 90 percent of all such calls."[40]

RECOMMENDATION

Amend 14 CFR §139 so that it assigns ARFF personnel responsibility for airport structural fires and medical emergencies, and so that it incorporates accepted safety, training, and equipment practices for structural fires and medical emergencies occurring on airport premises.

Responding to Hazardous Material Incidents

Today, significant amounts of hazardous materials are routinely present at airports.[41] So many hazardous materials are used at airports that the Environmental Protection Agency was petitioned to add airports to the list of industries required to report releases under the Toxic Release Inventory.[42]

Because it considers airports part of local communities, the FAA chose to defer jurisdiction on HAZMAT issues, relying on local governments to develop disaster plans for responding to airport HAZMAT incidents. As for day-to-day HAZMAT procedures, Part 139 gives airport authorities and air carriers discretion on how to handle and store hazardous materials that are transported by air.[43] Air carriers are, of course, responsible for their cargo, but their employees know how to handle only contained hazardous materials. They are unprepared for emergency situations involving hazardous materials released by accident.

DOD Regulations

By contrast, on-site fire stations have the responsibility for HAZMAT incidents at military installations. DODI 6055.6 includes requirements for all aspects of HAZMAT work:

- assessing HAZMAT risks,
- response planning, and
- forming HAZMAT response teams.[44]

Additionally, Occupational Safety and Health Administration regulations require training for all employees who handle hazardous materials.[45]

OSHA Regulations

OSHA regulation 29 CFR § 1910.120 governs the safety and

health aspects of hazardous materials operations and emergency response to uncontrolled hazardous materials releases. This regulation addresses six issues that have an impact on emergency response personnel: medical surveillance, training, emergency response, incident management, decontamination procedures and chemical suit testing.

NFPA Regulations

NFPA has two consensus documents specifically concerning HAZMAT incidents, 471[46] and 472.[47] NFPA 471 outlines minimum requirements and operating guidelines for responding to HAZMAT incidents. The practices described in NFPA 471 apply to all organizations responding to HAZMAT incidents, including incident commanders responsible for managing HAZMAT incidents. NFPA 471 specifically covers the following:

- planning procedures,
- policies,
- application of procedures for incident levels,
- personal protective equipment,
- decontamination,
- safety, and
- communications.

NFPA 472 specifies competencies required for different levels of HAZMAT responders. It specifies competencies for first responders at the awareness and operations levels. The regulation also lays out requirements for hazardous materials technicians and incident commanders.

As when other airport emergencies occur, waiting for municipal mutual-aid responders to handle HAZMAT incidents is a dangerously ineffective way to protect public safety. A more productive approach would be to train ARFF fire fighters to handle hazardous cargo spills or other HAZMAT situations that occur on airport

premises. At a minimum, these individuals need operations level HAZMAT training.[48] Doing so would enable ARFF personnel to identify HAZMAT situations and protect nearby persons and property.

RECOMMENDATION

Amend 14 CFR §139 so that it specifies that ARFF personnel have the responsibility for airport HAZMAT incidents and it adopts OSHA's operations and safety procedure, 29 CFR §1910.120, and NFPA 471 and 472.

Requiring Terrorism Response And Consequence Training

As evidenced by recent domestic terrorist bombings, terrorism is a real threat to public safety. Fortunately, no American airport has been victimized by a terrorist attack. However, the threat of terrorism has forced airports to implement security measures under 14 CFR §§107 and 108 that frequently affect the operation of ARFF services. Airport fire fighters and security personnel are often the only individuals who could effectively respond to the immediate consequences of terrorist incidents involving weapons of mass destruction.

The FAA only requires airport operators to have an emergency plan to confront terrorist incidents, but does not require airport operators to practice or validate these plans. This dichotomy results in inconsistent and inadequate procedures for terrorism response and consequence management.

By contrast, NFPA 402 recommends that ARFF departments' role in bomb threat emergencies include helping to evacuate aircraft, assuming standby status, remaining in readiness, and, in the event of detonation, taking command and control of any rescue operation or fire incident that results.[49]

Part 139 must be improved to more specifically address ARFF's role in these situations. Given the recent history of domestic terrorism in our country, the FAA must draft and develop a terrorism incident procedure that integrates fire and security operations.

RECOMMENDATION

Amend 14 CFR §139 so that ARFF personnel participate in planning for terrorist incidents, and are adequately trained and equipped to manage the consequences of a terrorism attack, including those involving weapons of mass destruction.

SECTION 5
CONCLUSION: CHALLENGES FOR THE FAA

ARFF departments are struggling to provide adequate protection to the traveling public because ARFF regulations leave airport authorities room for discretion and interpretation. If an airport authority chooses to maximize its profits, it can use these ambiguities to justify cutting airport ARFF department budgets. Although this approach may improve the facility's balance sheet, it undoubtedly will severely reduce public safety. Such funding cuts have the FAA's tacit approval because the FAA has not seen the need to maintain its standards in response to changes in aircraft and airport design and the increasingly complex demands placed on fire and rescue workers.

The tragic consequences of obsolete FAA regulations were clearly exposed on November 19, 1996. United Express Flight 5925, carrying 10 passengers and 2 crew members, collided with a Beechcraft King Air A90 general aviation aircraft, carrying 2 people, at the Quincy Municipal Airport, near Quincy, Ill. At the time of the collision, Flight 5925 was landing and the King Air was taking off. All 14 people involved in the accident survived the impact forces; however, all 14 people died in the post-impact fire.[50]

Witnesses who ran to the accident scene immediately after the collision said that they heard sounds of life from within the cabin of Flight 5925, and that the captain talked to them from the cockpit.[51] However, the occupants of Flight 5925 could not escape from the burning plane because the cabin door was jammed and could not be opened by either the passengers or the witnesses who tried to assist. The Quincy Fire Department, located about 10 miles away, was dispatched to Quincy Airport within 2 minutes of the collision. It took them almost 14 minutes to arrive on the scene.[52] By that time, both planes were engulfed in flames. Quincy Airport had one ARFF truck, but it was not staffed be-

cause FAA regulations require an ARFF presence only for aircraft with seating capacity of more than 30 passengers or operating under Part 121.[53]

The autopsy reports revealed that all 14 people involved in the accident died of carbon monoxide poisoning or inhalation of combustion products from the post-impact fire.[54] The NTSB determined that the absence of ARFF protection at Quincy Airport contributed to the severity of the accident. If properly staffed, that truck would have reached the accident site in no more than one minute.[55] The NTSB concluded that had ARFF protection been required, lives could have been saved.[56] It recommended that the FAA extend its ARFF services requirement to all airports served by aircraft having 10 or more passenger seats and find ways to fund such protection.[57] To date, the FAA has not followed these recommendations.

As the Quincy situation and others illustrate, there is a need for the FAA to do a better job of ensuring public safety. The FAA can do a better job if it improves Part 139—especially at a time when improved cabin technology has helped to keep more people alive beyond the impact, and when fire fighters have better tools to rescue victims. It is critically important that the FAA adopt specific standards for the ARFF regulations that reflect realities of modern aviation and ensure that air travel remains a safe and dependable form of transportation. CAAPS, which is composed of organizations concerned with public safety at American airports, urges the FAA to enact the following recommendations to improve aviation safety.

RECOMMENDATIONS

- *Mission:* Amend 14 CFR §139 so that ARFF personnel have the mission of initiating exterior and interior aircraft fire suppression, and extricating trapped victims.

- *Response Times:* Amend 14 CFR §139 so that it explicitly adopts NFPA 403 response time standards, recognizing that ARFF response times to incidents are a function of fire station location and staffing levels.

- *Staffing Levels and Vehicle Standards:* Amend 14 CFR §139.319(j)(5) so that it adopts 29 CFR §1910.134, OSHA's two in/two out fire ground safety regulation, to ensure appropriate staffing levels for comprehensive response capabilities to provide the highest degree of ARFF protection (similar to staffing levels specified by the DOD), and incorporates by reference NFPA standards 414, 1976, and 1981.

- *Fire Extinguishing Agents:* Amend 14 CFR §139.317 by adopting NFPA 403 and 414 so that the fire extinguishing agent amounts specified and vehicles specified are adequate to extinguish both interior and exterior aviation fires.

- *Structural Fire Fighting and EMS:* Amend 14 CFR §139 so that it assigns ARFF personnel responsibility for airport structural fires and medical emergencies, and so that it incorporates accepted safety, training, and equipment practices for structural fires and medical emergencies occurring on airport premises.

- *HAZMAT Response:* Amend 14 CFR §139 so that it specifies that ARFF personnel have the responsibility for airport HAZMAT incidents and it adopts OSHA's operations and safety procedure, 29 CFR §1910.120, and NFPA 471 and 472.

- *Terrorism Response:* Amend 14 CFR §139 so that ARFF personnel are participants in planning for terrorist incidents and are adequately trained and equipped to manage the consequences of a terrorism attack, including those involving weapons of mass destruction.

Due to recent catastrophic aviation accidents, the DOT and the FAA have launched a new program to reduce the U.S. fatal accident rate by 80 percent over the next 10 years by focusing on preventative measures such as requiring more rigorous engine inspections and the mandatory installation of enhanced ground-warning systems. Although the FAA's program to prevent aviation accidents is laudable, the agency is not doing what it could do to mitigate the aftermath of accidents. No matter how demanding preventative measures are or how diligently they are enforced, aviation accidents will occur at airports. Therefore, ARFF regulations must be improved so that all those who can survive an aviation accident, do survive.

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ENDNOTES

[1] David H. Koch, *Recollections of My Survival of an Airplane Crash*, excerpted from Ralph Nader, Wesley J. Smith, *Collision Course: The Truth About Airline Safety*, (1994).

[2] Air Transport Association of America, *Airline Traffic Statistics 1960-96.*

[3] Federal Aviation Administration, *FAA Aviation Forecasts: Commercial Air Carriers FY 1997-2008.*

[4] Boeing Commercial Airplane Group, *Statistical Summary of Commercial Jet Airplane Accidents Worldwide Operations 1959-1996*, at 27 (1997).

[5] National Transportation Safety Board accident reports were reviewed between 1970 and 1995. Of the 138 accidents that occurred during this interval, the NTSB determined that 60 were survivable or partially survivable.

[6] Civil Aeromedical Institute of the Federal Aviation Administration, *Federal Air Surgeons Medical Bulletin*, "Getting Out Fast is Getting Out Alive," Issue 941 (1994).

[7] National Transportation Safety Board comments to Federal Aviation Administration responding to a Notice of Opportunity for Comments, *Airport Rescue and Firefighting Mission Response Study* (1996).

[8] The National Fire Protection Association is the consensus codes and standards-making body of the American fire service. The association's membership is composed of diverse fire-based organizations and individuals, ranging from fire fighters to insurance companies to manufactures to governmental agencies. Using their diverse expertise, the members develop consensus fire safety standards.

[9] The International Civil Aviation Organization was created in 1944 to promote the safe and orderly development of civil aviation in the world. A specialized agency of the United Nations, it sets international standards and regulations necessary for the safety, security, efficiency, and regularity of air transport and serves as the medium for cooperation in all fields of civil aviation among its 185 Contracting States.

[10] Federal Aviation Administration, *Report to Congress: Aircraft Rescue and Firefighting Services—Mission Response Study* (1996).

[11] National Fire Protection Association, *NFPA 402 Guide for Aircraft Rescue and Fire Fighting Operations*, at Chapters 7-9 (1996).

[12] Department of Defense, *Department of Defense Instructions 6055.6* (1994) incorporates by reference Air Force Instructions 32-2001 which specifies ARFF mission scope. DOD revisions to 6055.6 are expected in the near future but were not available when this document was published.

[13] International Civil Aviation Organization, *Standards and Recommended Practices of ICAO*, at 105 (1995).

[14] Tim Marker, FAA, *Full Scale Test Evaluation of Aircraft Fuel Fire Burn Through Resistance Improvement* (1999).

[15] Air Line Pilots Association, *Location of Landing and Takeoff Accidents*, compiled from 1952 to 1997.

[16] IAFF S-6 Airport Fire Fighters comments to the FAA responding to a Notice of Opportunity for Comments, *Airport Rescue and Firefighting—Mission Response Study* (1996).

[17] Lehigh-Northampton Airport Firefighters Union comments to the FAA responding to a Notice of Opportunity for Comments, *Airport Rescue and Firefighting—Mission Response Study* (1996).

[18] 14 CFR §139.315(c).

[19] 14 CFR §121.391.

[20] 29 CFR §1910.134.

[21] 29 CFR 1910.134(g)(3) and (4)

[22] Department of Defense, *Department of Defense Instructions 6055.6,* at 2 (1994).

[23] Via Air Force Policy Directive 32-20.

[24] Federal Aviation Administration, *Report to Congress: Aircraft Rescue and Firefighting Services—Mission Response Study,* at 2 (1996).

[25] Department of Defense, *Department of Defense Instructions 6055.6 E7,* at 22 (1994).

[26] National Fire Protection Association, *NFPA 1500 Standard on Fire Department Occupational Safety and Health Programs,* at Chapter 1 (1997).

[27] National Fire Protection Association, *NFPA 1500 Standard on Fire Department Occupational Safety and Health Programs,* at Chapters 6-4.3 & 6-4.4 (1997).

[28] National Fire Protection Association, *NFPA 414 Standard for Aircraft Rescue and Fire-Fighting Vehicles* (1995).

[29] National Fire Protection Association, *NFPA 1976 Protective Clothing for Proximity Fire Fighting* (1992).

[30] National Fire Protection Association, *NFPA 1981 Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service* (1997).

[31] 14 CFR §139.317.

[32] National Fire Protection Association, *NFPA 403 Aircraft Rescue and Fire Fighting Services at Airports,* at Chapter 3-3 (1993).

[33] Department of Defense, *Department of Defense Instructions 6055.6 E3,* at 18 (1994).

[34] ICAO, *Standards and Recommended Practices of ICAO,* at 107 (1995).

[35] Captain George Freeman, ARFF Coordinator, Dallas Fire Department, *Aircraft Fires—Agency Requirements: Minimum Extinguishing Agent Quantities* (1996).

[36] 29 CFR 1910.134, 29 CFR 1910.120(q)(3), and Section 5(1)(a) of the Occupational Safety and Health Act (the “general duty clause”).

See also National Fire Protection Association, *NFPA 1500 Fire Department Occupational Safety and Health Program,* at 6-4.1.1 (1997).

[37] Department of Defense, *Department of Defense Instructions 6055.6,* at E4 (1994).

[38] Journal of the American Medical Association, *Guide for Cardiopulmonary Resuscitation and Emergency Cardiac Care,* at 2184, Vol. 268, No. 76; October 28, 1992.

[39] *Id.*

[40] National Institutes of Health, *Staffing and Equipping Emergency Medical Services Systems,* at 10 (1993).

[41] Federal Aviation Administration, *Report to Congress: Aircraft Rescue and Firefighting Services—Mission Response Study,* at 10 (1996).

[42] The Toxic Release Inventory is a publicly available database that lists information about hundreds of highly-toxic materials. The database was established on the premise that citizens have the right to know about harmful chemicals in their communities, and has become a powerful tool for emergency responders.

[43] 14 CFR 139.321.

[44] Department of Defense, *Department of Defense Instructions 6055.6 E2.4.1.2 and E2.5.1* at 8 and 9 (1994).

[45] 29 CFR 1920.120.

[46] National Fire Protection Association, *NFPA 471 Recommended Practice for Responding to Hazardous Materials Incidents* (1997).

[47] National Fire Protection Association, *NFPA 472 Professional Competence of Responders to Hazardous Materials Incidents* (1997).

[48] 29 CFR 1920.120(q).

[49] National Fire Protection Association, *NFPA 402 Guide for Aircraft Rescue and Fire Fighting Operations,* at Chapter 10 (1996).

[50] National Transportation Safety Board, *NTSB Aircraft Accident Report: Runway Collision United Express Flight 5925 and Beechcraft*

King Air A90 at Quincy Municipal Airport Quincy, IL, on November 19, 1996, NTSB/AAR-97/04, PB97-910404 at 53 (1997).

[51] *Id.*, at 48.

[52] *Id.*, at 51.

[53] See 14 CFR §§139.3 and 139.319.

[54] National Transportation Safety Board, *NTSB Aircraft Accident Report: Runway Collision United Express Flight 5925 and Beechcraft King Air A90 at Quincy Municipal Airport Quincy, IL on November 19, 1996*, NTSB/AAR-97/04, PB97-910404, at 48 (1997).

[55] *Id.*, at 51.

[56] *Id.*, at vi, 51, 53, 54.

[57] *Id.*, at 55.

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