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Civil Engineering

**AIRCRAFT RESCUE AND FIRE FIGHTING
(ARFF) STAFFING AND VEHICLE
CAPABILITY NOTIFICATION
REQUIREMENTS**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFI 32-2001 requirements. It explains ARFF staffing and vehicle capabilities and limitations, and provides a capability matrix that allows commanders to determine risks involved in continuing aircraft maintenance and flight operations. Provides the Wing Commander with the necessary risk management tool to use in determining fire protection capabilities as they pertain to mission requirements.

1. General. Effective fire fighting is based on three key factors: Adequate agent to control and/or extinguish a fire, adequate staffing to perform fire fighting tasks, and timely response. A shortfall in any one factor degrades capability. The fire protection flight is staffed and equipped to respond to only one major aircraft, structural, or hazardous material incident at a time. **Response to any one incident seriously degrades or eliminates its capability to effectively respond to a simultaneous incident.** Equipage and staffing is based on permanently assigned aircraft. Even at full staffing, the flight is immediately at a disadvantage when responding to emergencies involving larger aircraft or aircraft containing excessively more fuel. Vehicle outages due to maintenance or accidents also result in capability degradation. On-going mobility taskings consistently degrade the flight's ability to meet Air Force minimum staffing, thus the need for this instruction.

2. Responsibility:

2.1. 375 CES/CEF, Fire Protection Flight. Local fire protection vehicle authorizations and commensurate manpower is based on the longest permanently assigned aircraft.

2.1.1. As a minimum, the Fire Protection Flight is required to deliver the fire fighting agent necessary to meet National Fire Protection Standard 403 for KC-135 Aircraft (see [Attachment 1](#)). They must implement policies and procedures to deal as effectively as possible with emergencies on all aircraft regardless of size with that same agent.

2.1.2. Minimum Air Force staffing requirements for Scott AFB to handle all emergency incidents is 22 personnel on duty at all times. The minimum staffing requirements to respond to assigned

aircraft incidents is 18. A reported structural fire response requires a minimum response of 12 firefighters and a hazardous materials incident requires 15 firefighters. On-going mobility and training commitment makes the daily attainment of 22 improbable and 18 is the Scott AFB established minimum staffing requirement. Any staffing level below this level begins to seriously degrade fire fighting capability and if a fire emergency should occur, it could significantly impact the Wing's mission capability.

2.1.3. Aircraft Emergency Response Requirements. The ARFF and support vehicles must be capable of responding to any incident on the runways or overruns within 1 minute after prepositioning for a preannounced emergency. For unannounced emergencies, at least one primary ARFF vehicle must reach the end of the furthest runway within 3 minutes from the time of dispatch from the airfield fire station. The remaining primary ARFF vehicles must arrive at the incident (for both announced and unannounced emergencies) at intervals not exceeding 30 seconds.

2.1.4. Facility Emergency Response Requirements. Facility emergency response times are outlined in DODI 6055.6, **DOD Fire and Emergency Services Program**, and vary in relation to the type and occupancy of the facility.

2.2. MidAmerica Airport (MAA) Fire Department. The MidAmerica Airport Fire Department is governed by the Federal Aviation Authority (FAA) guidelines and does not meet Air Force requirements for aircraft emergency response. They do represent the initial response capability to the MAA runway and parking ramps. Their agent, staffing, and response time capability is considered in determining capabilities to respond to the MAA side of the airfield.

2.2.1. The MAA Fire Department immediate response capability is one ARFF vehicle with 3000 gallons of water/AFFF Agent. A second ARFF vehicle with 1500 gallons of agent is available if staffing is available in the station.

2.2.2. The MAA's minimum staffing level is 3 personnel. However, because of other functions provided by MAA emergency personnel, only 1 person can be counted on for immediate ARFF response at all times.

2.3. Senior Fire Officer (SFO) On-Duty. The SFO will ensure that the fire alarm center (FAC) operator makes the following notification when the vehicle, staffing, and/or response time requirements can not be met. All notifications will be annotated in the Fire Protection Flight Daily Activity Log.

2.3.1. Anytime an ARFF vehicle is out of service, staffing levels fall below 18, an off-airfield emergency response takes fire vehicles and staffing outside the required response time windows, and/or when real world contingencies or exercises affect any of the capability factors, the following personnel will be notified:

2.3.1.1. Fire Chief and Deputy Fire Chief.

2.3.1.2. Base Fire Marshal.

2.3.1.3. Support Group Commander.

2.3.1.4. Wing Command Post and the 126 ARW Command Post. (Subsequently, they will notify the 375 AW/CC and 126 ARW/CC.)

2.3.1.5. Base Operations:

2.3.2. The ARFF fire-fighting capability will be reported IAW the ARFF capability matrix at [Attachment 2](#). The report will include separate indicators detailing the Fire Protection Flight's capability to first, combat a large exterior aircraft fire and second, it's capability to make an aggressive interior attack and aircrew rescue. The capability report corresponds to permanently assigned Group 2 (KC-135) aircraft at Scott AFB. Anytime the designated rescue team or on-scene agent resupply capability is unavailable, the capability category declines one, and a report is made.

2.3.3. Capability Indicators are GREEN, Mission Capable; YELLOW, Increased Risk; or RED, Severe Risk. Indicator Descriptions are explained in [Attachment 2](#). All reports will include two colors. An example follows; e.g., a structural fire response takes 12 firefighters off the air field and leaves 7 firefighters in the airfield fire stations (including one in MAA Station). The capability report would be YELLOW-RED.

2.3.3.1. Exterior Attack Capability: YELLOW.

2.3.3.2. Interior Attack and Rescue Capability: RED.

2.3.4. Leadership will use the attached Risk Matrices ([Attachment 2](#) and [Attachment 3](#)) to make ORM decisions, considering the control measures including in this instruction.

2.3.5. If reporting is due to a vehicle outage, the FAC operator will also provide, vehicle type, agent capacity, reason vehicle is out of service (maintenance or personnel shortage), action taken to return the vehicle to service, and the estimated time/date vehicle will return to service.

2.3.6. In addition to the above, when any mobility vehicle is out of service or two primary ARFF vehicles are out of service, HQ AMC Fire Protection Office will be notified.

3. Risk Control Measures:

3.1. The Fire Protection Flight will take the following risk control measures:

3.1.1. When an off air field response occurs, remaining personnel in Air Force fire stations will don protective clothing and stand-by at their vehicles, ready for immediate response.

3.1.2. Personnel will staff as many remaining ARFF vehicles as possible to assure maximum agent is delivered to the scene of an incident.

3.1.3. Immediately upon arrival at an off air field incident, the SFO will initiate the capability report. The capability report will be changed as the situation dictates.

3.1.4. If the SFO expects on-scene firefighters to be actively engaged in fire fighting or incident mitigation for period to exceed 30 minutes, a recall of off-duty firefighters and/or a mutual aid request for assistance from surrounding communities will be initiated.

3.2. Wing leadership should use the attached risk matrices ([Attachment 2](#) and [Attachment 3](#)), the Wing's mission requirements, and the following risk control measures to make ORM determinations:

3.2.1. Consider minimizing or stopping normal flying.

3.2.2. Consider minimizing or stopping aircraft maintenance and fueling operations.

3.2.3. Consider minimizing or stopping local exercises.

3.2.4. Seek relief from higher headquarters exercises or taskings.

3.2.5. Consider minimizing or stopping large frame aircraft traffic.

3.2.6. If time permits, consider diverting in-flight emergencies.

4. When firefighters are engaged in an airfield incident, the capability to respond to a structural fire, hazardous materials incident, or other emergency response is eliminated or at the very least significantly delayed. Long-term operations will dictate the need for a recall of off-duty firefighters and mutual aid from surrounding communities.

5. **Assigned ARFF Vehicles and Agent Quantities.** [Attachment 4](#) is provided for further information to make accurate risk assessments. It contains both ARFF and structural assigned vehicles and their corresponding agent quantities.

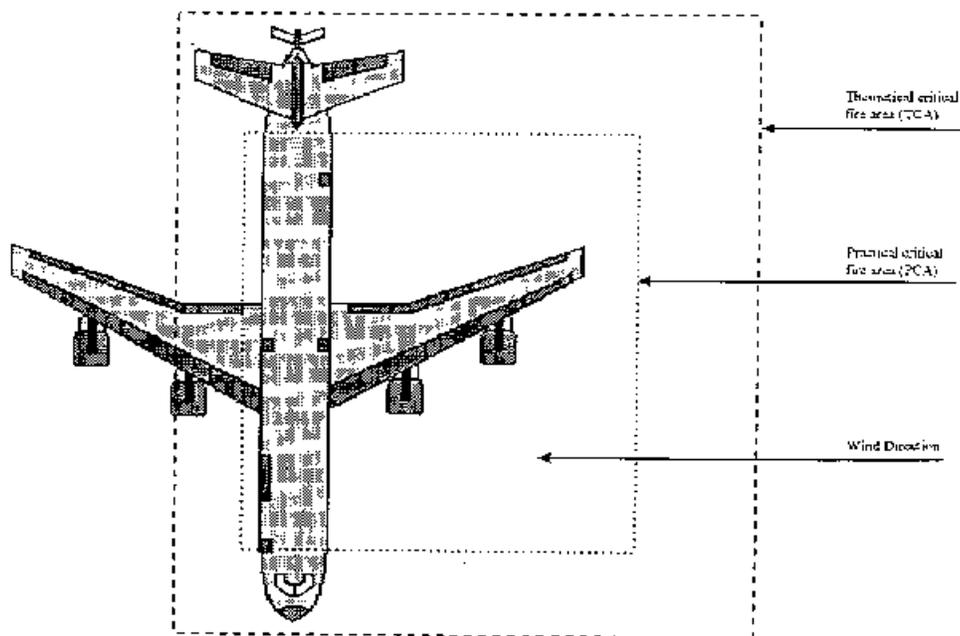
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Attachment 1

NFPA 403

Theoretical Critical Fire Area (TCA) - the theoretical area adjacent to an aircraft in which fire must be controlled for the purpose of ensuring temporary fuselage integrity and providing an escape area for its occupants

Practical Critical Fire Area (PCA) - in 93% of test fires, proven to be the practical area adjacent to an aircraft in which fire must be controlled for the purpose of ensuring temporary fuselage integrity and providing an escape area for its occupants. This practical area is approximately two-thirds of the TCA.



Attachment 2

AIRCRAFT RESCUE AND FIRE FIGHTING CAPABILITIES RISK MATRIX

A2.1. Purpose: The aircraft rescue fire fighting (ARFF) risk matrices have been developed to assist fire chiefs in the operational risk management (ORM) process and presentation of the various levels of capabilities to installation commanders. The minimum Air Force standards are based on the NFPA Standard 403 “Q” factor calculations and studies. The firefighter staffing and fire incident scenario risk matrix is not all-inclusive. The fire incident scenarios are based upon the most common types of aircraft fires. The staffing numbers and capabilities are based upon common standard operation procedures and compliance with OSHA 29 CFR 1910.134 and NFPA 1500.

A2.2. Installation fire chiefs should adjust levels of risk and personalize their matrix based upon mission, local conditions, and standard operating procedures. The ORM control measures should be developed and approved by installation commanders.

A2.3. Background:

A2.3.1. The risk matrices are based upon the aircraft rescue fire fighting vehicle response posture necessary to achieve fire control of the NFPA defined practical critical fire area, maintain control or extinguish the remaining fire (or both), water, and staffing necessary for interior fire fighting. These capabilities are based upon the minimum agent, vehicles, and discharge rates outlined in NFPA Standard 403, Tables 2-3.1, 3-3.1(a), and 4-1.1. As mentioned previously, staffing is based upon safe vehicle operations, OSHA 29 CFR 1910.134, and NFPA 1500.

A2.3.1.1. The theoretical critical fire area (TCA) is a means for categorizing aircraft in terms of the magnitude of the potential fire hazard. It is the area adjacent to and out from an aircraft in which fire must be controlled for the purpose of ensuring temporary fuselage integrity and providing an escape area for its occupants. This is designed with the objective of preventing the fire from melting through the fuselage or causing an explosion of the fuel tanks. It is all related to aircrew and passenger survivability

(1 minute). (Ref: NFPA 403.)

A2.3.1.2. The practical critical fire area (PCA) is two-thirds of the TCA. This is the area, verified by studies, of actual spill fire sizes and aircraft accidents. The operational significance is substantial in that it relates to both the quantities of fire suppression agents required to control the fire in the PCA and quantities to be applied within a time period of 1 minute. (Ref: NFPA 403)

A2.4. Risk Matrices Definitions:

A2.4.1. There are two risk matrices which compliment one another and must be used together to provide a total picture of aircraft rescue and fire fighting capabilities. The following provides an explanation of each matrix and risk level color code:

A2.4.1.1. ARFF Agent Quantity and Vehicle Risk Matrix. This matrix provides levels of ARFF risks based upon capabilities for various types of aircraft compared to the NFPA Standard 403 PCA requirements. Additional factors to be considered when determining risk levels are located at the bottom of the chart and in the slide notes ([Attachment 3](#)).

A2.4.1.2. Aircraft Rescue and Fire Fighting Staffing Capabilities Risk Matrix. This matrix provides levels of ARFF risks based on levels of firefighter staffing. It defines fire control, suppression, and aircrew rescue capabilities for various types of aircraft based upon the number of firefighters available on the initial response. This matrix should also be used to determine ARFF capability risks during any off flightline response. Additional factors to be considered when determining levels of risk are located in the slide notes ([Attachment 3](#)).

A2.4.2. Firefighter Staffing Matrix:

A2.4.2.1. Aircrew Rescue. Based on the assumption that aircrew rescue is being conducted simultaneously with fire control and suppression.

A2.4.2.2. Ext. A/C Fire (LG). Exterior pool or running fuel fire, regardless of aircraft frame type. Assumes aircraft entry is necessary for systems shutdown, search, and to check for fire extension.

A2.4.2.3. Ext. A/C Fire (SM). Exterior small fires, such as, engine, brake, wheel well, etc., regardless of aircraft frame type. Does not include running fuel fire.

A2.4.2.4. Int. A/C Fire (LG). Large fire on the interior of an aircraft. Includes fires involving cargo, internal fuel cells, oxygen fed, etc. Also includes heat and smoke calls where location and/or cause is unknown.

A2.4.2.5. Int. A/C Fire (SM). Small fire on the interior of an aircraft where the location and type fire is known upon arrival. This category includes electrical, auxiliary power units, etc.

A2.4.3. Mission Capable (GREEN). Fully capable of providing the PCA agent quantities, ARFF vehicles, and staffing to perform fire control, fire suppression, interior fire fighting, and rescue for a specified type or size airframe.

A2.4.4. Increased Risk (YELLOW). Capable of providing 2 minutes of fire control and extinguishment of the aircraft exterior PCA. Based upon the time of arrival at the fire incident scene, scenario, and effective fire attack, limited interior fire fighting and rescue operations may be attempted. Level of possible success is diminished.

A2.4.5. Severe Risk (RED): Capable of providing only one minute of fire control for the aircraft exterior PCA and the capability to provide interior fire suppression and rescue operations is unlikely. Success is doubtful.

Attachment 3

AIRCRAFT RESCUE AND FIRE FIGHTING VEHICLE/AGENT QUANTITY AND STAFFING CAPABILITIES RISK MATRIX

Aircraft Risk Group	Aircraft Type	Mission Cap. Agent Quantity - Vehicle Req.	Increase Risk Agent Quantity - Vehicle Req.	Severe Risk Agent Quantity - Vehicle Req.
Group #1	C-5, B-7, B-2	> 11764	< 11764 but > 9264	< 9264
	KC-10			
Group #2	D-1, B-52, C-17, B-57, B-1	> 7778	< 7778 but > 5278	< 5278
	C-130, C-9	> 2744	< 2744 but > 2494	< 2494
	C-21, C-20, C-12, C-59	> 1335	< 1335 but > 735	< 735
Group #3	F-22, F-15, F-16, A-10			

Aircraft Rescue And Fire Fighting Staffing Capabilities Risk Matrix

Group Tasking **	# Firefighters *					Group Tasking **	# Firefighters *				
	≥20	17-19	15-16	12-14	<12		≥20	17-19	15-16	12-14	<12
Aircraft Rescue Group #1	●	●	●	●	●	Int A/C Fire (LC) Group #1	●	●	●	●	●
Group #2	●	●	●	●	●	Group #2	●	●	●	●	●
Group #3	●	●	●	●	●	Group #3	●	●	●	●	●
Ex A/C Fire (LC) Group #1	●	●	●	●	●	Int A/C Fire (SV) Group #1	●	●	●	●	●
Group #2	●	●	●	●	●	Group #2	●	●	●	●	●
Group #3	●	●	●	●	●	Group #3	●	●	●	●	●
Ex A/C Fire (SM) Group #1	●	●	●	●	●						
Group #2	●	●	●	●	●						
Group #3	●	●	●	●	●						

Attachment 4

AGENT CAPACITY/VEHICLE INFORMATION

A4.1. Assigned ARFF Vehicles with their corresponding agent quantities and staffing requirements.

VEHICLE TYPE	AGENT CAPACITY	REQUIRED	PUMP	STAFFING CAPACITY
P-23	3,300 gallons	3	2,000 GPM	500-lb dry chemical
P-23	3,300 gallons	3	2,000 GPM	500-lbs dry chemical
P-23	3,300 gallons	3	2,000 GPM	500-lbs dry chemical
P-26	5,000 gallons	1	1,200 GPM	
P-10 (Rescue)	N/A	3	N/A	
P-20	400-lbs dry chemical	????		
P-19	1,000 gallons	3*	????	

The P-19 is assigned for mobility, training, and is placed in-service when a P-23 is out of service or when needed for a major incident.

A4.2. Assigned Structural Vehicles, with their corresponding agent quantities and staffing requirements.

VEHICLE TYPE	AGENT	HOSE	REQUIRED STAFFING	PUMP CAPACITY
P-24	655 gals	2,300 ft	4	1,000 GPM
P-24	655 gals	2,300 ft	4	1,000 GPM
P-26	5,000 gals	650 ft	1	1,250 GPM
P-21	150 gals	1,050 ft	4*	1,000 GPM

The P-21 is an authorized third pumper and receives no manning authorizations. When needed, it is cross-staffed from ARFF vehicles with 4 personnel.