FIRE FIGHTER SAFETY AND DEPLOYMENT STUDY

Fundamental Research Question:

In the event of a fire on an upper floor of a high-rise building, what is the minimal fire service deployment configuration (crew size and total fire fighting force) necessary to mitigate the event effectively and safely?

High Rise Time-to-Task Experiment Assumptions:

1) **Scenarios -** Each scenario assumes a fire on the 10th floor of a 12 story commercial building with open floor plan. Seat of the fire in large room TBD. The fuel load is cubicle open-wall material with typical desk and file cabinet furniture, computers, printers and office chairs. There is one victim (non-ambulatory) on the fire floor (trapped in path of egress) and one victim (ambulatory, but confused) on the floor above the fire. The door to the room of origin is open, allowing smoke to spread throughout the floor of origin. (NFPA 72 – EVAC)

Scenario 1: Fire occurs on a floor with sprinkler protection. Two fire service access elevators are available for fire service use. (Best case)	**Scenario 2:** Fire occurs on a floor with sprinkler protection. The elevators are not available for fire service use.
Scenario 3: Fire occurs on a floor without sprinkler protection. Two fire service access elevators are available for fire service use.	**Scenario 4:** Fire occurs on a floor without sprinkler protection. The elevators are not available for fire service use. (Worst case)

2) Fire ignition = 0 time
3) 1 minute for Recognition and call to 9-1-1
4) 1 minute for call processing/dispatch
5) 1 minute for turnout
6) For second and third alarm apparatus – add 30 seconds for dispatch and 1 minute for turnout to standard travel times.
7) **Apparatus Travel Time** =
    a. Times for each responding apparatus determined using fire department response data collected from Metropolitan jurisdictions.

b. Travel times confirmed using GIS modeling of actual fire department response to the high rise building used in the experiments.

8) **Alarm Assignment Size** = determined using actual response protocols from fire departments throughout the United States. Protocols were then categorized as a standard 'high' or 'low' deployment.

   a. **High** = 4 engines, 4 trucks, 3 ambulances, 2 Battalion Chiefs, [Add: 2 District Chief (Superior) on second and third alarm]

   b. **Low** = 3 engines, 3 trucks, 2 ambulance, 2 Battalion Chiefs, [Add: 2 District Chief (Superior) on second and third alarm]

9) **Call for 2nd and 3rd Alarm =**

   a. Add 1 minute 40 seconds for first engine to conduct size up, report assessment and call for 2nd and 3rd alarm.

   b. For 2nd and 3rd alarm, from time of arrival on scene, add 2 minutes for gathering equipment and walking to building (Base) AND 2 minutes to get assignment then engage.

10) **Crew Size - Crew Size**: 4 levels (3, 4, 5, and 6 per engine/ladder trucks) typical staffing for all other response vehicles (chief vehicles, EMS vehicles)

		Apparatus	First Alarm		Second Alarm		Third Alarm	
3-Person Crews	Low	3 Engine	9		9		9	
		3 Truck	9	26 Total FF	9	52 Total FF	9	78 Total FF
		2 Amb	4		4		4	
		2 BC/Aide	4		4		4	
	High	4 Engine	12		12		12	
		4 Truck	12	34 Total FF	12	68 Total FF	12	102 Total FF
		3 Amb	6		6		6	
		2 BC/Aide	4		4		4	

		Apparatus	First Alarm		Second Alarm		Third Alarm	
4-Person Crews	Low	3 Engine	12		12		12	
		3 Truck	12	32 Total FF	12	64 Total FF	12	96 Total FF
		2 Amb	4		4		4	
		2 BC/Aide	4		4		4	
	High	4 Engine	16		16		16	
		4 Truck	16	42 Total FF	16	84 Total FF	16	126 Total FF
		3 Amb	6		6		6	
		2 BC/Aide	4		4		4	

		Apparatus	First Alarm		Second Alarm		Third Alarm	
5-Person Crews	Low	3 Engine	15	38 Total FF	15	76 Total FF	15	108 Total FF
		3 Truck	15		15		15	
		2 Amb	4		4		4	
		2 BC/Aide	4		4		4	
	High	4 Engine	20	50 Total FF	20	100 Total FF	20	150 Total FF
		4 Truck	20		20		20	
		3 Amb	6		6		6	
		2 BC/Aide	4		4		4	

		Apparatus	First Alarm		Second Alarm		Third Alarm	
6-Person Crews	Low	3 Engine	18	44Total FF	18	88 Total FF	18	132 Total FF
		3 Truck	18		18		18	
		2 Amb	4		4		4	
		2 BC/Aide	4		4		4	
	High	4 Engine	24	58 Total FF	24	116 Total FF	24	174 Total FF
		4 Truck	24		24		24	
		3 Amb	6		6		6	
		2 BC/Aide	4		4		6	

Total number of Experiments: 4 Crew x 2 Apparatus x 4 scenarios x 3 replicates = **96 experiments**