

Culture and Analytics for Resilient Fire/EMS

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Learning Objectives

Familiarity with Organizational Resilience Definition (Ambiguity) Cultural & Data Elements Data-Oriented Examples Current State / Coming Developments Best Practices



Problem

Fire/EMS Planning is Hard! Complexity Dynamic Environment Multiple Time Scales High-Stakes Mission





Solution

Resilient Fire/EMS Organizations





Resilience

The organization's ability to <u>quickly recover</u> from an incident or events, or to <u>adjust easily</u> to changing needs or requirements.

-- Fire and Emergency Service Self-Assessment Manual, 9th Ed., p.160



Pl's, C's and CC's

Туре	Index	Key Objectives				
		characteristics for the response area are identified, such as key employment types and centers, assessed values, blighted areas, and				
PI	2.A.7	population earning characteristics				
		Risk categorization and deployment impact considerations such factors as cultural, economic, historical, and environmental values, and				
С	2.B	operational characteristics				
		documented through quality response measurements that consider overall response, consistency, reliability, resiliency and outcomes				
С	2.C	throughout all service areas. The agency develops procedures, practices and programs to appropriately guide its resource deployment				
CC	2.C.5	and found those services consistent and reliable within the entire response area				
		current deployment methods for emergency services appropriately address the risk in its service area. Its response strategy has evolved to				
		ensure that its deployment practices have maintained and/or made continuous improvements in the effectiveness, efficiency, and safety of its				
С	2.D	operations, notwithstanding any outside influences beyond its control.				
CC	2.D.1	methodology for assessing performance adequacies, consistencies, reliabilities, resiliencies, and opportunities for improvement				
CC	2.C.7	The agency has identified efforts to maintain and improve its performance in the delivery of its emergency services				
		The performance monitoring methodology identifies, as least annually future external influences, altering conditions, growth and				
CC	2.D.3	development trends, and new or changing risks, for purposes of analyzing the balance of service capabilities with new conditions or demands				
CC	2.D.6	Performance gaps for the total response area, such as inadequacies, inconsistencies, negative trends, are determined at least annually				
		On at least an annual basis, the agency formally notifies the authority having jurisdiction (AHJ) of any gaps in the operational capabilities and				
PI	2.D.8	capacity of its current delivery system to mitigate the identified risks within its service area, as identified in its standards of cover				





Martin, Paredes, Wainer (2018):

- Massive literature review
- 11 common factors
- 8 cultural (communication, leadership, risk tolerance, redundancy, ...)
- 3 planning/data-related

Martin C, Paredes A and Wainer G. "What we know and do not know about organizational resilience." <u>International Journal of Production Management and</u> <u>Engineering</u>, (2018) 6(1), 11-28





Dimensions of Resilience

- Performance
- Planning
- Personal





Performance Resilience







Planning Resilience

Planning processes that scale and adapt well in unpredictable circumstances











Personal Resilience

Organizational structures, processes and strategies that support the <u>well-being</u>, <u>capabilities</u> and <u>effectiveness</u> of the people in the in the organization.





Foresight Performance Resilience







City of Palm Beach Gardens



- Primarily Residential
- Home sizes from 1,200-8,000 ft²
- 59 mi² Population of 54,0000







Palm Beach Gardens Fire Rescue

- CFAI and CAAS Accredited
- ALS Transport
- 5 Fire Stations 121 Firefighters
- 12,000 calls Annually









Foresight Performance Resilience





Challenge #1

















Predict Call Volume

- Number of calls
- Type of calls
- Concentration of Calls





Location and Staffing

- Negotiations for Land
- Mutual Aid
- Reliability
- Time Benchmarks









Location and Staffing









Results

- Southern Location
- Estimated 2,800 Calls Annually
- Engine, Rescue, Ladder, Battalion





Exploration

Deployment Enhancements





- Current Deployment: 3 Person ALS Engine, 2 Person ALS Medic Unit
- Critical Task Analysis: Moderate Risk EMS Requires 3 Personnel
- Currently Requires both a Medic Unit and an Engine to meet ERF
- Theory: Adding a 3rd Person to the Medic unit will increase availability/reliability of Engines for concurrent calls.





Activity Level (Units) by Time of Day



Hours Since Midnight



Predicted Daytime Engine Reliability







Simulator Considerations

- Simulated call volume based on historical data
- Season
- Day of Week
- Hour of Day
- Geography ALF - Chest Pain/SOB Warehouse – Fire
- Frequency



Simulator Considerations

- Speed Tables: Based on historical data
- Turnout, On Scene, and Hospital Turnover Time: Based on the mean (most common experience)
- Transport destination is closest ER
- Agency dispatch rules and run cards are factored





Predicted Engine Reliability





Predicted Daytime Engine Reliability





Predicted Daytime Engine Reliability - Effects of Training vs. 3-person Rescue Companies





Lessons Learned

- 5-6 Years Worth of Data
- Trust but Verify Results
- "Try before you pry"







Situational Awareness









Detailed View - Monthly Volume



Planning Resilience







Problem:

Optimize placement of advanced EVP systems at 25 out of 150 signal-controlled intersections

150!/(125!x25!) = **2.9x10²³⁴ choices**!









Solution:

"Pareto Optimization"

(Letting the computer explore...)

















125000 - Series1 120000 -. . 115000 -. Pred. Total Time Savings (Seconds) . 110000 -• 105000 -. 100000 -95000 -90000 -. 85000-388 389 390 392 393 391 394 395 396 Pred. 90% Initial Travel Time (Seconds)

90% Travel Time / Total Savings Benefits, Top Solutions (N = 30 -> 90 EVP Systems), Emergent 2018 Data



Where to...?



Personal Resilience

Probability, 4.0+ Continuous Hours' Sleep Per Crew, By Deployment Model



 $\blacksquare \text{Option } A = \text{Option } B = \text{Option } C$



Getting Involved: Resilience Analytics SIG



Best Practices





Best Practices

Foresight ("What Next")

- Multiple future scenarios
- Collaborate with Planning
- Analogy validation (Cunningham/Schumacher)

Exploration ("What If")

- Simulate before piloting
- Model validation (8 points)
- Data/command teamwork
- Hands on work!





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The "Improvise-Adapt-Overcome" spirit of fire/EMS!





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In the app, go to the session you just attended and click Poll.

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	No		



The Battalion Chief David J. Farnum Jr. Cerebral BLEVE Slide Is brought to you by...

