How much is each additional Firefighter on an Engine worth? About $600,000.

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Published in elitecommandtraining
4 min read · May 19, 2017

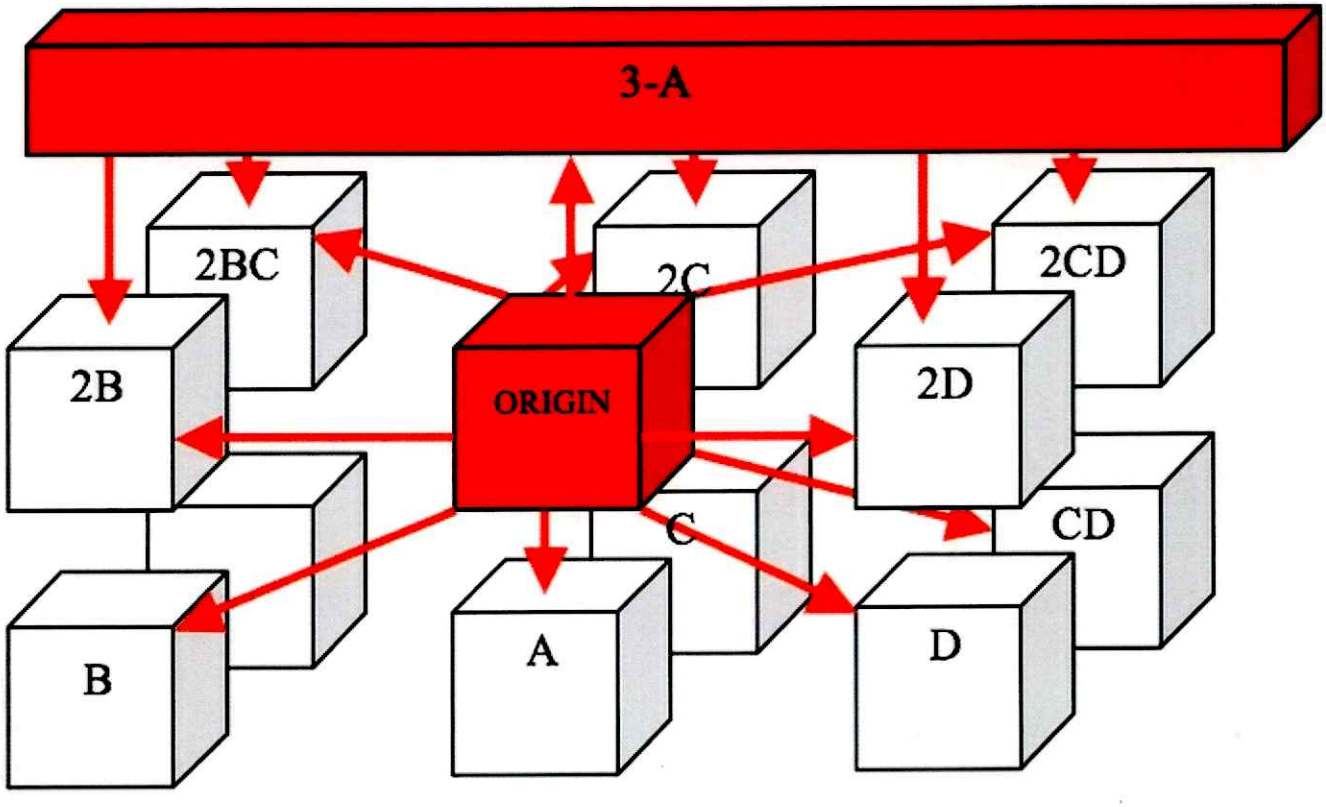
A single firefighter may cost $120,000 in total costs, but saves the community over a half million from fire loss.

Imagine you have two cities, side by side with similar population size, population density, square mileage, and near identical fire departments. The only difference is fire department "A" staffs three people per engine and "B" staffs two people per engine. Could one quantify the added value or cost of the third firefighter on department "A's" engines? And if so what would the number be?

In 2016, the comparison of two sister cities with three stations each produced an added value of $581,549 per firefighter[1] .

The critical reader will first ask, what is "*added value,*" how is it calculated, and can I replicate the study?

When I refer to the "added value" of a fire department, I am referring to a published study in a peer-reviewed journal called "Quantifying a Negative, how homeland security adds value (QtN[2])." The study published in 2015 asserted that the value added of a fire department is how much is saved on each fire. The study developed at methodology using network science[3] , inductive replace cost[4] , and economic impact models[5] to calculate the amount saved on each fire in a dollar amount.



Network Science Describes how a fire spreads through an apartment building with a common attic

The publication describes each step of the methodology and presents four case studies as examples so any department can replicate the study, which is what the California cities of Lincoln and Rocklin did.

In 2016, the sister cities of Lincoln and Rocklin applied the QtN methodology to each fire, totally the amount saved, the ratio of saved verse at risk, and the return on investment for each department[6] . The results are staggering.

The department staffed with two people per engine saved $6.8 million in value, or roughly 66% of everything at immediate[7] risk of burning during fires, resulting in a 125% return on investment when compared to their 4.4-million-dollar budget. Impressive results on any level!

Table 11

Total Value Saved	$	5,571,826.96
Average Value Saved per Fire	$	992,253.37
Number of Building fires in 2016		7
Annual Budget	$	4,422,826.00
Annual ROI		125.98%

But the department staffed with three people per engine saved $16.5 million in value, or roughly 92% of everything at immediate risk of burning during fires, resulting in a 225% return on investment when compared to their $7.1 million budget. Incredible results!

Table 18

Total Value Saved	$16,274,504.88
Average Value Saved/Structure Fire	$1,479,500.44
Number of Building fires in 2016	11
Annual Budget 2016	$7,128,200.00
Annual ROI	228.31%

So this begs the question, what is the individual value of each addition firefighter to department "A"? If we take the difference of the amount saved in department "A" verse department "B," the result is $10.4 million. Or in other words, the department staffed with three people saved an addition $10.4 million. Then, if we take the difference in total employees between "A" and "B," the result is 18[8] . Or rather, the department that saved an additional $10.4 million had 18 additional employees. Finally, if we simply divide the extra amount saved by the additional employees we get the incremental value added of each additional employee; $581,549. Every additional firefighter department "A" hired over department "B" added **$581,549** to the amount saved each year.

So, *what is the value of one additional firefighter*? In 2016, in the booming suburbs of northern California is was about **$600,000.**

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[1]These are full time professional firefighters

[2]https://www.hsaj.org/articles/9307

[3]Network science uses nodes, links, and contagions to map out the spread of fire

[4]Inductive replace cost is same methodology insurance companies use to estimate the cost replacing a structure due to fire loss.

[5]Economic impact models are used by federal, state, and local governments to estimate the cost of creating or losing businesses.

[6]The study only included 18 fires for the year, a mix of residential and commercial. Hopefully a study of more fires will be completed in the future.

[7]Immediate risk is any building within ten feet of the building burning. It is a very conservative measure and does not include the entire blocks, or cities, ect.

[8]Department A has 36 employees; three 3 person engines and one 4 person truck while department B 18 employees; three 2 person engines.

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