

A Cost-Benefit Estimate for MARSAs

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Abstract : This paper proposes that the Marine Search & Rescue and Salvage Association of Korea (MARSAs) can provide KCG a very positive return on investment; that is, MARSAs will save lives and property well over the budget needed from KCG to operate MARSAs. To perform this Cost-Benefit Analysis, actual performance data and other figures are taken from the USCG Auxiliary, and these figures are used to project expected possible MARSAs results. In this paper, MARSAs is projected to provide a 1,493 % return on investment.

Key Words : MARSAs, USCG, USCG Auxiliary, Korea Coast Guard, Cost-benefit analysis

1. Introduction

The Marine Search & Rescue and Salvage Association of Korea (MARSAs) was founded in Jan. 2013 in order to enhance the search and rescue (SAR) and salvage capability within Korean jurisdictional waters with the strength of cooperation between private and public sector (Korea Coast Guard). MARSAs is a network of civilian volunteers who offer their time and vessels to respond to SAR incidents as directed by KCG. In order to bring public attention to the value that MARSAs can bring to KCG and the Korean taxpayers, it is necessary to perform a cost-benefit analysis.

As the name indicates, a cost-benefit analysis examines the projected costs of a venture and measures those costs against projected benefits. The result is the *Return on Investment* (ROI). ROI is a percent of the amount of money returned to the investor based on the cost of the money invested. There is currently no public perception of the benefits that MARSAs could bring to KCG. Therefore, it seems necessary to show how much value MARSAs could deliver.

2. Cost-benefit Estimate for MARSAs

2.1 Cost-benefit Preliminaries

The Cost is the budget required for the Korea Coast Guard to

sponsor and support MARSAs. There are four categories that demonstrate the benefits MARSAs can offer to KCG:

- Value of Volunteer Hours;
- Value of Operational Savings;
- Value of Lives Saved; and
- Value of Property Saved.

Therefore in the final analysis, the Return on Investment will be:

$$ROI = \frac{Benefits - Cost}{Cost}$$

in terms of Korean Won (KRW).

Since MARSAs has short history with little performance data, the above values are computed, in this paper, on the assumption that the number of MARSAs's member is proportionate to the ratio of USCG(active duty) to KCG personnel, and its budget and achievements are proportionate to those of USCG Auxiliary.

2.2 Estimating Cost

To project the MARSAs budget, we take an average of the U.S Coast Guard (USCG) budget to operate the USCG Auxiliary which is a civilian volunteer corps to assist all USCG duties except law enforcement and military job. The budget for the USCG Auxiliary has been 17.4 million USD per year since 2009 (Barner, 2012). 17.4 million USD is 0.24 % of the annual USCG budget. Taking 0.24 % of the annual KCG budget of 115.38

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billion KRW, the projected MARSAs budget is 2.77 billion KRW.

2.3 Estimating Benefits

1) Estimated number of volunteers

Now that the budget has been established, the next step is to project the number of MARSAs members. There are 41,000 members of the USCG. There are 10,646 KCG police officers of all levels. The USCG Auxiliary has approximately 31,000 members. We use a simple ratio to project the number of MARSAs members:

$$\frac{31,000 \text{ USCG Auxiliary}}{41,000 \text{ USCG}} = \frac{m}{10,464 \text{ KCG}}$$

→ $m = 8,056$ MARSAs members

This figure, 8,056 members, will be useful later in this paper.

2) Value of Personnel Savings

The value of personnel time saved is another way of saying how much time MARSAs volunteers will bring to KCG in monetary terms. In other words, how much will the KCG *not* pay KCG officers because volunteers will do that amount of work?

The USCG considers an Auxiliarist to work at the GS-9, Step 1 pay grade, or 41,563 USD per year as of 2012. An American work year is considered 2080 hours, and therefore a USCG Auxiliarist can be said to have a time-value of \$19.98 per hour. In Korea, the pay scale is different. The main difference is in the level of KCG personnel needed to work with MARSAs. In the USCG, the GS-9 position is roughly the same pay grade as a Lieutenant Junior Grade. Due to the difference in the size of the organizations, this rank is too high for KCG in relation to MARSAs. Instead, MARSAs volunteers should be considered to have equivalent time-value to a KCG Senior Police Officer, whose annual salary is 35,000,000 KRW. The Korean work year is accounted as shorter than the American work year at 2,000 hours, making the time-value of a MARSAs volunteer 17,500 KRW per hour.

One cannot take the annual salary of a Senior Police Officer and multiply it times the number of MARSAs members. That would vastly over-estimate the time-value of MARSAs volunteers. Instead, we must project the number of hours MARSAs can expect its members to volunteer and multiply that number times the hourly time-value of 17,500 KRW. To reach the number of

hours volunteered, we again look to the USCG Auxiliary. In 2012 Auxiliarists volunteered 29,454 hours toward SAR and SAR-related missions.

$$\frac{29,454 \text{ SAR hours}}{31,000 \text{ USCG Aux members}} = \frac{h(\text{hours volunteered})}{8,056 \text{ MARSAs members}}$$

$h = 7,654$ SAR hours volunteered by MARSAs

Then to project the value of this time:

$$17,500 \text{ KRW} \times 7,654 \text{ hours} = 133,945,000 \text{ KRW}$$

MARSAs has a feature that USCG Auxiliary does not have: reimbursing members for their time. MARSAs members will be reimbursed 77,200 KRW per day. Based on an 8-hour day, that is 9,650 KRW per hour. Therefore:

$$-9,650 \text{ KRW} \times 7,654 \text{ hours} = -73,861,100 \text{ KRW}$$

$$133,945,000 - 73,861,100 \approx 60 \text{ million KRW}$$

It can then be said that MARSAs volunteers are projected to donate approximately 60 million KRW annually in Value of Volunteer Hours.

3) Value of Operational Savings

Another way that KCG can save money through using MARSAs is in the cost of operating vessels. An hour of operating a USCG 41-foot Utility Boat costs 2,739 USD, due to the salaries of the crew, cost of fuel and maintenance, and depreciation of the asset. On the other hand, operating an Auxiliary vessel only costs 36 USD, because the only expenses are fuel and pro-rated maintenance. Thus USCG Auxiliary saves 2,703 USD per operational hour by using the Auxiliary. The Auxiliary operated 20,105 on-the-water hours in 2012, meaning in that year the Auxiliary saved USCG over 54 million USD. A similar comparison can be done with the KCG and MARSAs, but this comparison will be limited to the cost of fuel consumption and reimbursement.

A reasonable comparison begins with a KCG P-type patrol vessel. The P-type vessel operates for 5,345 hours per year, consuming 336,955 liters of fuel. That works out to 63 liters of fuel per hour. The government rate for fuel is 939.9 KRW per liter, meaning that each hour costs 59,214 KRW in fuel. MARSAs has vessels ranging from one ton to over ten tons; however the average size is 3 tons. The average horsepower of a

three ton vessel is 200 horsepower. A three ton vessel coupled with a 200 horsepower engine has a fuel coefficient rate of 0.166 liters, thus the average MARSAs boat is expected to consume 33.2 liters per hour. At the tax-free fuel rate of 939.9 KRW, that is 31,205 KRW per hour, a savings of about 28,000 KRW per hour. To project the operational savings, then, we must first find the number of operational hours and multiply it by the amount of fuel expenses saved per hour. Using the basic USCG Auxiliary-to-MARSA membership ratio, the operational hours are projected to be:

$$\frac{8,056 \text{ MARSA members}}{31,000 \text{ USCG Aux members}} \times \frac{h}{20,105 \text{ hours}}$$

$$= 5,225 \text{ operational hours (MARSA)}$$

$$5,225 \text{ hours} \times 28,000 \text{ KRW per hour}$$

$$= 146,300,000 \text{ KRW}$$

5,225 operational hours times 28,000 KRW per hours equals 146.3 million KRW in operational costs saved per year.

4) Value of Lives Saved

This is a rather controversial topic. How can one place a monetary value on a human life? In the USA, the standard advice is to have a life insurance policy worth seven to ten times one’s annual income (CNN, 2014). For this paper, we use the more generous 10 times annual income. This is not to say that everyone has life insurance, just how much each person should have. Life insurance is a good measure of the value of a human life because that is precisely what life insurance does: puts a dollar amount on the life of the human covered by the policy.

The 2012 average annual wage in South Korea was 32,329 USD (OECD, 2014). Thus, according to the life insurance rule-of-thumb, the value of a human life in South Korea is 323,290 USD, or roughly 388 million KRW. The average annual wage in the USA 55,048 USD, making the US Value of a Human Life, 550,480 USD.

The number of lives saved by USCG Auxiliary in 2012 was a low outlier. The average number of lives saved annually by the USCG Auxiliary is 280. So we project the lives saved by MARSA with the average, not the 2012 low outlier.

$$\frac{280}{31,000} = \frac{l}{8,056} \Rightarrow l(\text{lives}) \approx 73$$

$$73 \times 388,000,000 \text{ KRW} = 28,324,000,000 \text{ KRW}$$

MARSA is expected to save about 73 lives annually, and each of those lives has a VSL of 388 million KRW, for an annual Value of Lives Saved of 28.32 billion KRW.

5) Value of Property Saved

The final benefit is the monetary Value of Property Saved. The USCG Auxiliary saves, on average, 50 million USD of property per year.

$$\frac{50 \text{ million USD} \times 1,200 \text{ KRW}}{31,000 \text{ members}} = \frac{p}{8,056}$$

$$\Rightarrow p(\text{property}) \approx 15.592 \text{ billion KRW}$$

MARSA is projected to save 15,592 billion KRW of property per year.

2.4 Return on Investment

Now that we have finished the process for projecting the MARSA cost and benefits based on real USCG Auxiliary data, we can calculate the ROI. The results are in Table 1:

Table 1. Final weight for each item

	USCG Auxiliary (million USD)	MARSA (100 million KRW)
Cost	17.4	27.7
Volunteer Hours (h)	96	0.6
Operational Savings (o)	54	1.463
Lives Saved (l)	154.1	283.24
Property Saved (p)	50	155.92
Total Benefit	354.1	441.243
$ROI = \frac{(h + o + p) - C}{C}$	1,935%	1,493%

3. Conclusion

In this early effort to discern a Return on Investment for MARSA, we project a very respectable ROI of 1493%. The gap between the USCG Auxiliary ROI and the MARSA ROI are due largely to salary difference between USCG and KCG, and in the

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method for calculating membership participation ratios. Not all 31,000 members of USCG Auxiliary participate in SAR mission; less than 6,000 do. If we were to project MARSAs benefits based on a ratio of 6,000 USCG Auxiliary members who are boat crew to the 8,056 MARSAs members, who are all presumed to be boat crew, MARSAs's ROI would be much greater. Thus the estimates here are likely quite conservative and likely under-estimate to some degree the value that MARSAs may deliver to KCG, if properly utilized.

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