CAPITAL BUDGETING IN THE FEDERAL GOVERNMENT: THE CASE OF A MARINE CORPS EXERCISE SUPPORT DETACHMENT IN YUMA, ARIZONA

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CASE DESCRIPTION

This case requires the use of capital budgeting techniques to compare two competing alternatives to carry out a particular required Marine Corps training exercise. Training outcomes are assumed to be the same under each alternative with the focus on lowering costs as the primary objective. The core activities in this case involve the analysis of cost and discount rate inputs to measure the present value of the costs and the evaluation of the two options. The backdrop for these two competing alternatives is a federal government attempting to inculcate fiscal constraints and cost cutting within the military. While this case is based on an actual, real set of facts, people, and organizations, some specific data have been changed for proprietary or educational reasons.

The case lends itself to student group project assignments with respect to developing a capital budgeting analysis for the "Marine Corps Exercise Support Detachment." Proposed solution(s) should determine the costs of both the "status quo" (current situation) and the proposed "alternative," and, subsequently, which alternative to accept. Furthermore, students should give consideration to the various inputs of their prospective capital budgeting models as well as consider factors other than costs that may affect the decision.

The case has a difficulty level appropriate for a senior course at the undergraduate level or an MBA graduate-level course. The case is designated to be taught in 1.5 class hours, assuming students have put in at least one hour of preparation outside the classroom either individually or in groups.

CASE SYNOPSIS

This case explores the potential cost savings of establishing a Marine Corps Exercise Support Detachment (ESD) in Yuma, AZ. It requires comparing the costs of a current operational mode (status quo) to those associated with an ESD (proposed alternative). Historical data are provided to calculate the costs of the status quo. A large input cost of the status quo is the personnel cost associated with equipment preparation and embarkation, and post-exercise maintenance. The costs of the proposed alternative may be calculated using historical data from similar projects and operations—which can either be provided to students or which students can be asked to research—as well as Department of Defense (DoD) and U.S. government regulations regarding cost estimation. The annual costs of the alternative can then be compared to the annual costs of the status quo to quantify potential annual savings at each

level of involvement. The time value effect of any annual savings will then need to be analyzed using capital budgeting techniques such as the net present value (NPV) method to show the total cost and/or benefit of the ESD over a range of extended periods.

TEACHING APPROACH AND LEARNING OBJECTIVES

This case requires students to first identify relevant information, specifically in terms of costs, for two competing alternatives and then to use capital budgeting techniques to analyze the two alternatives. The unique attributes of this case have to do with the governmental nature of the decision under analysis. Parts of the discussion should focus on the differences at each step between what is appropriate for a government capital budgeting analysis versus a for-profit capital budgeting analysis. It is suggested the Case Questions that follow be used as a road map to lead through the logical discussions and steps to conduct the analysis.

The Case attempts to address the following Learning Objectives:

1. Identify relevant costs and benefits in a decision
2. Evaluate the acceptability of an investment project using the net present value method
3. Understand the difference in discount rates applied to government capital budgeting decisions and why they differ from for-profit analysis
4. Understand the risks associated with capital budgeting decision and options for dealing with risk

DISCUSSION QUESTIONS

Question 1. What are the current average annual costs associated with field support units at the Weapons and Tactics Instructors Course that require annual operations and maintenance funding (the status quo option)?

The data for the costs of the status quo come from fiscal year (FY) 2011 and FY2012, during which four Weapons and Tactics Instructors Course (WTI) exercises occurred. As a simplifying assumption, the average cost per year is used in the calculations that follow. The relevant costs of the status quo include transportation costs, opportunity costs of time for both the equipment preparation and embarkation phase and the maintenance phase, and temporary additional duty (TAD) costs.

TRANSPORTATION COSTS

The total transportation costs for FY2011 and FY2012 associated with equipment shipments to MCAS Yuma totaled $6,249,626. The yearly average would be $3,124,813.

Table 7 (Table 2 from the case) shows the breakdown of costs by Marine Air-Ground Task Force (MAGTF) element per fiscal year. The Air Combat Element (ACE) accounts for a majority of the costs because it sends the most units to Yuma to train. The transportation costs associated with the ACE include those of ground assets, not aviation assets. Aviation assets would continue to be the same in both situations and do not represent relevant costs.

Table 7 (Table 2 from Case) TRANSPORTATION COSTS ASSOCIATED WITH THE STATUS QUO			
	FY11	FY12	Total
Air Combat Element	$ 2,319,656	$ 2,727,055	$ 5,046,711
Ground Combat Element	$ 214,034	$ 965,764	$ 1,179,798
Logistics Combat Element	$ 23,117	$ -	$ 23,117
Total	$ 2,556,807	$ 3,692,819	$ 6,249,626
Average			$ 3,124,813

COST OF TIME—EQUIPMENT PREPARATION AND EMBARKATION

The opportunity cost of time associated with the current operations' equipment preparation and embarkation phase represents a significant personnel opportunity cost. Establishing the ESD, unit commanders can redirect personnel resources to other pressing matters instead of investing a large number of personnel in the preparation and embarkation of equipment. Using Tables 3 and 4 from the case yields Table 8.

Table 8 OPPORTUNITY COST OF TIME FOR EQUIPMENT PREPARATION AND EMBARKATION PHASE FOR THE STATUS QUO					
Pay Grade/Rank	Total	Daily Comp	Total per Day	14 days	2 Units Annual
O - 4 (Major)	6	$723	$4,338	$60,732	$121,464
O - 3 (Captain)	19	608	11,552	161,728	323,456
O - 2 (1st Lieutenant)	19	482	9,158	128,212	256,424
O - 1 (2nd Lieutenant	0	N/A	0	0	0
W - 5 (Chief Warrant Officer 5)	0	N/A	0	0	0
W - 4 (Chief Warrant Officer 4)	0	N/A	0	0	0
W - 3 (Chief Warrant Officer 3)	1	604	604	8,456	16,912
W - 2 (Chief Warrant Officer 2)	3	534	1,602	22,428	44,856
W - 1 (Chief Warrant Officer)	0	N/A	0	0	0
E - 9 (Sergeant Major)	3	618	1,854	25,956	51,912
E - 8 (First Sergeant)	10	509	5,090	71,260	142,520
E - 7 (Gunnery Sergeant)	28	456	12,768	178,752	357,504
E - 6 (Staff Sergeant)	44	395	17,380	243,320	486,640
E - 5 (Sergeant)	123	321	39,483	552,762	1,105,524
E - 4 (Corporal)	192	264	50,688	709,632	1,419,214
E - 3 (Lance Corporal)	230	224	51,520	721,280	1,442,560
E - 2 (Private First Class)	1	199	199	11,144	44,576
E - 1 (Private)	0	N/A	0	125,538	251,076
Total Annual Cost					$6,042,400

MAINTENANCE, COST OF REPAIR, AND REPLACEMENT PARTS

The case assumes that the cost of equipment maintenance will be the same for either the status quo or alternative option. This could be a point of discussion, as there may be opposing opinions. An argument could be made that the costs might differ.

TEMPORARY ADDITIONAL DUTY COSTS

Using Table 5 provided in the case and noting that nine units are affected, the total temporary additional duty (TAD) cost for the status quo is $29,016 per unit; and given there are nine units requiring TAD, the total TAD cost per WTI exercise is $261,144. The total annual WTI cost is $522,288 for two exercises, as shown in Table 9.

Table 9
STATUS QUO TAD COSTS

Grade	Number of Given Grade	Days ADVON	Days Rear	Total Days TAD	TAD Cost/Day	TAD Cost
O - 3	1	10	3	13	$ 124	$ 1,612
O - 2	1	10	3	13	$ 124	$ 1,612
E - 7	1	10	3	13	$ 124	$ 1,612
E - 6	1	10	3	13	$ 124	$ 1,612
E - 5	2	10	3	13	$ 124	$ 3,224
E - 4	4	10	3	13	$ 124	$ 6,448
E - 3	8	10	3	13	$ 124	$ 12,896
Total per Unit	18			Total TAD Cost per unit		$ 29,016
Total Cost per WTI exercise (9 units participating)						$261,144
Total Annual Cost (2 WTI Exercises)						$522,288

Question 2. What are the average annual relevant costs associated with field support units operations and maintenance funding if an Exercise Support Detachment is established (the alternative option)?

The estimates for the costs of the alternative option are based on actual costs of similar facilities and activities, as well as DoD-defined estimation tools. The relevant costs of the proposed alternative option include the cost of permanent military and civilian personnel, facilities construction and annual operating costs, and TAD costs.

PERMANENT PERSONNEL (CIVILIAN AND MILITARY) (SEE APPENDIX A IN THE CASE FOR SUGGESTED CALCULATIONS)

Based on the proposed personnel structure outlined in Figure 1 of the case, Appendix A yields the total annual costs of $3,046,518 for permanent civilian personnel and $3,801,581 for permanent military personnel, making the grand total for the annual cost of permanent civilian and military personnel $6,848,099. Table 10 summarizes this information.

Table 10 TOTAL BIENNIAL COST OF PERMANENT CIVILIAN AND MILITARY PERSONNEL	
Personnel Type	**Annual Cost**
Civilian	$ 3,046,518
Permanent Military	$ 3,801,581
Total Cost	$ 6,848,099
Note: Calculated using the following from the case: Proposed Org Chart (Figure 1) times Military Annual Compensation Rate (Table 4) or Annual GS Salaries (Table 6). For actual ranks and pay grades, see Appendix A: ESD Personnel Calculations.	

FACILITIES COSTS (INITIAL CONSTRUCTION AND ANNUAL OPERATING COSTS)

From Appendix B of the case, the proposed alternative requires an estimated $30 million in initial construction costs. This is based on the costs of similar facilities built in Twentynine Palms, CA. Yuma would not require the same space as Twentynine Palms because it requires less equipment and holds fewer exercises. This means the construction cost could be lower, but, in keeping with the conservative approach of this research, the facilities cost calculations include the larger cost. Also from Appendix B of the case, the estimated annual operating costs are $420,320. Table 11 shows both the estimated initial construction costs and the estimated biennial operating costs.

Table 11 FACILITIES' COSTS			
Estimated Size of Facilities (in SqFt)	Estimated Construction Costs*	Estimated 2013 Annual Operating Costs per SqFt**	Total Estimated Annual Operating Costs
74,000	$ 30,000,000	$ 5.68	$ 420,320
* Calculated using http://www.bls.gov/data/inflation_calculator.htm and conservatively rounded to nearest X.X million dollars. See Appendix B in the case. ** From FY 2010 Federal Real Property Report (Federal Real Property Council, 2010)			

TEMPORARY ADDITIONAL DUTY COSTS

As mentioned before, temporary additional duty (TAD) costs exist in both situations, but the total costs differ due to the shortened amount of time the advance party (ADVON) and rear party would be in Yuma. The total annual TAD cost for the proposed alternative is $401,760, as reflected in Table 12.

Table 12 PROPOSED ALTERNATIVE TAD COSTS						
Grade	Number of Given Grade	Days ADVON	Days Rear	Total Days TAD	TAD Cost/Day	TAD Cost
O - 3	1	7	3	10	$ 124	$ 1,240
O - 2	1	7	3	10	$ 124	$ 1,240
E - 7	1	7	3	10	$ 124	$ 1,240

E - 6	1	7	3	10	$ 124	$ 1,240
E - 5	2	7	3	10	$ 124	$ 2,480
E - 4	4	7	3	10	$ 124	$ 4,960
E - 3	8	7	3	10	$ 124	$ 9,920
Total per Unit	18	Total TAD Cost per unit				$ 22,320
Total Cost per WTI Exercise (9 units participating)						$200,880
Total Annual Cost (2 WTI exercises)						$401,760

Question 3. What cost savings before considering the time value of money, if any, are associated with establishing a Marine Corps Exercise Support Detachment in Yuma, AZ?

Comparative Analysis

Table 13 is a summary table that depicts the potential annual savings when comparing the current operations to those of the proposed ESD.

Table 13
SUMMARY – COMPARATIVE ANALYSIS OF ALTERNATIVES' ANNUAL COST DIFFERENCES

Comparative Analysis				
Status Quo Option		Alternative Option		Difference
Transportation	$3,124,813	Personnel	$6,848,099	--------
Personnel	$6,042,400	Facilities Costs	$420,320	--------
TAD	$522,288	TAD	$401,760	--------
Totals	$9,689,501	--------	$7,670,179	$2,019,322

The potential annual savings is $2,019,322 with a one-time initial construction cost of $30,000,000. The largest portion of savings comes from the transportation cost savings. Establishing the ESD allows units to focus more time and resources on important endeavors other than preparing to ship and maintain equipment. More maintenance personnel resource availability, coupled with the fact that a unit is not using its own equipment, increases the readiness percentage of the unit.

An additional point of discussion involves the risk involved with fuel price fluctuations over the past decade, a trend that is not expected to change. Therefore, eliminating the transportation of equipment reduces the risk to the government associated with increasing fuel prices. Commanders would not have to choose between sending equipment and saving money.

Question 4. Conduct a Net Present Value Analysis with respect to the two options. Then, address the following:

1. **Why does the discount rate for a government capital project analysis differ from that of a for-profit analysis? Specifically, why would the government rate be lower?**
2. **What are the implications should the discount rate change? Given current market rates, what direction do you think rates will go in the future?**
3. **Discuss risks associated with estimated cash flows**

The sensitivity analysis starts with a 50-year life (3.0 percent discount rate) and then changes the life span assumption to 10 years, 15 years, and 20 years, which changes the discount rate to 2.0, 2.4, and 2.7 percent, respectively. Table 14 shows the comparison of savings at the three levels of personnel participation for the 10-year, 15-year, and 20-year building lifespan assumptions, respectively.

Table 14
NPV AT EACH LEVEL OF PARTICIPATION ASSUMING 10-YEAR BUILDING LIFESPAN

Suggested Discount Factors	Present Value of Investment in Facilities	Present Value of Annual Savings	Net Present Value
50 years - 3.0%	$(30,000,000)	$51,956,679	$21,956,679
20 years - 2.7%	$(30,000,000)	$30,892,896	$892,896
15 years - 2.4%	$(30,000,000)	$25,186,900	$(4,813,100)
10 years - 2.0%	$(30,000,000)	$18,138,732	$(11,861,268)

As shown in Table 14, the potential cost savings decrease as the building lifespan assumption decreases. In fact, if the life of the alternative (ESD) is slightly less than 20 years, the net present value (NPV) will be negative. Thus, it is important that a long-term commitment be made to allow for the setup of a permanent detachment that would be economically viable.

1. Government discount rates are inherently different from, indeed lower than, rates of for-profit organizations because the U.S. government rate is determined predominately by the incremental borrowing rate on U.S. treasuries. There is obviously no equity component to the calculation of a weighted average cost of capital (WACC). Since equity costs of capital are almost always higher than the after-tax cost of debt, and since the riskiness is higher for non-government organizations, for-profit firms will always have a higher discount rate given their need to calculate a WACC for all sources of capital.

2. As for discount rate changes with respect to the U.S. government, it should be noted that at the writing of this case, U.S. interest rates have been at or near historical lows. The Federal Reserve has been considering rate increases to bring rates back to "normal." While one can argue about the correct "normal," the likelihood of rate increases is high. Such increases would increase U.S. Treasury rates and thus the appropriate discount rates for long-term projects. Such increases could potentially change the viability of any capital budgeting project. For instance, in the 50-year scenario of this case, a rate of 5 percent would result in an NPV of just $6,864,591. If the discount rate were to go to 6.44 percent, the NPV would just break even at 50 years. Shorter time periods would see even less-favorable NPV amounts.

3. Since cash flows are by their very nature estimates of the future, errors are bound to occur. If the cash flow estimates are unbiased and the errors are random, estimation errors will tend to cancel out. Regrettably, cash flow estimates are frequently biased. Many program managers tend to be overly optimistic and costs are understated. Managers can become emotionally attached to their projects and thus fail to objectively assess the projects' negative factors. Cash flow estimates are also subject to market risk, which includes such factors as: inflation, recessions, high interest rates, and budget uncertainty especially for government agencies, just to name a few.

Question 5. What conclusions can you make, and what would you suggest for further investigation to include a discussion of real (embedded) options?

CONCLUSIONS

Overall, the establishment of an ESD in Yuma can save the Marine Corps money given a long enough time horizon and continued relatively low discount rates. The transportation and opportunity costs of time associated with the current operations cost the Corps money and decrease the efficiency of operations. The current operations require a large amount of resources from the Major Subordinate Commands (MSCs), which could endanger the longevity of the operations in Yuma. By establishing an ESD, the Marine Corps can save money in the long run and makes the operations in Yuma more sustainable. By avoiding transportation costs, the MSCs can save millions of dollars. Avoiding transportation of their own equipment also allows units to spend time on more pressing issues rather than on equipment preparation and embarkation.

While preparing the equipment for embarkation provides Marines with some relevant training, it does not outweigh the cost of transporting that equipment across the country. Units can conduct embarkation training at their home base or station, reducing the costs while providing similar training.

Assuming a tight fiscal situation necessitates the need for improving the efficiency of operations, especially those vital training operations conducted on an annual basis. An ESD in Yuma allows the Marine Corps to continue the vital training exercises in the area, while allowing the MSCs to spend money on their own operations and training exercises instead of spending it on transporting equipment to Yuma.

Possible Real (Embedded) Options and Suggestions for Further Investigation

This case focused on the costs associated with ground operations in Yuma and assumed all necessary equipment would be located at the ESD. While addressing the case, many issues may be identified that necessitate further discussion, particularly real (embedded) options.

This project has considerable risks associated with the length of time of the project and uncertainty of the estimated cash flows as previously discussed. Therefore, managers might want to consider real options where mangers can influence the size and riskiness of the project's cash flows by taking different actions during the project's life. A decision tree could be used to reduce risk since the expenditures are made in stages over a number of years. A decision tree would revalue the projects cash flows using new information and probability of those cash flows to determine if the project should continue or be abandoned. Other real options would include flexibility options (switch inputs such as people and equipment), capacity options (change the size or scope of the project), and timing options (option to delay).

Flowing from the discussion above, some possible further investigation considerations might include, but not limited to, the following:

1. Would it be more cost effective to increase the size and scope of the ESD in Twentynine Palms, CA, as opposed to establishing an ESD in Yuma?

2. Given the use of both high- and low-density equipment and expertise needed to maintain certain equipment, what is the most cost-effective equipment set that should be maintained at the Yuma ESD in order to maintain the current level of operations? As a corollary, is it more cost effective to continuing shipping in certain equipment items rather than maintaining them at the Yuma ESD?

3. Given a certain equipment set, what should the organization of the ESD be in order to maintain the necessary equipment at a relatively lower cost to the government?

4. Does the establishment of an ESD increase MCAS Yuma's capacity for conducting exercises? If so, by how much? Would conducting some exercises in Yuma instead of their current location save the Marine Corps money?

LIST OF ACRONYMS AND ABBREVIATIONS

ACE	Air Combat Element
ADVON	Advance party
Arty Bln	Artillery battalion
Bldg	Building
BLS	Bureau of Labor Statistics
CF	Cash flow
DoD	Department of Defense
ESD	Exercise Support Detachment
FY	Fiscal year
GS	Government service (pay grade)
HQ	Headquarters
Inf BlnBn	Infantry battalion
MACG	Marine Air Control Group
MAGTF	Marine Air-Ground Task Force
MAGTFTC	Marine Air-Ground Task Force Training Command
MAW	Marine Aircraft Wing
MAWTS-1	Marine Aviation Weapons and Tactics Squadron One
MAWTULant	Marine Air Weapons Training Unit Atlantic
MAWTUPac	Marine Air Weapons Training Unit Pacific
MCAGCC	Marine Corps Air Ground Combat Center
MCAS	Marine Corps Air Station
MCO	Marine Corps Order
MILCON	Military construction
MRX	Mission rehearsal exercise
MSC	Major Subordinate Command
NAF	Naval airfield
NPV	Net present value
O&M	Operations and maintenance
OMB	Office of Management and Budget
OpFor	Operating forces
OPM	Office of Personnel Management
Org	Organization
SqFt	Square feet
T/O	Table of organization
TAD	Temporary additional duty
VMAQ	Marine Tactical Electronic Warfare Squadron
WTI	Weapons and Tactics Instructors Course

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