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THESIS

MAKING BETTER USE OF FINANCIAL STATEMENTS FOR MILITARY: WHAT'S WRONG AND WHAT CAN BE DONE?

by

Shuzo Homma

December 2018

Thesis Advisor: Chong Wang
Co-Advisor: Judith M. Hermis

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13. ABSTRACT (maximum 200 words)

This research focuses on how to make better use of military financial statements, especially for internal decision makers, by introducing a new approach to weapon systems' valuation and its appearance on balance sheets. This new approach aims to improve decision-making in the resource allocation of weapon systems. The author compares military balance sheets of several countries and identifies major flaws in two current primary valuation approaches: historical cost and fair value. These two approaches are difficult to use in decision-making because of their inability to reflect military reality on the book value of weapon systems. The author also verifies the effectiveness of the existing depreciation method of weapon systems and proposes a new decelerated depreciation method. The new valuing approach based on the military value of weapon systems is created and compared with existing approaches. To measure the usefulness of the new approach and the new depreciation method in the decision-making, a simplified scenario is made up, and changes in the value of weapon systems are compared between the new approach and two status quo approaches. The result shows that the new approach provides military leadership decision usefulness, which could accelerate transformation in the portfolio of weapon systems that must constantly respond to rapidly changing strategic circumstances.

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MAKING BETTER USE OF FINANCIAL STATEMENTS FOR MILITARY: WHAT'S WRONG AND WHAT CAN BE DONE?

Shuzo Homma
Lieutenant Commander, Navy, Japan
Bachelor of International Relations, National Defense Academy, 2006

Submitted in partial fulfillment of the
requirements for the degree of

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December 2018

Approved by: Chong Wang
Advisor

Judith M. Hermis
Co-Advisor

Don E. Summers
Academic Associate,
Graduate School of Business and Public Policy

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This research focuses on how to make better use of military financial statements, especially for internal decision makers, by introducing a new approach to weapon systems' valuation and its appearance on balance sheets. This new approach aims to improve decision-making in the resource allocation of weapon systems. The author compares military balance sheets of several countries and identifies major flaws in two current primary valuation approaches: historical cost and fair value. These two approaches are difficult to use in decision-making because of their inability to reflect military reality on the book value of weapon systems. The author also verifies the effectiveness of the existing depreciation method of weapon systems and proposes a new decelerated depreciation method. The new valuing approach based on the military value of weapon systems is created and compared with existing approaches. To measure the usefulness of the new approach and the new depreciation method in the decision-making, a simplified scenario is made up, and changes in the value of weapon systems are compared between the new approach and two status quo approaches. The result shows that the new approach provides military leadership decision usefulness, which could accelerate transformation in the portfolio of weapon systems that must constantly respond to rapidly changing strategic circumstances.

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LIST OF ACRONYMS AND ABBREVIATIONS

AASB	Australian Accounting Standards Board
AFR	Agency Financial Report
AGA	Association of Government Accountants
CFO	chief financial officer
DoD	Department of Defense/Defence
DoN	Department of Navy
DWPs	defence weapons platforms
FASAB	Federal Accounting Standards Advising Council
FY	fiscal year
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
IFRS	International Financial Reporting Standards
IJS	Imperial Japanese Navy
ISYD	inversed sum of the year's digits
JGSDF	Japan Ground Self Defense Force
MHCA	modified historical cost accounting convention
MoD	Ministry of Defense/Defence
MoF	Ministry of Finance
NPM	new public management
NZDF	New Zealand Defence Force
ODRC	optimized depreciated replacement cost
OMB	Office of Management and Budget
PAR	Performance and Accountability Report
PP&E	property, plant and equipment
SME	specialist military equipment
SUME	single use military equipment
SYD	sum of the year's digits
TVM	time value of money
VLE	various land equipment
WWII	World War II

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I. INTRODUCTION

A. PURPOSE OF STUDY

This research focuses on how to make better use of military financial statements, especially for internal decision makers, by introducing a new method of weapon systems' valuation on a balance sheet. By articulating the limitations and potentials of balance sheets, this study identifies areas where balance sheets can be most improved for decision-making in resource allocation aligned with military strategy.

B. BACKGROUND

Ideally, corporate-style financial statements of a military agency are informative for decision-making by executives and managers. Advocates for financial statements insist that such statements are not only a tool for accountability, but also for decision-making by executives and managers (Aman, 2012). It is, however, only in theory that governmental managers fulfill their accountability to citizens and make various decisions through financial statements.

In reality, few internal users care about financial statements. As former comptroller of the Office of Management and Budget (OMB) Danny Werfel has pointed out: "Neither the public nor the government decision makers appear to be liking at our standard reports, such as our balance sheets or our net operating cost" (Federal News Radio, 2010). The widespread view that financial statements have little or no value probably represents one of the reasons why the U.S. Department of Defense (DoD) remains the only agency that has still not achieved audit-readiness as of FY2018, almost three decades after enactment of Chief Financial Officer (CFO) Act. The former Senate Armed Services Committee Chairman John McCain illustrated the failure and the reluctance of senior executives of the DoD: "This has been a very public continuing failure for the department due to a failure of senior management to make this a priority for the department and invest the necessary time and will to get it done" (Federal News Radio, 2017). In conclusion, the importance of financial statements is not fully understood by federal executives and managers.

The lack of attention to financial statements may be partially explained by the DoD's military tradition and culture. People in uniform are trained to fight fiercely, not to bookkeep accurately. Another reason, however, lies in financial statements themselves. Financial statements are considered neither important nor useful in decision-making due to serious limitations. Some government executives view financial statements as being useless (Aman, 2012). Others say that, rather than stale and aggregate numbers on financial statements, the DoD has more concrete and relevant numbers for decision-making in two other accounting systems called budgetary accounting and managerial accounting, and decision-making based on historical data of financial statements is like "driving by looking in the rearview mirror" (Candreva, 2004, p. 10). Ultimately, financial statements of governmental agencies including the DoD are currently rarely used in decision-making by internal decision makers.

However, financial statements for the military can be more useful for decision-making with the modifications this study suggests. More useful financial statements further motivate achieving and maintaining audit-readiness and clean financial statements. This is true not only for the U.S. DoD, but also for the Ministry of Defense (MoD) of Japan.

C. METHODOLOGY

This research focuses on balance sheets, especially the depreciation and valuation of long-term assets. Compared with cash-based/single-entry financial reporting, one clear advantage of corporate-style financial statements in the public sector is its capability to express the value of various assets on balance sheets. Balance sheets can integrate all information of assets and liabilities in dollar terms, which gives who need the information easy access and comparability.

In addition to the abovementioned importance, there is another reason to focus on balance sheets. A military agency is highly capital intensive in its activity. It needs many expensive weapon systems to fulfill its mission, and these weapon systems are classified as long-term assets on balance sheets. The right capacity of major weapon systems is directly related to the combat readiness, effectiveness, and lethality of the military. Users of financial statements—including executives—could get a big picture of national defense

if balance sheets express the value of weapon systems in an ideal way. In particular, asset valuation, depreciation, and impairment of military weapon systems represent the key issues in utilizing DoD financial statements for decision-making.

Despite the fact that financial statements could potentially be highly important, the use of balance sheets is rather limited in practice. As mentioned previously, one complaint is that financial statements are difficult to use outside the financial management community. Numbers on book are not what executives and management teams need for their decision-making. When military decisions need to be made, financial information that is irrelevant to military value is simply useless.

The first step to make better use of balance sheets in decision-making is to define what the numbers on balance sheets should be. The numbers on balance sheets, as is, are historical cost based and adjusted for use (depreciation), but they can be very different from military value. Next, we need to know the reason why the number is not expressed in decision-useful ways. In other words, we need to know the reason for the discrepancy between military value and financial book value. To serve that purpose, historical examples that indicate the relationship between the two values are studied. The relationship is elusive, ambiguous, and needs an interdisciplinary approach to address. So far, little attention has been paid to the relationship. Various examples are given, ranging from the Pacific War to the latest developed weapon system, such as a Zumwalt-class destroyer.

Third, in order to achieve better valuation of weapon systems on balance sheets, two valuation methods are compared. The DoD has been using the historical cost approach for deciding depreciation basis. On the other hand, several countries' military agencies, such as The United Kingdom, Australia, and New Zealand, use the fair value approach and have achieved cleaner financial statements than the U.S. DoD. Through examples of these countries, two approaches are compared to determine which is better from the viewpoint of decision-making. Basically, the historical cost approach relies on the idea that depreciation is an allocation of costs, not an expression of value. Meanwhile, the fair value approach is based on a mixed idea of cost allocation and valuation of assets. Costs are allocated over the period of an asset's life, at the same time, the value of assets are updated on a regular basis. In the U.S. private sector, long-term assets (i.e., property, plant, and

equipment) are based only on the historical cost approach, while revaluation by the fair value approach is not allowed (at least not on the upper side). Many assets categorized as PP&E (property, plant, and equipment) do not have an active market, hence subjectivity is inevitable in fair value pricing. Managers in the private sector could arbitrarily control profit and taxation by the fair value approach and violate the accounting principle called "conservatism." Conservatism in the valuation means that when two or more reasonable alternative values are indicated, the lower amount has to be chosen (Whittington & Pany, 2014). When the fair value approach for PP&E is allowed, it could violate conservatism by arbitrarily underestimating or overestimating the asset's value to manipulate the amount of profit and tax. Governmental agencies have neither profit nor tax implications however, and accounting conservatism is less important in the public sector. With the ease of conservatism concern, the fair value approach can better express military value on balance sheets with modifications.

In addition to the analysis of two valuation methods, this study describes three depreciation methods: straight-line, accelerated, and decelerated. The straight-line method is the default for the depreciation of weapon systems of the DoD, and the accelerated method is commonly used for the private sector. Though the decelerated method is rarely used both in the public and private sectors, it has the possibility for better expressing military value on balance sheets because it best fits the pattern of a weapon system's value decline. The combination of the modified fair value approach and the decelerated method of depreciation can be a new way to express military value on a balance sheet.

Lastly, based on the findings of this research, several models are simulated to display a better way of expressing the value of weapon systems. Because the DoD has not established a reliable system to make financial statements, real numbers are not suitable for simulation. Hence, the scenario about military weapon systems is made up and simulated. The results of the simulation are compared with the existing approach and method side by side. One column is based on the historical cost approach and straight-line method, and the other column is tailored especially for a military agency based on the findings of this thesis. This exhibition of two sets of numbers has the potential for making military financial statements more useful to decision makers.

D. CONTRIBUTION OF STUDY

This study contributes to the DoD's mission by making balance sheets more useful to decision makers; in particular, new methods of valuation and depreciation of PP&E (including major weapon systems) are proposed. It is further argued that the new approach will improve the DoD's combat readiness and effectiveness through better decisions on maintaining and updating the correct capacity of major weapon systems.

Another contribution of this study relates to the Japanese military. Japan is left far behind leading-edge countries over governmental financial statements. Every agency, including the MoD of Japan, produces financial statements, yet at an antiquated level, both qualitatively and quantitatively. To bridge the gap, Japan should learn from the examples of other countries and start from the place where other countries have already proven to work. By revealing the limitations and potentials of military financial statements, this study provides justifications for Japan MoD to start improving and catch up with developed countries.

E. THESIS ORGANIZATION

The remainder of the thesis is organized as follows: Chapter II reviews literature.

Chapter III starts with the DoD's current valuation method of weapon systems and then moves on to examples of other countries' depreciation and valuation of military weapon systems. Later, the chapter provides examples that show the differences between financial book value and military value. In the last section of the chapter, military financial statements of Japan are studied.

Chapter IV proposes a new way to express military value on balance sheets based on the modified fair value approach and decelerated depreciation method. Then, a simulation is provided, and the simulation result is compared to the status quo approach.

Lastly, Chapter V summarizes the findings, makes recommendations for better use of military financial statements, and concludes this thesis. Recommendations are divided into two parts. One part is about military financial statements in general, and the other part is for the MOD of Japan.

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II. LITERATURE REVIEW

This chapter illustrates the characteristics of military accounting/financial statements: the types of accounting, information users, purpose, and achievement of financial statements in the military. Additionally, this chapter discusses depreciation of long-term assets because weapon systems play essential roles on military financial statements. Though literature directly referencing military financial statements is very limited, commonality exists between military and public sector financial statements. Therefore, financial statements from the general public sector are mainly reviewed in this chapter.

A. CHARACTERISTICS OF MILITARY ACCOUNTING/FINANCIAL STATEMENTS

This section illustrates characteristics of military accounting systems and military financial statements.

1. Three Types of Accounting in the Military

Three types of accounting systems exist within the U.S. DoD: budgetary, managerial, and financial accounting. Each of these accounting systems has a different purpose and origin in the history of the DoD.

Budgetary and managerial accounting systems were practiced earlier than financial accounting in the DoD. Budgetary accounting is "the process of the budgeting, justifying, and accounting for appropriations" (Candreva, 2017, p. 364), and managerial accounting is the supporting tool for decision-making which provides sets of information and analysis such as cost estimation. On the other hand, financial accounting "provides historical information on the financial condition of the agency" (Brook, 2013, p. 139). Financial accounting was introduced from the private sector during the series of financial reform acts triggered by the CFO Act of 1990. The point herein is that the DoD has been functional with budgetary and managerial accountings long before the introduction of financial accounting. Especially in the decision-making of managers and executives, managerial

accounting has played a central role with providing methods such as cost estimation and cost benefit analysis.

2. Financial Reporting and Financial Statements

Federal financial statements are part of federal financial reporting (Office of Management and Budget, 2004). The Federal Accounting Standards Advisory Board (FASAB), which oversees improving federal financial statements through recommendation and issuance of statements, defines financial reporting as:

> [T]he process of recording, reporting, and interpreting, in terms of money, an entity's financial transactions and events with economic consequences for the entity. Reporting in the federal government also deals with nonfinancial information about service efforts and accomplishments of the government, i.e., the inputs of resources used by the government, the outputs of goods and services provided by the government, the outcomes and impacts of governmental programs, and the relationships among these elements. (OMB, 1993, para. 22)

Financial reporting is a broadly defined process, ranging from recording to interpreting, and financial statements play the most important role in this process. Specifically, financial statements provide highly aggregated information to decision makers.

The abovementioned definition by FASAB also indicates the importance of the nonfinancial information component of financial reporting. A combination of financial and non-financial information serves accountability/decision usefulness better than financial information alone.

3. Financial Statements in the Military

Federal agencies including the DoD are required to report the following four principal statements: Balance Sheet, Statement of Net Cost, Statement of Changes in Net Position, and Statement of Budgetary Resources. Except for the Statement of Budgetary Resources, the other three statements have counterparts in the private sector. Federal agencies, however, have no equivalent statement to Cash Flow Statement. Table 1 briefly summarizes the four principal statements.

Table 1. Principals of DoD financial statements. Source: DoD (2017, p. 55)

Statement	Information it provides	Equivalence in the private sector
Balance Sheet	"Reflects the Department's financial position as of the statement date. The assets are the amount of future economic benefits owned or managed by the Department. The liabilities are amounts owed by the Department. The net position is the difference between the assets and liabilities."	Balance Sheet
Statement of Net Cost	"Shows separately the components of the net cost of the Department's operations for the period. Net cost is equal to the gross cost incurred by the Department less any exchange revenue earned from its activities."	Income Statement
Statement of Changes in Net Position	"Presents the sum of the cumulative results of operations since inception and unexpended appropriations provided to the Department that remain unused at the end of the fiscal year. The statement focuses on how the net cost of operations is financed. The resulting financial position represents the difference between assets and liabilities as shown on the consolidated balance sheet."	Statement of Changes in Equity
Statement of Budgetary Resources	"Provides information about how budgetary resources were made available as well as their status at the end of the period."	--
--	--	Cash Flow Statement

Table 2 shows the required financial statements across the five countries studied in this thesis: the United States, Japan, The United Kingdom, Australia, and New Zealand.

Table 2. Required financial statements of five countries.

Country Name	Required Financial Statements			
U.S.	Balance Sheet	Statement of Net Cost	Statement of Changes in Net Position	No Statement of Cash Flow
Japan	Balance Sheet	Statement of Operation of Cost	Statement of Changes in Assets and Liabilities	No Statement of Cash Flow
U.K.	Statements of Financial Position	Statement of Comprehensive Net Expenditure	Statements of Changes in Taxpayers Equity	Statements of Cash Flow
Australia	Statement of Financial Position	Statement of Comprehensive Income	Statements of Changes in Equity	Cash Flow Statement
New Zealand	Statement of Financial Position	Statement of Comprehensive Revenue and Expense	Statements of Changes in Equity	Statements of Cash Flow

4. Information Users of Military Financial Statements

Public sectors' financial statements have two types of information users: external users and internal users. FASAB defines citizens and Congress as external users, and executives and program managers as internal users. In the private sector, internal users could be represented by managers and executives similarly to the public sector, and external users, who are primary users, are bondholders and shareholders. Whereas the difference between internal and external users is clear in the private sector, such distinction in the public sector is less significant, as FASAB describes:

> Distinction between internal and external users is in many ways less significant for the federal government than for other entities. Officials who in theory should have ready access to information often find in practice that it is not available. Factors that contribute to this problem include the size and complexity of the government, the rapid turnover among senior political executives compared with the time required to install information systems in large bureaucracies, and the division of authority in the federal government. (Office of Management and Budget, 1993, para. 28)

Ultimately, public sectors' internal users have characteristics of external users because in contrast to the private sector, where internal users usually possess the detailed information of the organization, internal users do not necessarily know much more than outsiders due to the size and complexity of the government. Therefore, sometimes the internal users in the public sector rely on information that is intended for the use of external users. This is especially true for the defense sector because typically the DoD is the largest among federal agencies, as evidenced by both the United States and Japan. Hence, in theory, borders between internal and external users are less clear, and consequently it can be argued that in the public sector, both internal and external users are primary users of financial statements.

5. Purpose of Financial Reporting in the Military

Governmental financial reporting has two major objectives: to ensure accountability and to support decision-making (Brook, 2010).

a. Accountability to Taxpayers

One main purpose of public sector financial reporting is to ensure accountability to taxpayers and the military is no exception. FASAB prescribes four objectives of financial reporting for accountability: Budgetary integrity, Operating performance, Stewardship, and Systems and Control (OMB, 1993). The Government Accountability Office (GAO) stresses the importance of accountability by the DoD: "This is particularly true for DOD, whose reported discretionary spending makes up about half of the federal government's and whose physical assets represent more than 70 percent of the federal government's" (U.S. GAO, n.d.).

b. Decision Usefulness for Internal Information Users

Among the four objectives mentioned in Part a. of FASAB, Operating performance is highly relevant to the topic of this research, which is how the balance sheet can help DoD leaders make better decisions regarding resource allocation for weapon systems. FASAB describes Operating Performance as:

> Federal financial reporting should assist report users in evaluating the service efforts, costs, and accomplishments of the reporting entity; the manner in which these efforts and accomplishments have been financed; and the management of the entity's assets and liabilities. Federal financial reporting should provide information that helps the reader to determine
>
> —the costs of providing specific programs and activities and the composition of, and changes in, these costs;
>
> —the efforts and accomplishments associated with federal programs and the changes over time and in relation to costs; and
>
> —the efficiency and effectiveness of the government's management of its assets and liabilities.(OMB, 1993, para. 14)

Costs and accomplishments are key for this objective, and balance sheets provide both types of information. First, depreciation of assets is cost allocation. Second, weapon systems, as long-term assets, to some extent measure combat readiness and hence can be used as a proxy of accomplishment. Further, readiness is a combination of the right weapon systems and the right personnel. A substantial portion of readiness derives from the right mix and capacity of various weapon systems. Users can potentially assess the operating performance of the DoD if balance sheets present the correct information in the right manner.

6. Achievements of Military Financial Statements

This section consists of two parts. One part is the current status of financial statements in the military agency/ministry of several countries. The financial statements of some countries are audited and have acquired unmodified opinion[1]. Other countries have not reached that stage. The second part elaborates on what financial statements actually have brought to military agencies in terms of abovementioned two purposes.

[1] Unmodified opinion is the most favorable opinion, equivalent to the “clean” opinion. This opinion is issued only when the auditors found no evidence to believe the statements are unreliable and conclude financial statements fairly represent the organization’s actual condition without modification (Candreva, 2017).

a. Current Status of Military Financial Statements

Having corporate-style financial statements in governmental agencies is one of the practices of New Public Management (NPM). NPM is the global reform in the public sector that started in the late 20th century, motivated by the belief that the private sector is more effective and economical in managing organization than the public sector. Consequently, in many countries, the public sector borrowed various practices from the private sector, and introducing corporate-style financial statements is considered one of the most important of NPM's applications to address public sector's inferiority. Several "leading-edge" countries of NPM, such as Australia, New Zealand, the United Kingdom, and the United States, have introduced corporate-style financial statements vigorously to governmental agencies including their defense agencies/ministries.

In the United States, the CFO Act of 1990 and the Government Management Reform Act of 1994, which expanded on the CFO Act, require 24 agencies of the United States to have audited financial statements (The Chief Financial Officers Council & The Council of the Inspectors General on Integrity and Efficiency, 2011). By FY2010, 21 of the 24 agencies had acquired "clean opinion," which means that "financial statements were fairly presented in all material respects, in accordance with the generally accepted accounting principles used to prepare and present the financial statements" (The Chief Financial Officers Council & The Council of the Inspectors General on Integrity and Efficiency, 2011, p. 13). As of 2017, the DoD is the one and only agency staying in disclaimer of opinion, which means "the auditors were not able to complete their work or issue an opinion because they lacked sufficient evidence to support the amounts presented" (U.S. GAO, n.d.). In 2018, the DoD plans to launch its first-ever agency-wide financial audit, which is expected to save the DoD from disclaimer, though it is not expected to bring clean opinion in this year because most agencies did not receive it during their first audit (Congressional Research Service, 2018).

Defense agencies of other leading-edge countries have acquired clean opinion on their financial statements (Australia, New Zealand) or at least have been audit-ready (the Unite Kingdom). On the contrary, Japan lags far behind the global trend. Though governmental agencies including the MOD are required to have financial statements,

significant limitations exist in these statements. Basically, the Japanese governmental accounting system is required to be single-entry and cash basis[2] by the law, and information for financial statements has to be extracted and transformed to accrual, double entry basis information. More importantly, each agency is not required to have independent auditing, and no one assures whether statements are fairly presented or not.

b. What Indeed Financial Statements Brought Us

Douglas A. Brook, former Under Secretary of DoD under the Bush Administration (Financial Management and Comptroller), argued that having clean opinion is not necessarily a proxy for good financial management (Brook, 2010). Association of Governmental Accountants (AGA) also reported: "[C]lean opinions on financial statements should result from financial processes that are as good as they need to be. Finally, just striving for a clean opinion adds little or no value to programs or entity missions" (Association of Government Accountants, 2007, p. 9). Audited financial statements are just means, not ends. In other word, having clean opinion itself is not the achievement, and the achievement is assessed by what financial statements bring to the internal and the external information users. As identified in the previous section, the purpose of financial statements is to fulfill accountability to the public and to support decision-making, and these are the ultimate goals of financial statements.

Theoretically, audited financial statements enhance accountability by increasing reliability and reducing information cost, i.e., the cost to access correct information. The Office of Management and Budget (OMB) stated: "As individuals, citizens typically have limited time and ability to analyze reports about their government; they want and rely on assurances that the government is functioning economically, efficiently, and effectively" (OMB, 1993, para. 77). An audited financial statement with clean opinion offers reasonable assurance that information is free from material misstatement. Therefore, citizens do not need to incur extra cost to assess the reliability and accuracy of information. Actually in

[2] More elaborately, Japanese governmental accounting system is "modified cash basis" that entails one month of adjusting period after the end of the fiscal year. However, in dichotomy of cash and accrual, the nature of Japanese governmental accounting system is apparently cash basis.

the United States, the CFO Council concluded that the CFO Act has fostered accountability since its enactment (CFO Council, 2011). The Survey of the GAO finds that accountability was enhanced in federal agencies that had financial statements relative to those agencies that did not have financial statements (U.S. GAO, 2002). Globally, government financial executives in leading countries such as Australia and New Zealand stated that accrual-based financial system and financial reporting bring greater transparency and accountability (PWC, 2013).

While achievements in accountability are much easier to identify and confirm, success in decision-making is quite subtle. Some scholars remain skeptical because there is little evidence that executives and managers are making budgetary and managerial decisions by using financial statements. Brook points out: "[F]inancial statements are not linked to the processes for resource-allocation decisions, nor do they produce information needed by managers" (Brook, 2010, p. 52). He also states: "There is slim evidence that the statements themselves are useful to policy makers and managers" (Brook, 2013, p. 148). Candreva argues that the decision-making is primarily implemented through managerial accounting, not financial accounting (Candreva, 2017).

However, this skepticism does not necessarily mean that financial accounting is useless for the decision-making process. The information gathered and aligned to form financial statements is getting more accurate and timely with the effort to have and retain clean opinion, and agencies are using this information for supporting policy makers and managers (Brook, 2013). So called "spillover effects"(Candreva, 2017, p. 381) "provide complete, reliable, consistent, and timely information which is prepared on a uniform basis" ("Chief Financial Officers Act of 1990," n.d.). Also, Under Secretary of Defense (Comptroller)/CFO Department of Defense David Norquist stated:

> [F]ixing the pieces along the way produce a tremendous benefit. So think about the inventory in a warehouse, how many spare parts or munitions that you have. Those had been delivered by the vendor, but hadn't been recorded in the property system, which meant folks who were anticipating using them were still waiting to take advantage of it. (Federal News Radio, 2018)

Spillover effect has not materialized on Balance sheets of the DoD. The main reason is that the DoD cannot demonstrate accountability of accuracy, nor can it show the

completeness of its inventory, buildings, and other property and equipment, including their location and condition (U.S. GAO, n.d.). However, it is natural that with the improvement of this situation during the effort to have clean opinion, quality of financial information will be improved significantly.

In conclusion, currently financial statements are not very useful in decision-making, but financial information has a potential future use in decision-making by internal users of the DoD.

B. DEPRECIATION

This section discusses depreciation in the context of public sector/military agency because the issue is highly related to the decision usefulness of the military balance sheet. As David Norquist stated, property and property valuation is the most challenging part of DoD financial statements (Runnels, 2017), and depreciation is a central piece for property valuation.

1. Depreciation Defined

Depreciation potentially has implications on two fronts: valuation and cost allocation.

- Valuation

  Depreciation refers to loss in value of fixed tangible assets due to obsolescence and deterioration.

- Cost allocation

  Systematic allocation of cost over the useful life of a fixed tangible asset and is commonly used in financial reporting in the private sector (H. Peterson, 2002).

The U.S. Generally Accepted Accounting Principles (GAAP) is based on the latter definition of cost allocation. In the U.S. GAAP, depreciation "aims to distribute the cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation" (Financial Accounting Standards Board, 2018).

Japanese Accounting Standards also adopt cost allocation perspective. However, International Financial Reporting Standards (IFRS) is somewhat different from others because it allows revaluation for depreciation of fixed tangible assets. Under the IFRS, assets that "fair value can be measured reliably shall be carried at a revalued amount, being its fair value at the date of the revaluation less any subsequent accumulated depreciation and subsequent accumulated impairment losses" (The International Accounting Standards Committee, 2009, para. 31). Depreciation under the IFRS is a mixture of valuation and cost allocation perspective. Countries under the influence of the IFRS, such as the United Kingdom, Australia, and New Zealand, allow revaluation of long-term assets on balance sheets. The implication and possibility of revaluation is elaborated in a later chapter.

2. Three Types of Depreciation Method

This section introduces three types of depreciation methods: straight-line, accelerated, and decelerated. The first two types see applications both in the private and the public sector; however, the decelerated method is rarely used.

Under the straight-line method, depreciation is distributed equally over the estimated economic life of the asset. In the accelerated method, larger amounts of depreciation are allocated in the early phase of economic life and smaller amounts in the later phase. On the other hand, the decelerated method is the opposite of the accelerated method. Smaller amounts are depreciated in the early years and larger amounts in later years. In the United States, the decelerated method is currently neither used in the private sector nor in the public sector. Figure 1 is the graphical depiction of carrying value with respect to time under the three methods.

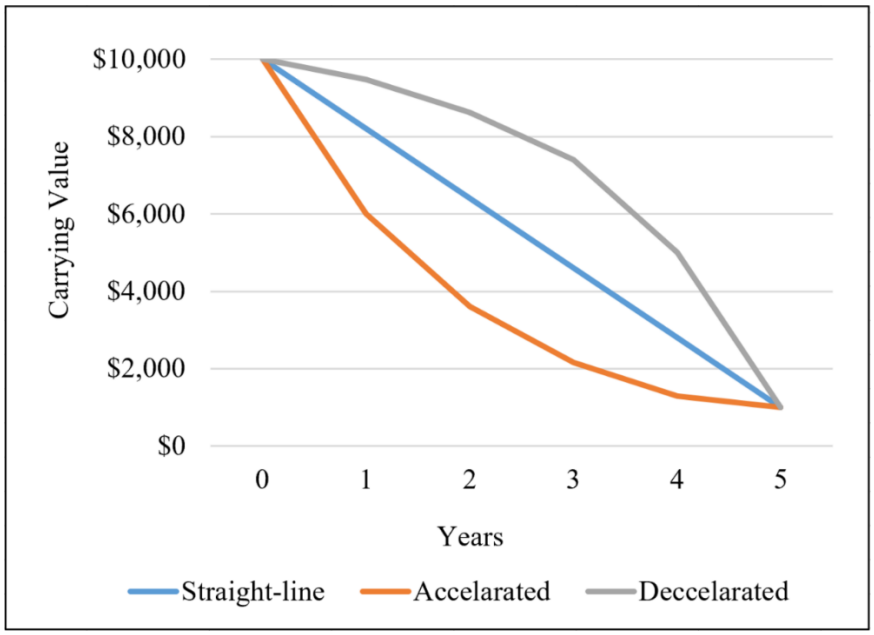

Figure 1. Graphical comparison of three depreciation method.

In the U.S. private sector, both the straight-line method and the accelerated method are permitted, and each company can choose either way. In the private sector, income tax is the major factor for choosing the depreciation method. A company can save income tax and increase cash flow in the early years with the accelerated method, and this results in higher Net Present Value for the company. Governmental agencies, however, have no tax implication, and the DoD uses the straight-line method for depreciation of long-term assets.

3. Depreciation in the Public Sector

Depreciation is one of the practices introduced from the private sector to the public sector in NPM and has yet proved to be effective in the public sector. Andrew et al. discussed that the current depreciation method "does not seem to be a particularly useful tool of asset management" in the public sector (Andrew & Pitt, 2006, p. 259).

One reason that limits the usefulness of depreciation in the public sector is the matching principle in depreciation. The principle requires the matching of costs with the accounting period during which those costs generate benefit/revenue (H. Peterson, 2002). In the private sector, revenue is easily measured quantitatively, and profits are also easily calculated as the difference between revenue and expenses. In the public sector, however,

benefits are difficult to express in a quantitative manner in many cases, and hence matching between quantitative expenses and qualitatively expressed benefits could be challenging. Benefits expressed in alternative numbers, such as total flight hours, total mileage and number of customers, also might bring less usefulness to depreciation as cost allocation.

In conclusion, allocation perspective is less important in the public sector than in the private sector, and valuation perspective has better potential for decision usefulness because it can show users the current value of assets on balance sheets. This usefulness, however, depends on the possibility that fair value can be measured reliably. Several countries such as The United Kingdom, Australia and New Zealand have introduced the fair value approach for weapon systems. In the next chapter, the possibility and limitation of this approach are studied through analyzing specific examples of these countries.

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III. ANALYSIS AND COMPARISON OF FINANCIAL STATEMENTS OF THE MILITARY

This chapter contains four sections. Section A examines the current valuation on the U.S. DoD balance sheets and elaborates on what the numbers on the balance sheets represent. We argue that the status quo approach, which is based on historical acquisition cost, adjusted for depreciation that is based on cost allocation perspective and straight-line depreciation pattern, brings to internal users numbers difficult to use for decision-making. This section, through the examination of actual DoD balance sheets, explains why these numbers are not useful for decision-making, especially in resource allocation.

Section B sheds light on the fair value approach employed by military ministries of other countries. Frontrunners of NPM, such as the United Kingdom, Australia, and New Zealand, have long introduced the fair value approach into defense ministries, and the examples of these countries clarify the pros and cons of the fair value approach relative to the U.S. DoD's method.

Section C analyzes the discrepancy between the financial book value of weapon systems and military value through historical examples.

Section D aims to improve the financial reporting practice for the MoD of Japan based on comparisons with that of the United States, New Zealand, Australia, and the United Kingdom.

A. WHAT NUMBERS ON THE DOD'S BALANCE SHEETS REPRESENT

In order to improve the decision usefulness of military balance sheets, one has to first understand what numbers on balance sheets express—that is, how the numbers are derived, what determine the numbers, and how much the numbers are different from military value.

Figure 2 shows the assets part of the DoD's FY2017 balance sheet, and Figure 3 shows a graphical breakdown of the assets.

Department of Defense Consolidated Balance Sheet Agency Wide		*Dollars in Millions*
As of September 30, 2017 and 2016	**2017 Consolidated**	**2016 Consolidated**
ASSETS (Note 2)		
Intragovernmental:		
Fund Balance with Treasury (Note 3)	$ 501,620.4	$ 474,289.0
Investments (Note 4)	991,733.9	910,567.9
Accounts Receivable (Note 5)	2,055.0	1,907.6
Other Assets (Note 6)	927.2	1,253.4
Total Intragovernmental Assets	**$ 1,496,336.5**	**$ 1,388,017.9**
Cash and Other Monetary Assets (Note 7)	1,119.7	1,152.3
Accounts Receivable, Net (Note 5)	5,244.1	6,920.1
Loans Receivable (Note 8)	1,644.2	1,603.9
Inventory and Related Property, Net (Note 9)	266,760.5	255,289.9
General Property, Plant and Equipment, Net (Note 10)	761,707.8	711,717.2
Investments (Note 4)	3,511.6	3,521.7
Other Assets (Note 6)	29,390.0	35,130.6
TOTAL ASSETS	**$ 2,565,714.4**	**$ 2,403,353.6**

Figure 2. Assets part of the DoD's FY2017 balance sheet. Source: DoD (2017).

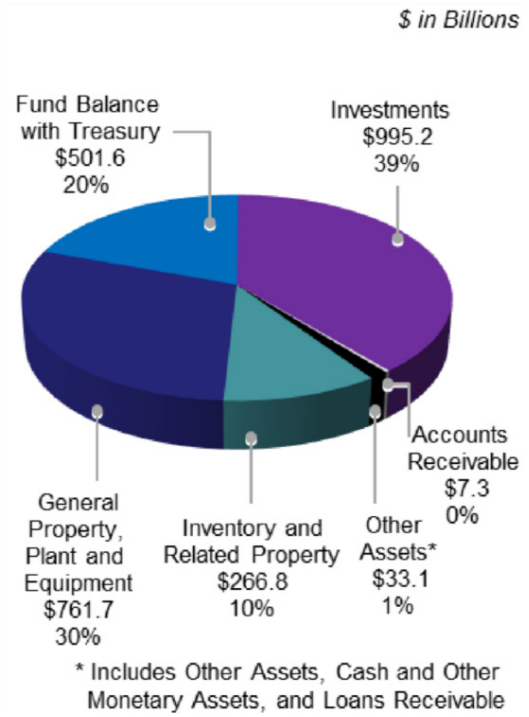

Figure 3. Graphical breakdown of the DoD assets of FY2017. Source: DoD (2017).

In this breakdown, "General Property, Plant and Equipment" (General PP&E) and "Inventory and Related Property" are directly related to military capability because General PP&E contains weapon systems such as vessels and aircrafts, and Inventory and Related Property contains all supplies such as ammunitions and spare engines (The Department of Defense, 2017). Other two relatively large accounts, "Fund Balance with Treasury" and "Investments," are intragovernmental accounts and are less relevant to decision-making.[3] Excluding these two accounts, General PP&E accounts for approximately 60 percent of all DoD assets. Figure 4 shows details of General PP&E.

General PP&E, Net					*Dollars in Millions*
	2017				
As of September 30	**Depreciation/ Amortization Method**	**Service Life**	**Acquisition Value**	**(Accumulated Depreciation/ Amortization)**	**Net Book Value**
Major Asset Classes					
Land	N/A	N/A	$ 10,615.4	N/A	$ 10,615.4
Buildings, Structures, and Facilities	S/L	35, 40 or 45[1]	407,135.0	(248,252.3)	158,882.7
Leasehold Improvements	S/L	Lease term	560.2	(293.2)	267.0
Software	S/L	2 – 5 or 10	9,069.5	(4,787.3)	4,282.2
General Equipment	S/L	Various	1,103,474.6	(637,223.7)	466,250.9
Assets Under Capital Lease	S/L	Lease term	353.7	(242.7)	111.0
Construction-in-Progress	N/A	N/A	109,992.1	N/A	109,992.1
Other	N/A	N/A	11,306.8	(0.3)	11,306.5
Total General PP&E			**$ 1,652,507.3**	**$ (890,799.5)**	**$ 761,707.8**

[1] *Based on a periodic reevaluation of useful lives, DoD management adjusted the Estimated Useful Lives of Buildings, Structures, and Facilities as follows: 45 years (Buildings), 35 Years (Structures), and 40 Years (Linear Structures).*

Legend for Valuation Methods: S/L = Straight Line N/A = Not Applicable

Figure 4. Note part of General PP&E of DoD's balance sheet in FY2017. Source: DoD (2017).

[3] Fund Balance with Treasury "consists primarily of deposit funds and receipt accounts. Deposit funds represent amounts held temporarily until paid to the appropriate party. Receipt accounts represent amounts collected on behalf of the U.S. Treasury General Fund"(The Department of Defense, 2017, p. 75) Investments account consists mostly of Military Retirement Fund and Medicare-Eligible Retiree Health Care, the account is prepared for future mandatory spending (The Department of Defense, 2017).

In Figure 4, "General Equipment" primarily consists of weapon systems, and its net book value accounts for 61 percent of all General PP&E (44 percent of all DoD assets excluding intergovernmental accounts).

The DoD balance sheet does not provide a further breakdown of General Equipment, but the Department of Navy does make more detailed information available through its own financial statement,[4] as shown in Figures 5 and 6.

As of September 30, 2017 and 2016
($ in Thousands)

	2017 Consolidated	2016 Consolidated
ASSETS:		
Intragovernmental:		
Fund Balance with Treasury (Note 3)	$ 153,450,180	$ 145,212,868
Investments (Note 4)	6,784	5,664
Accounts Receivable (Note 5)	330,582	181,481
Other Assets (Note 6)	695,255	580,268
Total Intragovernmental Assets	154,482,801	145,980,281
Cash and Other Monetary Assets (Note 7)	93,674	93,929
Accounts Receivable, Net (Note 5)	96,767	631,548
Inventory and Related Property, Net (Note 8)	78,527,486	81,577,809
General Property, Plant and Equipment, Net (Note 9)	389,805,674	362,367,317
Other Assets (Note 6)	1,623,411	8,675,162
TOTAL ASSETS	$ 624,629,813	$ 599,326,046

Figure 5. Asset part of FY2017 DoN's balance sheet. Source: DoN (2017).

[4] DoD has five component financial statements: Department of the Army, Department of the Navy, Department of the Air Force, Military Retirement Fund, and United States Army Corps of Engineering.

As of September 30 — 2017

(Amounts in thousands)	Depreciation/ Amortization Method	Service Life	Acquisition Value	(Accumulated Depreciation/ Amortization)	Net Book Value
Major Asset Classes					
Land	N/A	N/A	$ 531,931	$ -	$ 531,931
Buildings, Structures, and Facilities	S/L	20 or 40	157,426,745	(119,599,723)	37,827,022
Leasehold Improvements	S/L	lease term	6,530	(6,530)	-
Software	S/L	2-5 or 10	20,285	(6,800)	13,485
General Equipment:					
Vessels	S/L	20-50	305,356,609	(138,872,388)	166,484,221
Aircraft	S/L	15-30	150,647,315	(70,854,314)	79,793,001
Satellites	S/L	10-15	12,332,990	(9,383,478)	2,949,512
Trident Missiles	S/L	25	4,658,764	(2,661,592)	1,997,172
General Equipment-Remainder	S/L	Various	40,544,842	(30,926,778)	9,618,064
Total General PP&E			513,540,520	(252,698,550)	260,841,970
Construction-in-Progress	N/A	N/A	79,287,908	-	79,287,908
Other	N/A	N/A	11,303,358	-	11,303,358
Total General PP&E			$ 762,117,277	$ (372,311,603)	$ 389,805,674

Figure 6. Note part of General PP&E of DoN's FY2017 balance sheet. Source: DoN (2017).

The DoN segments General Equipment into five components: Vessels, Aircraft, Satellites, Trident Missiles, and General Equipment-Remainder, as shown in Figure 6. This segmented expression, which is convenient for users interested in DoN management of weapon systems, has just started from FY2017 financial statements. If this expression continues in coming years, users will see yearly changes in these categories. When the U.S. Navy gives priority to one category over others, the numbers in the category increase more than in other categories, and users can easily understand changes in weapon systems.

Neither the DoN nor the DoD has achieved clean opinion on their financial statements. Hence no one knows if these numbers are reasonably accurate. Users, however, can have a rough picture that weapon systems called "General Equipment" occupy a significant portion of the DoN assets, and they are depreciated based on the straight-line method. Users also grasp the ages of weapon systems by comparing gross book value with accumulated depreciation. Figure 7 shows yearly changes of the DoN's General Equipment over the last ten years.

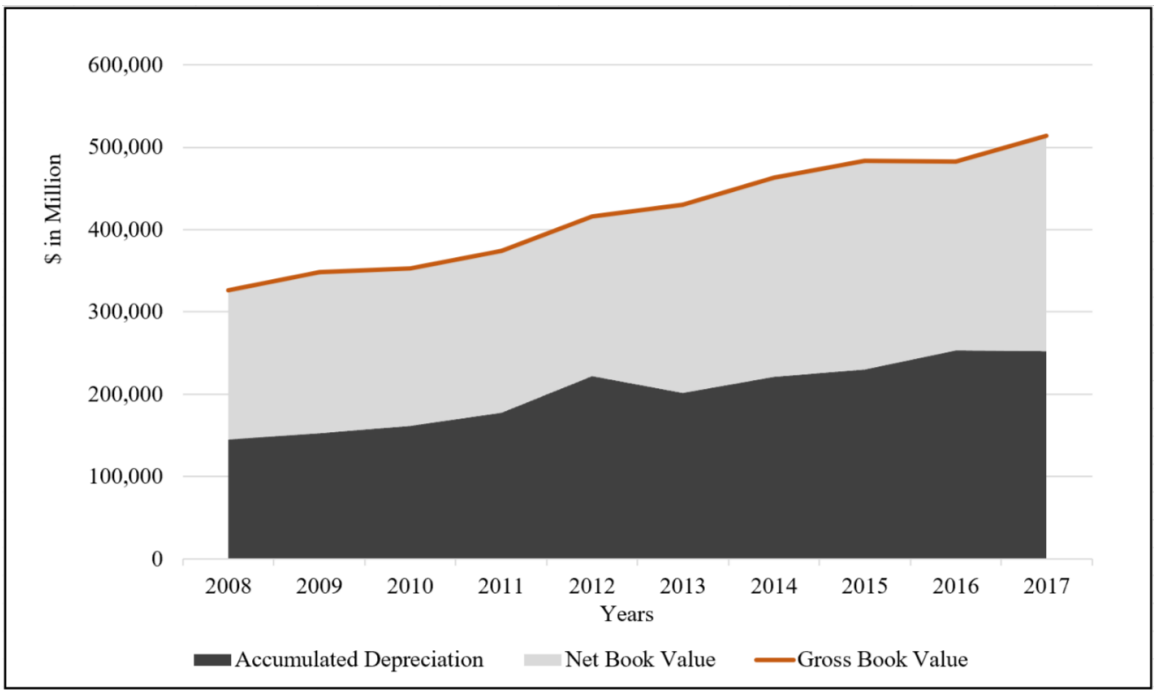

Figure 7. Yearly Changes of the DoN's General Equipment. Data compiled from Department of the Navy, *Annual Financial Report*, Washington, DC: Department of the Navy, editions 2008 to 2017.

Both gross book value and net book value have continuously increased over the past decade. The increase, however, does not necessarily mean better military capability. What those numbers actually represent are nothing but initial acquisition costs less accumulated depreciation, which is a result of planned allocation of the costs. Federal GAAP is based on cost allocation perspective for depreciation. Change of value in assets after acquisition, especially on the upward side, is not reflected on the balance sheet.

For example, users cannot rely on these numbers to identify the weakest link where the military value of weapon systems deteriorates much faster than the expected rate, hence is in imminent need of additional resource allocation. This limitation partially explains why decision-making based on financial statements ends in "driving by looking in the rearview mirror" (Candreva, 2004, p. 10). As described earlier, numbers based on the historical cost approach are just results of cost allocation, and they are dead numbers from the perspective of up-to-date valuation.

Then, does timely (re)valuation improve usefulness of balance sheets? Three countries already have adopted the fair value approach in weapon systems. The following section details these countries' examples.

B. FAIR VALUE APPROACH OF WEAPON SYSTEMS

Examples of New Zealand, Australia, and the United Kingdom show theoretical usefulness of the fair value approach and limitation in reality.

1. Fair Value Approach of Weapon Systems

In this section, the fair value approach in New Zealand, Australia and the United Kingdom is studied to compare with the historical cost approach of the U.S. DoD.

a. Fair Value Approach in New Zealand

New Zealand, the exemplar of NPM which has achieved unmodified opinion in military financial statements for a long time, has used the fair value approach to account for weapon systems for more than ten years. Fair valuing of assets uses a market-based approach when active markets are available. Specialist Military Equipment (SME), which is the category used for weapon systems in New Zealand Defense Force (NZDF), do not have an active market, hence the fair value of SME is calculated based on the Optimized Depreciated Replacement Cost (ODRC) method once every five years.

> Owing to the nature of the military environment and the unique specifications of the SME manufactured for the NZDF, comparable capability and equipment type is difficult to determine. Similar military variants were used for the valuation of SME based on recommendations and information sourced by NZDF Capability Subject Matter Experts, where available. (New Zealand Defense Force, 2017, p. 119)

One notable difference between the U.S. DoD and NZDF is subjectivity. Whereas the United States is persistent in objectivity and accounting conservatism, New Zealand allows subjectivity to reflect the fair value of weapon systems. Figures 8 and 9 show the assets part and note part of PP&E of NZDF's Statement of Financial Position (balance sheets).

2016				2017			
Group Actuals ($000)	Parent Actuals ($000)		Note	Group Actuals ($000)	Parent Actuals ($000)	Parent Unaudited Budget ($000)	Group Unaudited Forecast ($000)
		Assets					
		Current Assets					
65,420	62,121	Cash and cash equivalents		55,385	52,085	19,736	50,000
16,743	16,275	Debtors and other receivables from exchange transactions	E1	10,825	10,225	15,513	31,705
354,767	354,767	Debtors and other receivables from non-exchange transactions	E1	441,954	441,898	7,534	394,103
50,520	50,489	Prepayments		47,910	47,909	44,122	50,489
97,359	97,244	Inventories	E2	91,871	91,769	83,032	97,244
23,661	1,392	Other financial assets	E3	22,277	1,035	11,007	1,620
500	500	Assets held for sale	C4	-	-	-	500
608,970	582,788	Total Current Assets		670,222	644,921	180,944	625,661
		Non-Current Assets					
5,594,675	5,546,093	Property, plant and equipment	C1	5,990,600	5,933,613	5,362,494	5,697,807
41,191	41,191	Intangible assets	C3	41,565	41,565	28,368	43,636
257,546	257,546	Inventories	E2	257,585	257,585	249,788	257,546
3,592	228	Other financial assets	E3	5,506	172	-	-
5,897,004	5,845,058	Total Non-Current Assets		6,295,256	6,232,935	5,640,650	5,998,989
6,505,974	**6,427,846**	**Total Assets**		**6,965,478**	**6,877,856**	**5,821,594**	**6,624,650**

Figure 8. Assets part of FY2017 NZDF's Statement of Financial Position. Source: NZDF (2017).

C1 Property, Plant and Equipment (Continued)

Group 2017

	Land ($000)	Buildings ($000)	Specialist Military Equipment ($000)	Plant & Equipment ($000)	Office & Computer Equipment ($000)	Heritage assets ($000)	Total group ($000)
Cost or Valuation							
Balance as at 1 July 2016	946,055	1,436,827	3,740,111	278,693	127,589	16,247	6,545,522
Additions	384	35,171	368,114	12,157	22,950	1,446	440,222
Revaluation	44,474	270,685	-	-	-	6,203	321,362
Disposal	(8,986)	(9,110)	(23,868)	(19,242)	(12,210)	-	(73,416)
Work in progress movement	-	619	(39,325)	3,769	(4,033)	-	(38,970)
as at 30 June 2017	981,927	1,734,192	4,045,032	275,377	134,296	23,896	7,194,720
Accumulated Depreciation							
Balance as at 1 July 2016	-	(4,839)	(669,958)	(188,584)	(87,458)	(8)	(950,847)
Depreciation expense	-	(51,761)	(292,570)	(8,901)	(10,115)	(49)	(363,396)
Impairment	-	(7,753)	(19)	(7,586)	(796)	-	(16,154)
Eliminated on disposal	-	43	8,925	11,846	11,396	-	32,210
Eliminated on Revaluation	-	51,058	-	-	-	-	51,058
Reverse accumulated impairment loss	-	-	30,522	3,601	1,202	-	35,325
Other asset movements	-	7,676	-	-	-	8	7,684
as at 30 June 2017	-	(5,576)	(923,100)	(189,624)	(85,771)	(49)	(1,204,120)
as at 30 June 2017	**981,927**	**1,728,616**	**3,121,932**	**85,753**	**48,525**	**23,847**	**5,990,600**

Figure 9. Note part of PP&E of FY2017 NZDF's Statement of Financial Position. Source: NZDF (2017).

What users see in the amount of SME in Figure 9 is basically the current price of weapon systems, i.e., the current acquisition cost NZDF has to pay if it tries to buy the same weapon systems in the same condition. Figure 10 shows changes in the net book value of SME from 2006 to 2016.

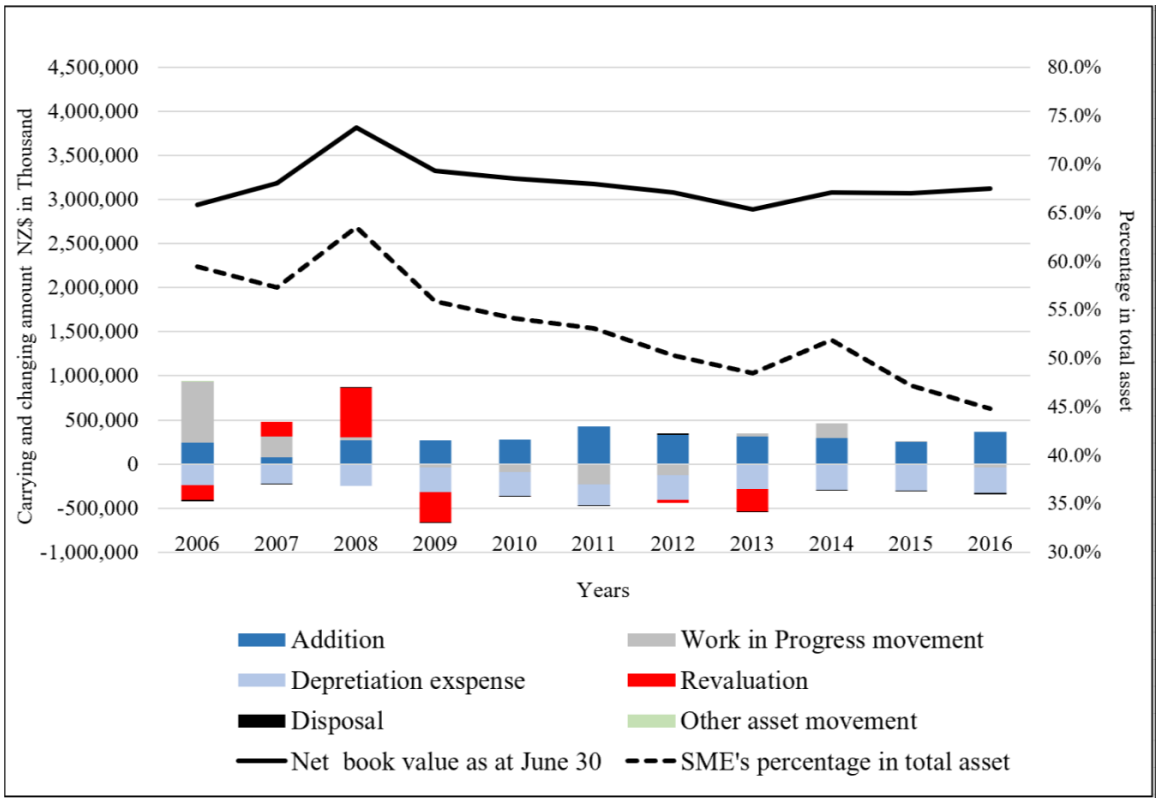

Figure 10. Yearly changes in net book value of Special Military Equipment of New Zealand. Data compiled from New Zealand Defence Force, *Annual Report*, Wellington: New Zealand Defence Force, editions 2006 to 2017.

In Figure 10, the solid line represents net book value, columns represent annual changes in the net book value of SME, and the dashed line represents SME's percentage of total assets. Revaluation is one of the largest elements that affects the value of weapon systems. If revaluation had not been performed, book value would have been significantly different from the current financial value.

Theoretically, NZDF's numbers on book are more useful than the U.S. DoD's in decision-making, such as when to replace weapon systems. Because the numbers provide the current price tags of needed systems as opposed to past acquisition costs less accumulated depreciation, these numbers are more relevant in assessing how much resources are needed to maintain or expand capacity, if needed. With the fair value

approach, weapon systems are free from the shackles of past reality. This opens the possibility for current and future decision-making.

The following question still exists: How useful is the fair value approach in reality? As discussed in the previous chapter, the U.S. DoD already has established a managerial accounting and budgetary accounting system for decision-making in cost estimation. With the fair value approach, does financial accounting/statements provide better utility in decision-making than these accounting systems?

Financial statements of the New Zealand Defense Force from 2007 to 2017 do not mention the usefulness of the fair value approach, yet an example of the Australian Department of Defense offers a clue for the extent of usefulness.

b. Controversy of Fair Value Approach in Australia

Australia is praised as a leading-edge country of NPM similar to New Zealand. The Australian Department of Defense has also established an unmodified opinion since the 2007-08 financial statements. Australia and New Zealand have learned from each other and have many accounting practices in common. The fair value approach in weapon systems is one of the commonalities. The fair value approach is, however, relatively new to the Australian DoD. The Australian DoD had been reluctant to introduce the fair value approach for several years. Originally the Australian DoD had been required to introduce the fair value approach in FY2015-16 financial statements by the Australian Accounting Standards Board (AASB) (Australian Department of Defense, 2016a). Before the introduction, the Australian DoD had a long controversy with AASB.

Defence Weapons Platforms (DWPs), one category of weapon systems in the Australian DoD's financial statements, was granted a two year extension of transition relief after the Australian Government expanded the fair value approach into PP&E in the early-2010s. The reason for granting the extension was "the magnitude and complexity of the valuation exercise" for weapon systems (Australian Accounting Standards Board, 2012, p. 8). The Australian DoD had succeeded in persuading the AASB by pointing out the following significant barriers to measure the fair value of DWPs:

- Non-active market for most of DWPs
- Negotiable price based on relative bargaining strength in non-active market
- Meaningless volatility in the fair value caused by temporary fluctuations such as changes in currency rate, notwithstanding that most DWPs are held for the entirety of their useful lives
- Significant level of judgement and subjectivity needed to decide the value for specialized and unique DWPs
- Lack of independent advisors with specialized knowledge needed for judgement and subjectivity (Prior, 2012).

The Australian DoD further insisted that the fair value approach in DWPs is not relevant to users' needs:

> Users of the Whole of Government financial statements are most interested in whether the Department has managed to maintain or enhance the physical service potential of its asset base in order to maintain or enhance its operational capability. Users are not interested in whether Defence has been able to maintain or enhance a financial notion of capital asset values for DWPs. (Prior, 2012, p. 5)

The Australian DoD also pointed out that costs overweigh any benefits to assess such imperfect fair value and requested perpetuation of DWPs' exemption from the fair value approach (Prior, 2012). The AASB, however, decided to introduce the approach starting from 2015-16 financial statements as previously planned. The main rationale for the introduction of the approach in DWPs was conformity; many other public sectors' assets, such as heritage assets and land under roads, have a similar difficulty in valuing (Australian Accounting Standards Board, 2015). The AASB, however, has not answered the problem of relevancy. Can users make better decisions based on numbers brought by the fair value approach?

To measure the relevancy of the fair value approach in weapon systems, the actual methodology and annual changes in amount are studied. When the Australian DoD was forced to introduce the fair value approach into 2015-16 balance sheets by the AASB, fair value was decided by:

> Publicly or privately sourced market prices of the same or similar assets, adjusted as necessary to reflect the lack of an active market, differences in the asset and time, or publicly or privately sourced production cost of asset that is in production but that is not traded, as adjusted for differences in asset and time. (Australian Department of Defense, 2016b, p. 79)

Figure 11 shows changes in the net book value of Special Military Equipment (SME) (i.e. weapon systems) on the Australian DoD's balance sheets after the DoD achieved unmodified opinion since 2007-08 financial statements.

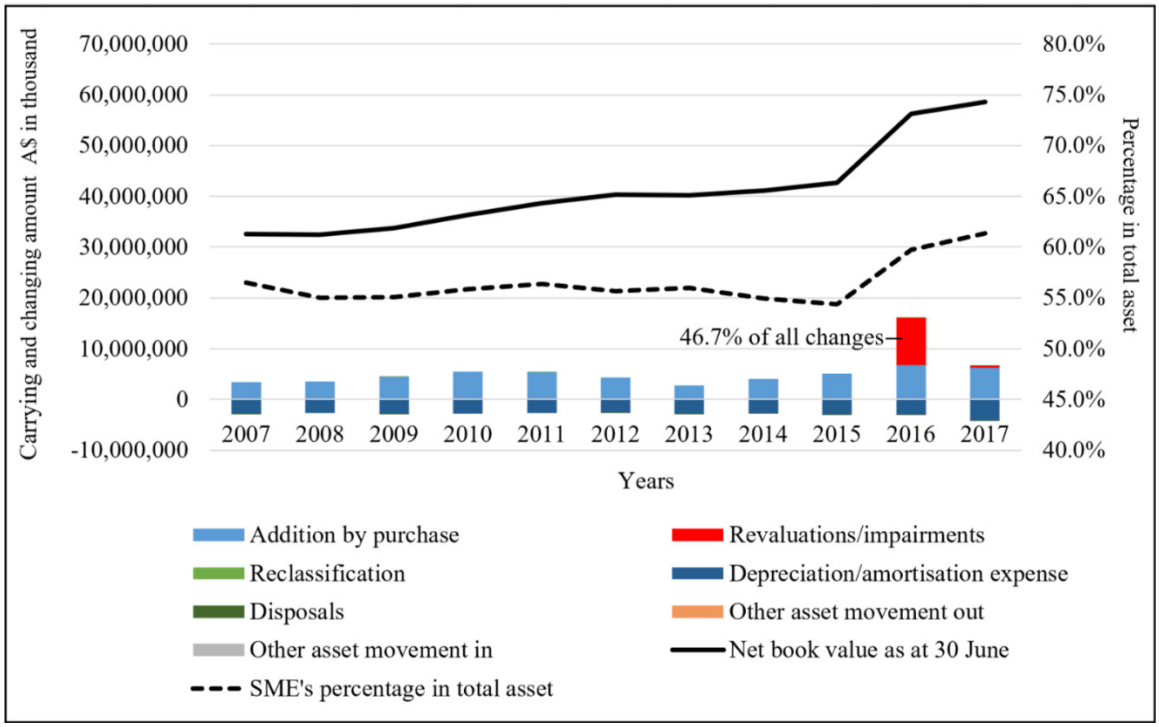

Figure 11. Yearly changes in net book value of Special Military Equipment of Australia. Data compiled from Australian Government Department of Defence, *Annual Report*, Canberra: Department of Defence, editions: 2007 to 2017.

In Figure 11, the solid line represents net book value, columns represent annual changes in the net book value of SME, and the dashed line represents SME's percentage of total assets. In FY2016, 46.7% of annual changes was brought by introduction of the fair value approach. As the financial statements of the New Zealand Defense Force demonstrate, updated numbers of weapon systems can be useful for decision-making to

replace weapon systems when executives and managers consider acquiring the same or similar weapon systems in similar conditions. The problem is that this former situation rarely happens because military technology develops so rapidly that, in most cases, the next generation's weapon systems cannot be the same or similar to that of the previous generation. In spite of significant changes in SME's value on FY2015-16 financial statements, the Australian DoD concluded:

> Fair value is not used for any decision-making in Defence as the information is not relevant to policy, operational or capability investment decisions. It takes time and money but for no identifiable benefit. (Australian Department of Defense, 2016a, p. 3)

Numbers on balance sheets are updated yet deemed irrelevant with decision-making. Then, what brings (ir)relevance to the fair value approach on balance sheets? We can learn from the example of the United Kingdom.

c. The United Kingdom

The United Kingdom is one of the three countries that has introduced the fair value approach in weapon systems. Though financial statements of the Ministry of Defense of United Kingdom (U.K. MoD) have stayed in qualified opinion[5], management of Single Use Military Equipment (SUME), a word for weapon systems in U.K. financial statements, has unmodified opinion. Fair valuing in the United Kingdom is different from the previous two countries; the United Kingdom applies the method called "Modified Historical Cost Accounting Convention" (MHCA). In this method, fair value is expressed by applying prospective indices that are produced by Defence Statistics (The U.K. Ministry of Defense, 2017). The characteristic of this method is its stability. Figure 12 shows yearly changes.

[5] Qualified opinion means that the financial statements are presented fairly in conformity with accounting principles except for the effects of some matter (Whittington & Pany, 2014).

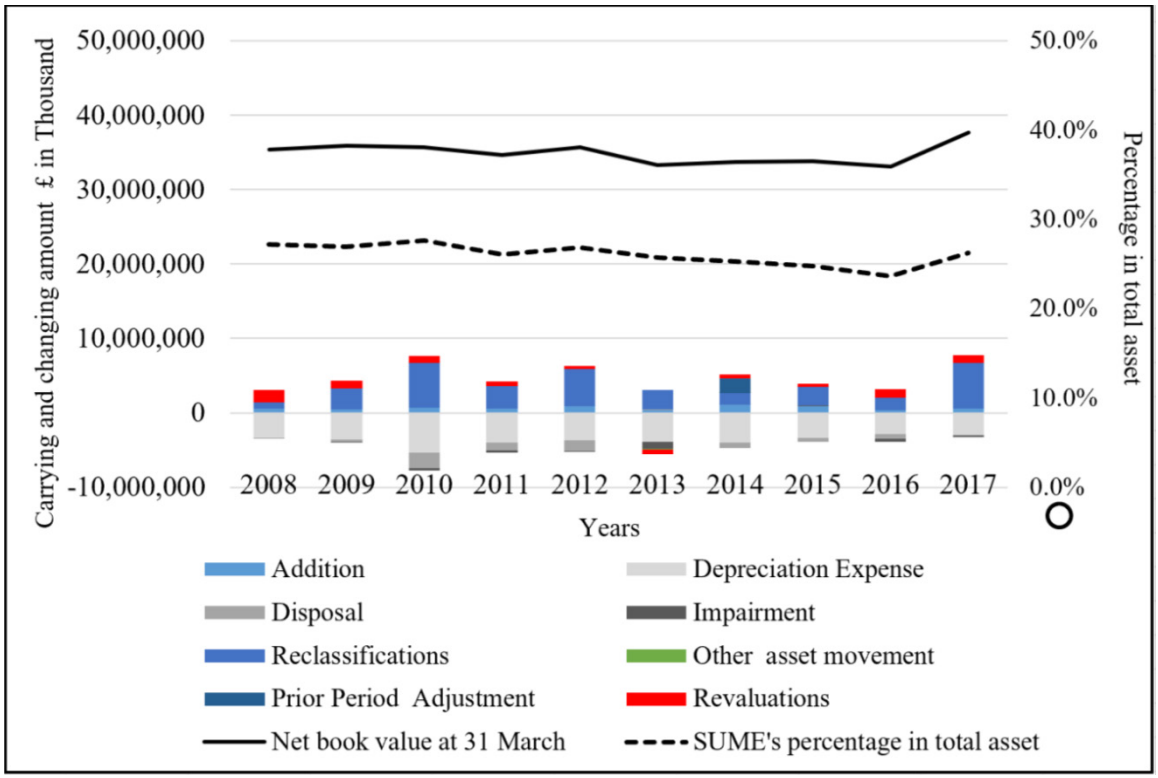

Figure 12. Yearly changes in net book value of Single Use Military Equipment of the United Kingdom. Data compiled from Ministry of Defence, *Annual Report and Accounts*, London: Ministry of Defence of the United Kingdom, edition 2008 to 2018.

In Figure 12, the solid line represents net book value, columns represent annual changes in the net book value of SUME, and the dashed line represents SUME's percentage of total asset. Revaluation brought by the MHCA is piecemeal and stable compared with New Zealand and Australia. The MHCA is the method mainly intended to adjust inflation. So, is this method decision useful for internal users? Unlike Australia, U.K. financial statements do not mention specifically about decision usefulness of the fair value approach. As a result, the relationship between actual resource allocation and financial statements must be studied through an example outside of financial statements. The example is the type 45 destroyers of the Royal Navy.

The type 45 destroyer is the most modern, and the only destroyer class, of the Royal Navy. Six destroyers of the class were commissioned between 2009 and 2013 with a unit cost of approximately £1 billion (Forecast International, 2016). Since its commission,

however, the type 45 class has suffered from reliability issues including major power failures. Especially when operating in areas with high ambient air and sea temperatures, engines were degrading catastrophically—that is to say, shutting down all power abruptly. The navy admitted design failures in the engines and announced an improvement plan with an estimated cost of £280 million in 2015 ("House of Commons - Restoring the Fleet: Naval Procurement and the National Shipbuilding Strategy - Defence Committee," n.d.).

The news about serious failures of the latest destroyers, sometimes drifting because of power outage, attracted national attention (Farmer, 2014), (Beale, 2016). The buzz meant external users of financial statements demanded information. Theoretically, internal users fulfill accountability and share decision-making with external users, especially when the problem is at high stakes. To do so, the fair value approach must promptly respond by reducing its value significantly.

To measure effectiveness in accountability and decision-making of financial statements on this matter, we scrutinized the financial statements of the U.K. MoD from 2008 to 2017 and asked the following questions: What financial statements reveal the problem of type 45 destroyer? How was the problem reflected on the balance sheets?

The results are that financial statements:

- Reported the net book value of the type 45 class destroyer on a yearly basis,
- Failed to mention the problem of the type 45,
- Did not address the budgetary needs to improve engine failure, and
- Did not revaluate the book value of the type 45 because of the failure

Based on the facts above, it is concluded that the financial statements failed to deliver accountability; the cost of £280 million was not shared by financial statement; and the fair value approach of MHCA failed to reflect the military reality that the latest destroyers had serious defects that reduced their capabilities.

2. Potential and Limitation of Fair Value Approach

This section summarizes the potential and limitation of the fair value approach based on facts garnered in the previous sections.

a. Potential

Numbers on balance sheets express the current financial value of weapon systems in forms such as the Optimized Depreciated Replacement Cost (ODRC) of New Zealand. This is a departure from the cost allocation perspective of depreciation. Numbers are active and updated, hence the theoretical possibility for decision usefulness is increased compared with the historical cost approach.

b. Limitation

The current fair value approach is not useful for decision-making because information generated through the approach is not what decision makers need (Australia).

The fair value approach fails to reflect military reality such as defects and the incapability of important weapon systems (the United Kingdom).

The next section examines factors that lead to the departure of financial value from military reality.

C. FINANCIAL VALUE VS. MILITARY VALUE

Section B revealed a significant gap between financial value on balance sheets and military capability. In other words, financial value failed to express military value even though the numbers were regularly updated by the fair value approach.

In this section, we use historical examples to examine the contributing factors of the discrepancy between financial value and military value.

1. Determinants of Acquisition Cost

Acquisition cost is the basis of depreciation and part of the fair value approach such as MHCA. It is susceptible to negotiation by sellers in a non-active market as the Australian

DoD pointed out, and it is also susceptible to diplomatic negotiation and political requirement.

For example, the unit cost of an F-35 Joint Strike Fighter for Japan is more expensive than the unit cost of a U.S. F-35 because of the relatively strong bargaining power of the United States. The unit cost is about 10 percent higher even after the Japanese government secured cost cuts by drawing some concessions from the U.S. government ("Exclusive: Japan secures extra cost cuts on U.S. F-35 fighter jet package," 2017). Similarly, the acquisition cost is affected by political factors. The Japan Ground Self Defense Force (JGSDF) acquired a Boeing AH-64D at about twice the price of a U.S. AH-64D ("Longbow Apache," n.d.), (Office of the Under Secretary of Defense(Comptroller)/CFO, 2011). The bloated cost was caused by the Japanese Government's political will to have the component assembly facility in Japan for maintenance capability and by failed negotiations with a contractor. Identical weapons with the same military value can have different financial value because of negotiation and political factors, leading to an inevitable discrepancy between military value and financial value.

2. Unpredictable Nature of Military Value of Weapon Systems

The military value is unpredictable because it is decided in the context of global competition and the constant development of technology. Sometimes innovation obsoletes existing weapon systems overnight. For example, in 1937 the Imperial Japanese Navy (IJN) started building the battleship *Yamato*, the largest and strongest battleship in the history. She was commissioned in December 1941, just several days after the attack on Pearl Harbor and the naval battle of Malaya in which the IJN itself proved the predominance of aircraft over battleship. The military value of the battleship *Yamato* had been impaired seriously because of technological and tactical breakthroughs even before its commission.

3. Military Strategy and Military Value

Strategy is another important determinant of military value of weapon systems. The military value is maximized in suited strategy for the weapon systems, and vice versa.

Sometimes military strategy is so short-lived that weapon systems developed under the strategy never got the opportunity to perform its intended purpose. For example, development of the DD-1000 *Zumwalt* was started under the strategy that puts emphasis on firepower projection from sea to land in a littoral area. Strategic environment, however, has changed significantly since the start of the project. The DD-1000 may not have the opportunity to play its originally intended role despite its huge acquisition cost/financial value.

4. Synergy in Military Value

Military value depends heavily on synergy effects. For example, when an aircraft carrier has no aircrafts, its military value is impaired seriously in spite of its huge financial value. Network is also a major factor influencing military value recently. Every weapon system exercises its full power when connected with the military network.

The nature of military value in weapon systems is similar to "goodwill" if one looks for an analogy in accounting. Goodwill is calculated as the difference between acquisition cost and the fair value of the acquired company at merger. That value can be impaired depending on the capability to generate future cashflow. The capability is affected by synergy effects with other divisions of the company and also affected by strategic circumstances of the company. The value of goodwill is more volatile compared with other assets' value, hence the annual impairment test is mandatory under U.S. GAAP.

D. THE PROBLEMATIC FINANCIAL STATEMENTS OF THE DEFENSE MINISTRY OF JAPAN

Before proceeding to the next chapter, the financial statements of the MoD of Japan are studied. They are primitive and at a developing level compared with other countries studied. This is not a failure only for the Japan MoD because the entire Japanese public financial accounting system is underdeveloped, and every ministry suffers from the same problems with their financial statements.

1. Single-Entry, Cash Basis System

The Japanese governmental accounting system is single entry and cash basis. Hence many elements of financial statements are abstracted from the cash-based system and converted on an accrual basis (YAMAURA, 2018). This is the same problem that the United States has, however, there are significant differences between these two countries, which are described in the following sections.

2. Lack of Information

The volume of information from financial statements for the Japanese MoD is very low. For example, FY2017 statements consist of 25 pages, while the equivalent U.S. DoD Agency Financial Report (AFR)/Performance and Accountability Report (PAR) consist of 374 pages. A simple comparison might be misleading because there is a significant difference in size and complexity between the two militaries. It is, however, concluded that the volume of information from Japan is excessively small considering that equivalent statements from New Zealand consist of 174 pages, statements from Australia consist of 252 pages, and statements from the U.K. consist of 209 pages.

3. Lack of Independent Audit

Among the four countries, Japan is the only country that does not have independent auditing of financial statements. Without independent auditing, no one can assure the correctness of information on financial statements, and the motivation to improve the accuracy of information is absent. Two main purposes of financial statements, accountability and decision usefulness, are difficult to achieve without reliable information that is reasonably assured by independent auditing.

4. Problem of Depreciation

Depreciation of the MoD is creating skewed information because of two problems: inappropriateness of accelerated method and unrealistic economic lives of long-term assets. In the short run, the Japan MoD has no choice except to blindly follow the accounting rules set by the Ministry of Finance (MoF). In the long run, protesting the rule setter and changing the rules have been possible, but the MoD have not tried. Neglecting

the obvious and prolonged problems of depreciation implies that users do not care about or utilize financial statements for any purpose.

a. Accelerated Method

The Japanese government has used the accelerated method for depreciation of long-term assets including weapon systems. This method makes sense when tax implication and the concept of Time Value of Money (TVM) exists, but is inappropriate for the public sector. The other four countries studied in this report (except Japan) use the straight-line method. Appropriateness of depreciation methods for weapon systems is elaborated upon in the next chapter.

b. Useful Economic Life

The Japan MoD has used inflexible useful economic life for long term assets including weapons systems because useful economic life is strictly decided by the governmental document. This document, for example, sets the useful economic life for aircrafts as 5 to 10 years compared with the 15 to 30 years set by the U.S. DoD (The Ministry of Finance of Japan, 2017), (United States Department of Defense, 2017). For vessels, useful life is set as 10 to 20 years compared with the 20 to 50 years set by the U.S. DoD.

These economic useful lives are much shorter than the actual service lives of weapon systems in Japan. Figure 13 shows the changes in net book value of vessels and aircrafts of the Japanese MoD.

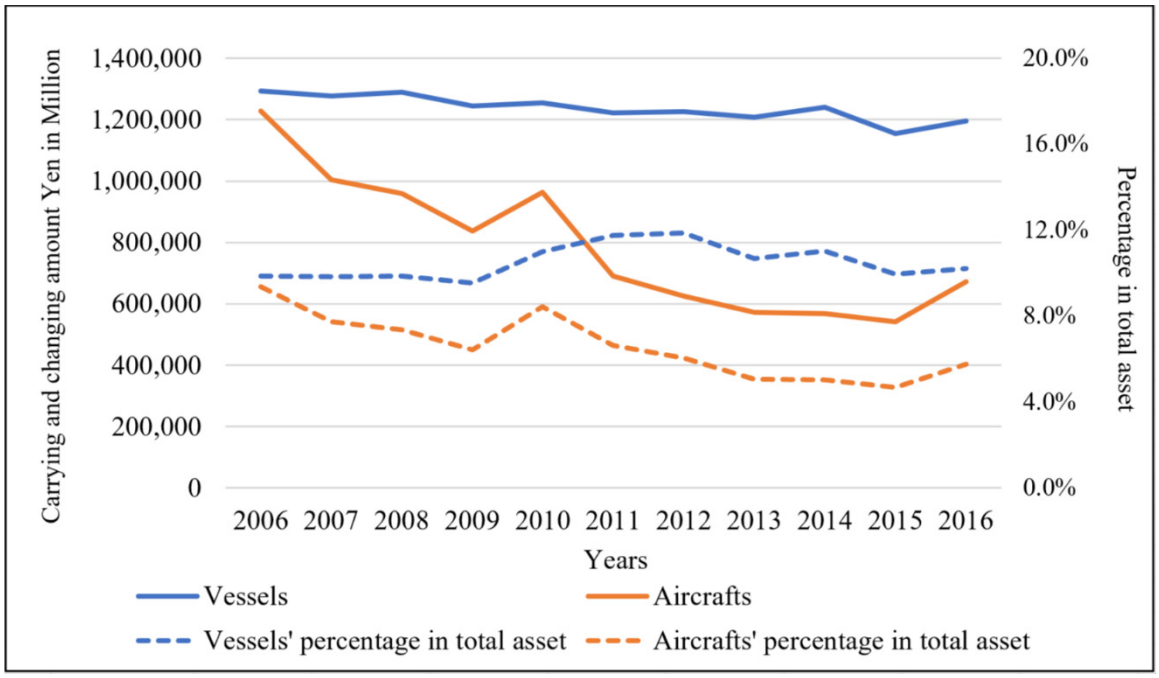

Figure 13. Yearly changes in net book value of vessels and aircrafts of the Ministry of Defense of Japan. Data compiled from Ministry of Defense, *Boueishou shouchoubetsu zaimushohyou*, Tokyo: Ministry of Defense of Japan, editions 2006 to 2016.

Unusual and continuous decrease, especially in the carrying amount of aircrafts shown in Figure 13, is caused by inappropriate economic useful life.

5. Irrelevant Information

Japanese financial statements have many accounting categories that are considered low relevancy by information users. Categorization in fixed asset on balance sheets is prescribed by the national assets accounting system. In other words, it was decided by a legacy system, not by the user's needs. For example, one of nine categories for fixed asset is "trees, bamboos, and rocks," and the amount of this category is just 0.16% of the total fixed asset. On the other hand, financial statements do not have a general category for weapon systems such as SME in Australia and New Zealand, and SUME in the United Kingdom. It is difficult to imagine that information users of military financial statements need the financial value of trees more than the financial value of appropriately categorized weapon systems.

Another drawback of Japanese financial statements is the lack of notes, where substantial supplemental information can be provided to improve irrelevancy, which seriously impairs the utility of financial statements.

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IV. NEW APPROACH AND SCENARIO ANALYSIS

This chapter consists of two sections. Section A builds on previous chapters and proposes a new fair value approach. While the fair value approach has theoretical appeal compared with the historical cost approach, the current fair value approach for weapon systems has little use in military decision-making and deviates from military reality. To improve relevancy, the new approach focuses on military value, not financial value, the decelerated method is also adopted for depreciation.

Section B runs scenario analysis across three methodologies: historical cost approach with straight-line method; fair value approach with straight line method; and modified fair value approach (fair military value approach) with decelerated method.

A. NEW APPROACH TO EXPRESS MILITARY VALUE

This section proposes a combination of the fair military value approach and the decelerated depreciation method.

1. Fair Military Value Approach

The aim of the new approach is to reflect as much military capability of weapon systems as possible on balance sheets. This military capability is called "military value." Military value is expressed in dollar terms just like financial value, yet it is more volatile than financial value because of reasons described in previous chapters.

The new approach is not meant to replace the historical cost approach; rather, it is supplemental to that approach. The basic form of financial statements is decided by standard setters, and conformity across various governmental agencies leaves little discretion on the format of financial statement. For example, the Australian DoD had to comply with the AASB rules as previously discussed in Chapter III.

The new approach allows subjectivity to ensure relevancy with military reality. Since objectivity and conservatism are already guaranteed in the existing approach, this additional flexibility effectively complements the status quo. It produces a new set of numbers that are useful in decision-making and allows comparison with the original

numbers. This comparison helps decision-making so that information users can note the changes that require new decisions being made for future resource allocation.

Following the fair value approach of the United Kingdom, the new approach adopts indexes. The difference between the U.K. fair value and the new military fair value approach is that the latter reflects military reality and relies on the judgement of executives in the military agency/ministry. Unlike the U.K. approach, changes by inflation are omitted in the new approach to better express military reality. Executives prepare indexes for weapon systems based on the following four factors:

- Strategy Impact

  How does strategy change impact the value of weapon systems?

- Negative shocks

  How exogenous shocks such as technical/tactical breakthrough, inflated original acquisition cost due to contractual and/or political negotiation impact the value of weapon systems?

- Technological failure

  How can the temporary decline of military value because of technological failures be fixed by capital investment?

- Synergy effects

  How do concerted efforts/arrangements enhance the value of weapon systems?

Assume we have three weapon systems A, B, and C, each with $1,000 net book value to start with. Now for each weapon system, executives consider four factors and decide an index for each factor, and the executives then calculate the composite index as the product of the four individual indexes. Finally, the fair military value is further calculated as the product of the composite index and the net book value. Table 3 presents a numerical case.

Table 3. A numerical example of indexation.

	Factors for indexation			Composite Index[b]	Fair military value[c]
Weapon system A	SI[a]	Key weapon system in current strategy	1.2	0.756	756
	N	Boasted cost by acquisition failure	0.9		
	T	Critical failure in function	0.7		
	S	N/A	1.0		
Weapon system B	SI	Limited usefulness in current strategy	0.7	0.49	490
	N	N/A	1.0		
	T	Critical engine failure	0.7		
	S	N/A	1.0		
Weapon system C	SI	N/A	1.0	1.2	1,200
	N	N/A	1.0		
	T	N/A	1.0		
	S	Enhancing usefulness of other weapon systems	1.2		

[a]SI: Strategy Impact N: Negative shocks T: Technical failure S: Synergy effect

[b]Product of SI, N, T and S

[c]Product of index and net book value

Indexation requires a high level of judgement, however, making high-level judgements is what executives always do. This approach would effectively facilitate efficient resource allocation by articulating the judgement of executives.

For large agencies such as the DoD, decision-making involves unified decisions, especially in resource allocation. As discussed in Chapter II, internal users face significant barriers in accessing information because of the size and complexity of the organization. As a result, the distinction between internal and external users is less obvious. This lack of distinction, combined with bureaucratic inertia and conflicts of interest, makes unified decisions difficult and slow. Indexation aims to improve unified decisions by simplifying

criterion and sharing the decisions with external information users, i.e. citizens and Congress.

Investing heavily in weapon systems with a high composite index and lightly in systems with a low composite index is beneficial for future military capability. Moreover, improving the index itself without addition or replacement of the system can also be valuable. Investing in existing weapon systems to fix technological failure would improve the index and consequently increase the fair military value. For example, both weapon systems A and B in Table 3 have technological failures that cause negative effects on indexation. Fixing the failure of weapon system A is more beneficial because the product of the other three factors of A is higher than that of B. Technical failure is quite common in military weapon, and indexation helps to prioritize tasks.

Executives do not need to provide indexes for all weapon systems given the cost of indexation. Rather, they can focus on major weapon systems by adopting the decelerated depreciation method for the rest of the weapon systems.

2. Decelerated Method for Depreciation

In Chapter II, three depreciation methods are studied: straight-line, accelerated, and decelerated. Of the five countries we studied, the United States, New Zealand, Australia, and the United Kingdom use the straight-line method, and Japan uses the accelerated method.

In theory, the decelerated method is appropriate for major weapon systems because newly developed weapon systems have technological dominance for a certain period of time until an enemy invents counterparts or countermeasures. At that point, the weapon system loses dominance rapidly. So the value of a weapon system declines little in the early years and a lot in later years. Historical examples show this pattern: German U-boats inflicted serious damage upon sea lines of communication of the Allies during the early years of World War II (WWII) as reflected by the high kill ratio of U-boats. The kill ratio declined significantly in later years, as shown by Table 4.

Table 4. Kill ratio of U-boat. Source: Hughes & Costello (1977).

	1939	1940	1941	1942	1943	1944	1945	Total
Loss of U-boat	9	22	35	87	237	239	153	782
Ships sunk by U-boat	105	435	410	1,015	435	117	55	2,572
Kill ratio	11.67	19.77	11.71	11.67	1.84	0.49	0.36	3.29

At the beginning of WWII (1939), U-boats demonstrated horrifying killing power. The kill ratio even increased in 1940 and then started to decline in 1941. The kill ratio stayed almost the same in 1942. In 1943, the kill ratio dropped rapidly when the Allied forces established countermeasures. By 1944, U-boats lost their effectiveness in the Atlantic. Among the three depreciation methods, the decelerated method best fits this typical pattern of weapon systems. Neither stable decrease in value by the straight-line method nor rapid decrease in the beginning stage by the accelerated method fits the pattern.

Currently, no established calculation method is available for decelerated depreciation. In this study, we propose the "inversed sum-of-the-year's-digits" (ISYD) method. This is the inverse of the existing sum-of-the-year's-digits (SYD) accelerated method.

Let's use a numerical example to illustrate ISYD. For instance, a weapon system is estimated to have a 5-year useful life. We first calculate "sum-of-the-years-digits," which is 15 (5 + 4 + 3 + 2 +1 = 15). Then for each of the five years, we calculate the depreciation rate as the ratio of the year number to the "sum-of-the-years-digits." For the first year, the depreciation rate is 1/15 of the depreciable basis (current book value minus residual value). For the second year, the depreciation rate is 2/15. For the third year, the depreciation rate is 3/15, and so on (4/15, 5/15). The depreciation amount in the first year is only one fifth of the last year.

B. SCENARIO ANALYSIS

This section runs a simulation to compare three approaches: historical cost approach with straight-line depreciation, fair value approach with straight-line depreciation, and military fair value approach with decelerated depreciation (inversed sum-of-the-year's-digits).

1. Scenario

Country A is a democratic country that is surrounded by the sea and consists of several islands. These islands are referred to as Main Island, East Island, and West Islands. Main Island is the economic and political center of the country. East Island has flat and extensive terrain. West Islands are tiny, mountainous, and not habitable. Country A has two hostile neighbors: Country B and Country C. Country A's constitution prohibits offense against other countries, hence its military capability and strategy must be defensive. In addition, Country A has experienced a series of disasters such as hurricanes and earthquakes. Figure 14 shows the geography of these three countries.

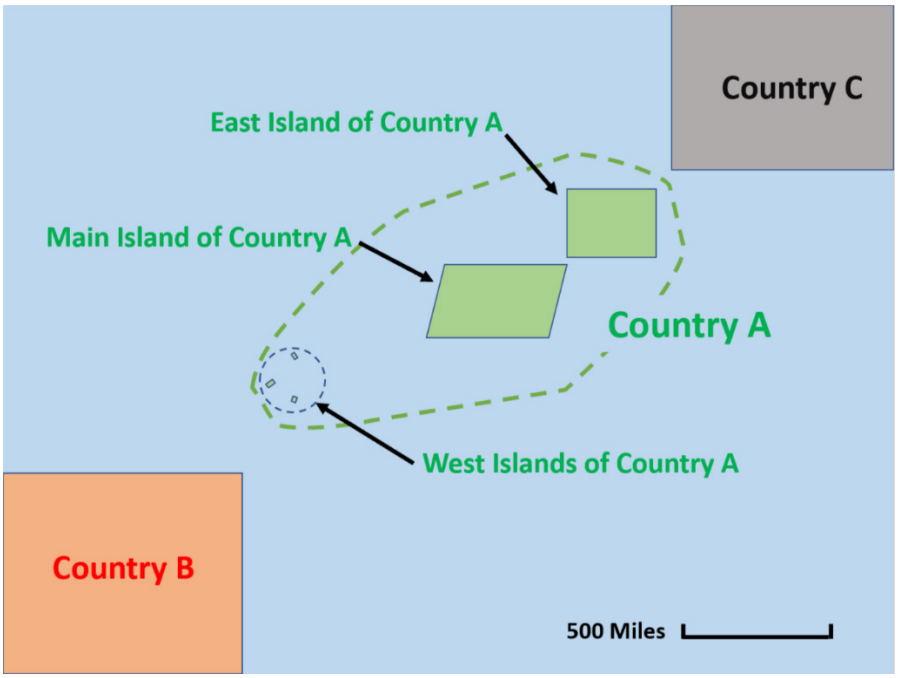

Figure 14. Geographical map of the scenario.

In Fiscal Year 1, Country C was considered a major threat to Country A because Country C had an army with amphibious warfare capability strong enough to invade East Island of Country A. Compared with Country C, Country B was not considered a threat because the country had been suffering political upheaval and poverty. The executives of Country A's DoD decided upon a military strategy based on the following strategy:

- Prepare for possible invasion into East Island by Country C.
- Develop a balanced military across the Army, the Navy, and the Air Force.
- The Army is mainly stationed on East Island and Main Island.
- The Navy and the Air Force patrol mainly around East Island.
- Prepare for possible disaster relief.

Based on the abovementioned strategy, the government of Country A set up a military development plan starting from FY 2 as shown in Table 5. (All costs are in Fiscal Year 1 dollars.)

Table 5. Military development plan of Country A.

Service	Weapon system	Quantity	Unit cost	Total cost	Service life	Residual value
Army	Various Land Equipment[a]	20	100	2,000	20	0
	Attack helicopter	10	500	5,000	20	0
Navy	Destroyer	6	1000	6,000	25	0
	Submarine	5	700	3,500	15	0
Air Force	Jet fighter	10	500	5,000	20	0
	Cargo airplane	10	200	2,000	25	0

[a] Various Land Equipment consists of Armored Fighting Vehicles and other weapon systems for land battle.

Country A planned to complete acquisition of these weapon systems by FY 15. The defense acquisition budget for each year is 1700 ± 100 in FY 1 dollars, and the inflation rate remains constant at 2%. Until FY 10, the development plan had been executed as planned; however, rapid technological advancement in space and network warfare forced the government of Country A to reconsider the plan. The government decided to found the Cyber Space Department at FY 10. The development plan of the Cyber Space Department is shown in Table 6. The acquisition for the Cyber Space Department started in FY11 and would end in FY16.

Table 6. Cyber Space Department.

Service	Weapon System	Quantity	Unit Cost	Total Cost	Service life	Residual value
Cyber Space Department	Satellite	3	200	600	8	0
	Network	2	600	1,200	8	0

To secure budget for the Cyber Space Department, the government decided to change the completion year of the military development plan from FY15 to FY16. The timetable for the development plan in FY 10 is shown in Table 7.

Table 7. Timetable of the development plan in FY10.

	FY2	FY3	FY4	FY5	FY6	FY7	FY8	FY9	FY10	FY11	FY12	FY13	FY14	FY15	FY16	Total
VEL	2	2	1	1	1	1	2	1	2	1	1	1	1	2	1	20
AH		1	1	1	1		1		1	1			1	1	1	10
Destroyer	1			1		1		1			1		1			6
Submarine		1			1				1			1			1	5
Jet fighter	1		2		1	1	1	1			1	1			1	10
Cargo		1	1			1	2		1	1		1	1	1		10
Satellite										1		1		1		3
Network										1				1		2

In FY15, executives of the DoD are certain about completing the development plan by FY16. With the military development plan to be completed in one year, the executives and the country's congress need to develop a new military strategy. The current situation in FY15 is as follows:

- Country C suffers political and economic disturbance, and its military is rapidly collapsing. C is not considered a major threat.
- The economy and military capability of Country B has been developing dramatically, and Country B has started claiming the territorial right over West Islands of Country A after natural resources had been found near those islands.
- Each service of Country A has a strong bureaucracy and each tries to justify the status quo.
- Country A is suffering from huge national debts; hence an increase in the defense budget is difficult without thorough accountability.
- Inflation between FY13 and FY15 had been unusually high at a rate of 10%, but it is predicted to return to 2% from FY16.
- Seismologists predict a 70 percent chance of a magnitude 9.0 class earthquake occurring and a subsequent tsunami killing 300,000 citizens in Country A in the next 30 years.

Situation of weapon systems is as follows:

- Recent technological development in the field of cyber space is rapid, and investment in this field is highly important for future military capability.
- Critical fragility in the weapon system network was recently discovered.
- Investigation identifies that the acquisition cost of an attack helicopter is twice as expensive compared with an identical helicopter of another country. This is caused by failures in contractual agreements.

Country A's new military strategy based on the abovementioned situation is as follows:

- Policy A: Prepare for possible invasion into West Islands by Country B.
- Policy B: Maintain balanced military across the Army, the Navy, the Air Force, and the Cyber Space Department.
- Policy C: Develop space and cyber warfare capabilities.
- Policy D: Keep the Army stationed in East Island and Main Island because the terrain of West Islands prohibits large deployment of the Army. The Army also prepares for a possible invasion by guerilla troops of Country B into Main Island and East Island.
- Policy E: The Navy and the Air Force patrol mainly around West Island.
- Policy F: The military is also to engage in disaster relief when it happens.

Country A's new strategy is obscure and somewhat contradictory because of each service's tendency to protect status quo.

2. Simulation of Decision Usefulness across Three Approaches

This section provides indexation by executives of Country A based on abovementioned situation and policies. Then, the section compares the results of three approaches: historical cost approach with straight-line depreciation, fair value approach with straight-line depreciation, and military fair value approach with decelerated depreciation

a. Indexation of Fair Military Value Approach

Executives of Country A decide indexes as follows: Policy A and Policy B are general statements and do not affect indexes. Policy C results in an especially high effect on indexes of weapon systems for the Cyber Space Department. Policy D results in low indexes of weapon systems for the Army because its weapon systems are not useful for possible conflict around West Islands. Also, the possibility of a guerilla attack on Main Island and East Island by Country B is considered low compared with the possible attack on West Islands. In addition, various land equipment (VLE) and attack helicopters are

considered to be of low effectiveness against a guerilla attack. Policy E results in high indexes for the Navy and Air Force, and Policy F results in a high index for cargo airplane.

Weapon systems of the Cyber Space Department have high synergy effects over the weapon systems of the other services, but technological failure of the network has a serious effect on its index. Failed contractual agreements of attack helicopters also has a serious effect on its index. In conclusion, indexation is decided as shown in Table 8 and applied starting from FY16.

Table 8. Indexes for Country A.

Service	Weapon system	Composite Index	Factors for indexation			
			Strategy Impact	Negative shock	Technological failure	Synergy effects
Army	VLE	0.5	0.5	1.0	1.0	1.0
	Attack helicopter	0.25	0.5	0.5	1.0	1.0
Navy	Destroyer	1.1	1.1	1.0	1.0	1.0
	Submarine	1.2	1.2	1.0	1.0	1.0
Air Force	Jet fighter	1.1	1.1	1.0	1.0	1.0
	Cargo airplane	1.1	1.1	1.0	1.0	1.0
Cyber Space Department	Satellite	1.44	1.2	1.0	1.0	1.2
	Network	0.72	1.2	1.0	0.5	1.2

b. Comparison of Three Approaches

Three approaches—historical cost approach with straight-line depreciation; fair value approach with straight-line depreciation; and military fair value approach with decelerated depreciation (inversed sum-of-the-year's-digits)—are calculated based on the information provided in the aforementioned scenario. Table 9 shows the net book value as of FY16, and Figure 15 shows changes in the net book value from FY10 to FY 16.

Table 9. Comparison of net book value of three approaches as of FY16.

Service	Weapon system	Historical cost	Fair value	Fair military value
Army	VLE	1,526.0	1,958.1	766.4
	Attack helicopter	4,123.6	5,148.5	985.7
Navy	Destroyer	4,761.9	6,549.6	5,550.8
	Submarine	2,505.8	2,993.4	2,730.0
Air Force	Jet fighter	3,511.4	4,684.3	4,111.9
	Cargo airplane	1,779.1	2,336.2	1,923.1
Cyber Space Department	Satellite	450.9	506.4	592.0
	Network	927.6	1,012.8	576.0
Total		19,586.3	25,189.3	17,236.0

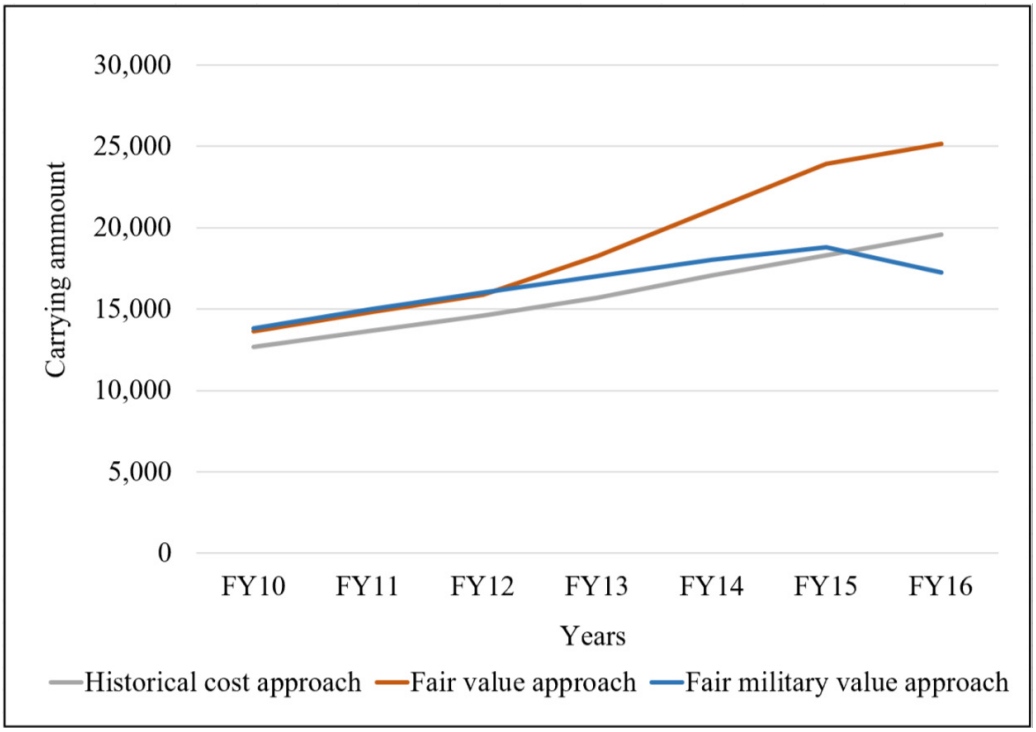

Figure 15. Changes in net book value from FY 10 to FY 16.

High value of the fair value approach was primarily introduced by inflation. Inflation has impacted both acquisition cost and existing book value in the fair value approach. Inflation impacted only acquisition cost in the historical approach and had no influence in the military fair value approach. Until FY15, higher value of the fair military value approach than the historical cost approach was brought by decelerated depreciation. Most of the weapon systems are in the early stage of their service lives, and the depreciation amount is smaller. Decline of the military fair value approach in FY16 is brought by the application of indexes. The other two approaches cannot reflect the military reality provided in the scenario.

Ultimately, the fair military value approach provides useful tips for executives of Country A's DoD in terms of decision-making about resource allocation:

- Investing in the Army's weapon systems yields low military value.
- The Army needs to introduce another type of weapon system that is suitable for the current strategy.
- Possible conflicts with Country B are mainly fought by the Navy, the Air Force, and Cyber Space Department.
- The Army might be better to invest heavily on weapon systems such as cargo helicopters that are helpful for disaster relief, which is certain to happen in the near future and may inflict a higher death toll than the conflict.
- Fixing the technological failure of the network brings higher military value while investing in the Army's weapon systems brings lower military value.

In contrast to the fair military value approach, the other two approaches show no significant usefulness for decision-making purposes. Both can be misleading because of financial effects such as inflation.

The process of making the index itself is also important because it leads each service of Country A into critically checking the status quo. Making indexes has a positive effect to reduce bureaucratic inertia and incrementalism. In other words, making the index is the first process of decision-making/decision unifying.

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V. SUMMARY, RECOMMENDATIONS, AND AREAS OF FURTHER RESEARCH

A. SUMMARY

This research revealed both limitations and potentials of two existing approaches: the historical cost approach and the fair value approach. It also created the new fair military value approach to enhance decision usefulness of balance sheets in resource allocation for weapon systems. The scenario analysis shows advantages of this new approach in decision-making compared with the existing approaches. The new approach is a complement, not a substitute, for the existing approaches.

Additionally, the study also inspected three depreciation methods in terms of usefulness for weapon systems and created the inversed sum-of-the-year's-digits method, which is used as the standard depreciation vehicle in the fair military value approach.

Finally, the study pointed to problematic financial statements of the Japan MoD and proposes remedies.

B. RECOMMENDATIONS

Recommendations are divided into two parts. One part is about military financial statements in general, and the other is for the MoD of Japan.

1. Recommendation for Improving Decision Usefulness of Balance Sheets

Two sets of information—one from the existing historical cost approach, the other from the new fair military value approach—should be put side by side on the same balance sheets. The combination of the historical cost approach and the new approach is better than the combination of the existing fair value approach and the new approach because the historical cost approach better secures objectivity, which is absent in the new approach. The existing fair value approach can be unnecessarily expensive in assessing fair value without an active market. It requires substantial costs, while the benefits are, at best, meager.

The addition of numbers by the new approach provides significant benefits for decision-making with reasonable cost. The essence of the new approach is to articulate and reflect the judgements of military executives which already exist, explicitly or implicitly, and to include these judgements in unified decisions in resource allocation. The new approach also prioritizes critical tasks effectively in resource allocation decisions. The main channel of this new approach is to prepare indexes and numbers to critically evaluate the capability and necessity of weapon systems; it is the first process of decision-making.

Making better use of balance sheets in decision-making makes sense given that the distinction between internal and external information users is less significant within the DoD. Balance sheets provide useful information to both internal and external users.

One limitation of the new approach is that it also provides important information to adversaries. Everybody can use financial statements once they are publicized, and making the distinction between qualified users and adversaries with harmful intentions is impossible. If the judgements of executives are disclosed on balance sheets, that information becomes available to adversaries as well. This is the dilemma of military financial statements.

In the short run, confidentiality might take the front seat. To prevent adversaries from exploiting the judgements of executives, actions such as shielding a part of index of vital weapon systems must be implemented. In the long run, democratic principles might be superior to military confidentiality. Lack of accessibility can preserve bureaucratic inertia and slow necessary changes to the portfolio of weapon systems, which could benefit adversaries more.

2. Recommendation to the Ministry of Defense of Japan

The new approach is useful only when the financial accounting system is mature enough to incorporate the existing historical cost approach without material misstatement. Application of the new approach is too early for the Japan MoD.

For good or ill, Japanese ministries are not required to prepare a full corporate-style financial statement with an independent audit. Furthermore, no motivations, no legal

authority, and no resources exist to make an effort to reach the level of maturity of other countries. Unaudited financial statements, however, have little use for any purpose, and someone in the national Diet or the MoF will have to notice the importance of auditing sooner or later.

What the MoD can do now is to actively prepare for the upcoming change. Due to the size and complexity of the Japan MoD, it would be wise for the MoD to start earlier than other agencies. Conducting a pilot case for better financial statements is a good way to secure resources from the Diet and the MoF. Early cooperation with the MoF and strong commitment from the MoD to develop the next level of financial statements can be rewarding. As the first step toward this goal, the MoD should make the point to the MoF: that the formatting of financial statements should consider:

- decision usefulness,
- the economic lives of long-term assets should be flexible, and
- accelerated depreciation is not appropriate for the public sector.

Once audited financial statements are established, the new approach can be available with reasonable costs, and the benefits are substantial. It will benefit the MoD by reducing bureaucratic inertia and by increasing the speed of decision-making/unifying of resource allocation. The result will be the right portfolio of weapon systems that is more in line with military strategy.

C. AREAS OF FURTHER RESEARCH

This research focuses on balance sheets and the depreciation of long-term assets. A similar indexing methodology could be applied to other statements such as Statement of Net Cost. For example, personnel expenses to run weapon systems with a low index can be associated with lower military value, and hence can be shifted out to another area with high military value in the coming fiscal year. Prioritizing expenses is as important as prioritizing investments because military readiness consists of the combination of the right personnel educated properly with the right weapon systems. Indexing both investments and expenses on financial statements prompts the necessary changes to the status quo.

Ultimately, indexing and prioritization in investments and expenses make better use of financial statements, which could result in a better and faster transformation of the entire military organization that constantly responds to rapidly changing strategic circumstances.

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